Open Geospatial Consortium, Inc.

Date: 2009-7-29

Reference number of this document: OGC 09-034

Version: 0.3.0

Category: Public Engineering Report

Editor(s): Genong (Eugene) Yu, Liping Di

OGC® OWS-6 Georeferencable Imagery Engineering Report

Warning

This document is not an OGC Standard. This document is an OGC Public Engineering Report created as a deliverable in an OGC Interoperability Initiative and is not an official position of the OGC membership. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an OGC Standard. Further, any OGC Engineering Report should not be referenced as required or mandatory technology in procurements.

Document type:	Public Engineering Report
Document subtype:	NA
Document stage:	Approved for public release
Document language:	English

Preface

Suggested additions, changes, and comments on this draft report are welcome and encouraged. Such suggestions may be submitted by email message or by making suggested changes in an edited copy of this document.

The changes made in this document version, relative to the previous version, are tracked by Microsoft Word, and can be viewed if desired. If you choose to submit suggested changes by editing this document, please first accept all the current changes, and then make your suggested changes with change tracking on.

Forward

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium Inc. shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

OWS-6 Testbed

OWS testbeds are part of OGC's Interoperability Program, a global, hands-on and collaborative prototyping program designed to rapidly develop, test and deliver Engineering Reports and Chnage Requests into the OGC Specification Program, where they are formalized for public release. In OGC's Interoperability Initiatives, international teams of technology providers work together to solve specific geoprocessing interoperability problems posed by the Initiative's sponsoring organizations. OGC Interoperability Initiatives include test beds, pilot projects, interoperability experiments and interoperability support services - all designed to encourage rapid development, testing, validation and adoption of OGC standards.

In April 2008, the OGC issued a call for sponsors for an OGC Web Services, Phase 6 (OWS-6) Testbed activity. The activity completed in June 2009. There is a series of on-line demonstrations available here:
http://www.opengeospatial.org/pub/www/ows6/index.html

The OWS-6 sponsors are organizations seeking open standards for their interoperability requirements. After analyzing their requirements, the OGC Interoperability Team recommended to the sponsors that the content of the OWS-6 initiative be organized around the following threads:

1. Sensor Web Enablement (SWE)
2. Geo Processing Workflow (GPW)
3. Aeronautical Information Management (AIM)
4. Decision Support Services (DSS)
5. Compliance Testing (CITE)

The OWS-6 sponsoring organizations were:

- U.S. National Geospatial-Intelligence Agency (NGA)
- Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD)
- GeoConnections - Natural Resources Canada
- U.S. Federal Aviation Agency (FAA)
- EUROCONTROL
- EADS Defence and Communications Systems
- US Geological Survey
- Lockheed Martin

- BAE Systems
- ERDAS, Inc.

The OWS-6 participating organizations were:

52North, AM Consult, Carbon Project, Charles Roswell, Compusult, con terra, CubeWerx, ESRI, FedEx, Galdos, Geomatys, GIS.FCU, Taiwan, GMU CSISS, Hitachi Ltd., Hitachi Advanced Systems Corp, Hitachi Software Engineering Co., Ltd., iGSI, GmbH, interactive instruments, lat/lon, GmbH, LISAsoft, Luciad, Lufthansa, NOAA MDL, Northrop Grumman TASC, OSS Nokalva, PCAvionics, Snowflake, Spot Image/ESA/Spacebel, STFC, UK, UAB CREAF, Univ Bonn Karto, Univ Bonn IGG, Univ Bunderswehr, Univ Muenster IfGI, Vightel, Yumetech.

Contents

Page

Figures

Page

Tables

Page

OGC® OWS-6 Georeferencable Imagery Engineering Report

1 Introduction

1.1 Scope

This OGC™ document discusses considerations about and recommendations for approaches for georeferenceable imagery under the Sensor Web Enablement thread during OGC Web Services Phase 6. This is an extension to the work described in the previous engineering report number OGC 08-071[1] . Georeferencealbe imagery is "a referenceable grid that has information that can be used to transform grid coordinates to external coordinates, but the transformation shall not be required to be an affine transformation"[2]. Geolocation of georeferenceable imagery refers to the techniques described in ISO 19130, such as sensor models, functional fit models, and spatial registration using control points[3].

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium Inc. shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

1.2 Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

Table 1. List of contributors (sorted by name)

Name	Organization
Alexander Robin	SpotImage, France
Arne Bröring	52ºNorth, Muenster, Germany
Barry Schlesinger	CSISS, GMU, USA
Dave Wesloh	NGA, USA
Genong (Eugene) Yu	Center for Spatial Information Science and Systems (CSISS), George Mason University (GMU), USA
Ingo Simonis	SWE Lead Architect
Liping Di	CSISS, GMU, USA

Peichuan Li	CSISS, GMU, USA
Peisheng Zhao	CSISS, GMU, USA
Philippe Merigot	SpotImage, France
Steve Kerr	NGA, USA
Xiaoyan Li	CSISS, GMU, USA
Yuqi Bai	CSISS, GMU, USA

1.3 Revision history

Table 2. Revision history

Date	Release	Editor	Primary clauses modified	Description
12/12/2008	0.1.0	Eugene Yu		Initial draft and outline
02/04/2009	0.3.0	Eugene Yu		Detailed architecture revision.
04/17/2009	0.4.0	Eugene Yu		First complete draft.
04/21/2009	0.4.1	Eugene Yu and Liping Di	Doc # and examples	Correction on document # and more examples.
04/21/2009	0.4.2	Eugene Yu and Liping Di		Completed examples for Appendix D. Correction of the document number throughout the entire document.
04/22/2009	0.4.3	Eugene Yu and Liping Di		Updated the appendices. Added the erorr models and complete sensor model examples.
04/27/2009	0.4.4	Eugene Yu and Liping Di		Gramatical revision.
7/10/09	0.3.0	Carl Reed	Various	Prepare for publication

1.4 Future work

Improvements in this document are desirable to include more specific comments and suggestions resulted from the demonstration. These comments would serve as specific areas to be further considered in the coming OWS 6 or future improvements of related specifications.

2 References

The following documents are referenced in this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

OGC 06-121r3, *OpenGIS® Web Services Common Specification*

NOTE This OWS Common Specification contains a list of normative references that are also applicable to this Implementation Specification.

OGC 06-083r8, *OpenGIS Web Coverage Service (WCS) Implementation Specification*, Version 1.1.0.

OGC 07-067r2, *OpenGIS Web Coverage Service (WCS) Implementation Specification Corrigendum 1 (1.1.1 c1)*, Version 1.1.1

OGC 06-043r3, *Change Request: WCS: Add Transaction operation (1.1.0)*, Version 1.1.0

ISO/IEC 15444-9:2005, *Information technology -- JPEG 2000 image coding system: Interactivity tools, APIs and protocols*

OGC 07-022r1, *Observations and Measurements - Part 1 - Observation schema*, Version 1.0

OGC 08-022r1, *Change Request - O&M Part 1 - Move extensions to new namespace (1.0.0)*, Version 1.0.0

OGC 07-002r3, *Observations and Measurements - Part 2 - Sampling Features (1.0)*, Version 1.0

OGC 07-122r2, *OpenGIS SensorML Encoding Standard v 1.0 Schema Corregendum 1 (1.01)*, Version 1.0.1

OGC 07-000, *OpenGIS Sensor Model Language (SensorML)*, Version 1.0

OGC 06-009r6, *OpenGIS Sensor Observation Service*, Version 1.0

OGC 00-116, *The OpenGIS Abstract Specification, Topic 16: Image Coordinate Transformation Services*, Version 6

OGC 03-105r1, *OpenGIS Geography Markup Language (GML) Encoding Specification*, Version 3.1.1

OGC 05-008, *OGC Web Services Common Specification*, Version 1.0.0

OGC 05-047r3, *OpenGIS GML in JPEG 2000 for Geographic Imagery Encoding Specification*

OGC 05-096r1, *GML 3.1.1 grid CRSs profile* OGC 06-009r5, *Sensor Observation Service*

OGC 06-083r8, *OpenGIS Web Coverage Service (WCS) Implementation Specification*, Version 1.1.0

OGC 06-111, *GML 3.1.1 grid CRSs Profile Corrigendu*

OGC 06-121r3, *OpenGIS® Web Services Common Specification*

OGC 05-099r2, *GML 3.1.1 simple dictionary profile*

OGC 05-103, *The OpenGIS Abstract Specification, Topic 2: Spatial Referencing by Coordinates*

OGC 06-010r6, *Transducer Markup Language (TML) Implementation specification*, Version 1.0.0.

OGC 07-000, *OpenGIS Sensor Model Language (SensorML)*, Version 1.0.0 OGC 07-002r3, *Observation and Measurements – Part 2 – Sampling Features*

OGC 07-006r1, *OpenGIS Catalog Service Implementation Specification*

OGC 07-022r1, *Observation and Measurements – Part 1 – Observation Schem*

OGC 07-030r1, *OpenGIS Image Geopositioning Service (IGS)*

OGC 07-031r1, *OpenGIS Image Geopositioning Metadata GML 3.2 application schema*

OGC 07-036, *OpenGIS Geography Markup Language (GML) Encoding Specification*, Version 3.2.1

OGC 07-055, *Web Coordinate Transformation Service (WCTS) draft Implementation Specification*

OGC 07-067r2, *OpenGIS Web Coverage Service (WCS) Implementation Specification Corrigendum 1 (1.1.1 c1)*

OGC 07-112, *GML 3.2.1 CR – Add implementation of ISO 19123 CV_Referenceable Grid to GML*

In addition to this document, this report includes several XML Schema Document files as specified in Annex A.

3 Terms and definitions

For the purposes of this report, the definitions specified in Clause 4 of the OWS Common Implementation Specification [OGC 06-121r3] shall apply. In addition, the following terms and definitions apply.

3.1 Workflow

Workflow, or composite Web service, is in its narrow definition in the domain of Web-based environment. A **workflow** is a sequence of operations that are enabled through a Web-based program or Web services in the geospatial domain as related to the initiative of this test bed.

3.2 Business Process Execution Language

BPEL is the abbreviation. The long name is **Web Service Business Process Execution Language (WS-BPEL)**. It is a standard for scripting the workflow of Web services. BPEL has been evolved into an Organization for the Advancement of Structured Information Standards (OASIS) standard in 2007. More details about the current version of WS-BPEL can be found at the website: http://www.oasis-open.org/committees/wsbpel.

4 Conventions

4.1 Abbreviated terms

AOI	Area of Interest
API	Application Program Interface
BPEL	Business Process Execution Language, also see WS-BPEL
BPEL4WS	Business Process Execution Language for Web Service
COM	Component Object Model
CORBA	Common Object Request Broker Architecture
COTS	Commercial Off The Shelf
CSISS	Center for Spatial Information Science and Systems, GMU, USA
CSW	Catalogue Service for the Web
DCE	Distributed Computing Environment
DCOM	Distributed Component Object Model
GeOnAS	GeoBrain Online Analysis System
GMU	George Mason University
IDL	Interface Definition Language
IFGI	Institute for Geoinformatics, University of Münster in Germany
ISO	International Organization for Standardization
JPEG	Joint Photographic Experts Group
JPIP	JPEG 2000 Interactive Protocol
NGA	National Geospatial-Intelligence Agency, USA
O&M	Observations and Measurements
OASIS	Organization for the Advancement of Structured Information Standards
OGC	Open Geospatial Consortium

OWS	OGC Web Services
OWS-5	OGC Web Services, Phase 5
SAS	Sensor Alert Service
SOS	Sensor Observation Service
SOS-T	Sensor Observation Service with the transaction option
SPS	Sensor Planning Service
UML	Unified Modeling Language
W3C	World Wide Web Consortium
WCS	Web Coverage Service
WCS-T	Web Coverage Service with the transaction add-on
WNS	Web Notification Service
WPS	Web Processing Service
WS-BPEL	Web Service Business Process Execution Language, also see BPEL
WSDL	Web Service Description Language
XML	eXtensible Markup Language
XPath	XML Path Language

4.2 UML notation

Most diagrams that appear in this standard are presented using Unified Modeling Language (UML) static structure diagrams, as described in Subclause 5.2 of [OGC 06-121r3].

4.3 Used parts of other documents

This document may use significant parts of document [OGC 09-034]. To reduce the need to refer to that document, this document copies some of those parts with small modifications. To indicate those parts to readers of this document, the parts that are mostly copied are shown with a light grey background (15%).

4.4 Others

4.4.1 HTTP GET request

This document may contain encoding appropriate for use of HTTP GET transfer of operations requests (using KVP encoding), and for use of HTTP POST transfer of operations requests (using XML or KVP encoding). When KVP encoding is used, the KVP request may be written across multiple lines. The document assumes that there is no space between lines. For example, the two KVP requests in the following Examples 1 and 2 are identical, even though they look different.

Example 1: *http://someserver/somerequest?p1=a1&p2=a2&p3=a3&p4=a4*

Example 2: *http://someserver/somerequest?*

p1=a1

&p2=a2

&p3=a3&p4=a4

4.4.2 XPath query

Queries are expressed as XPath queries as used in the Business Process Execution Language (BPEL) workflow, unless defined differently, because BPEL supports only XPath 1.0 query.

When an XPath query is written in the document, namespace may be used or omitted. The omission of the namespace is for convenience. Inclusion of namespace is recommended when a BPEL script is written, although the workflow engine used in the case, the BPELPower engine, tolerates the omission of namespace.

5 Georeferenceable Imagery overview

The specified Georeferenceable Imagery workflow addresses use cases that show the functions of the Sensor Web Enablement services: Sensor Planning Service (SPS), Sensor Observation Service with the optional transaction support (SOS-T), Web Processing Service (WPS), and Web Coverage Service with transaction support (WCS-T), as shown in Figure 1. The technical objectives are to allow instant access to time-sensitive imagery at different processing levels, to geo-locate the imagery of interest, and to propagate uncertainty statistics.

Given the accumulated experience from several OWS initiatives and the wide range of support in commercial and open-source design tools, the *de facto* industrial workflow scripting language, Business Process Execution Language (BPEL), has been used as the main language for composing the workflow. This leads to the requirement of adapting each OGC-compliant service to be used in the workflow. Harmonizing the service components and chaining the services into a mega-service or a workflow can be helpful in the development of individual Web services.

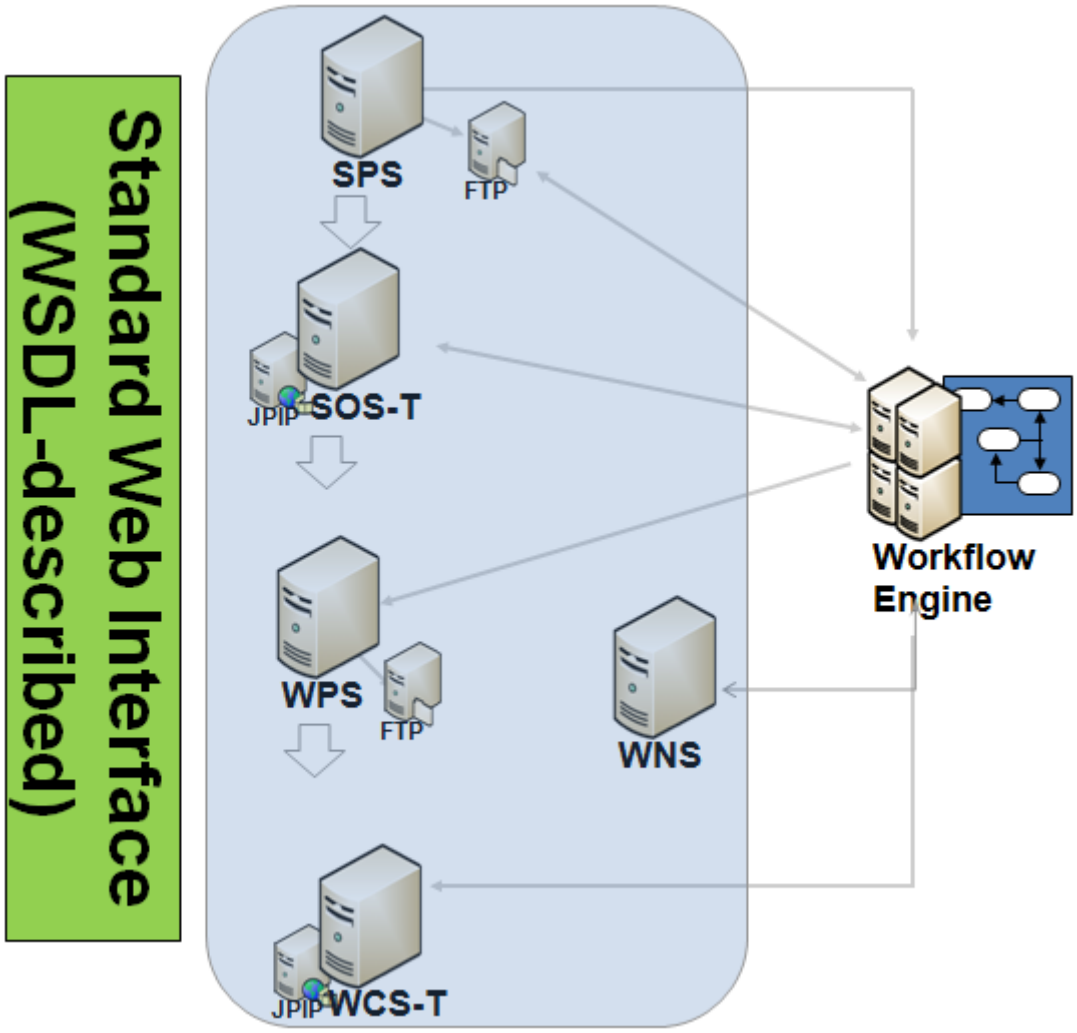

Figure 1 — Service Components and the Overall Workflow

6 GeoReferenceable imagery

6.1 User requirements

In this use case, Sensor Web Enablement is used for georeferenceable imagery. The case should be developed for the \OWS-5 georeferenceable imager workflow. The user requirements for Georeferenceable imagery can be summarized as follows:

(1) Instant notification of imagery availability: From the sensor to the end user, imagery may be available at different levels of processing. The imagery may be initially acquired as georeferenceable imagery, or non-rectified imagery with sensor parameters. Georeferenceable imagery should be accessible instantly on the Web through an interactive imagery server for the user to view and analyze without having to download all the imagery. The imagery may be further rectified using some models or processing services. The user should be notified the instant the rectified imagery is available.

(2) Geo-location: Image-to-ground geolocation should be supported when the imagery has been passed along in the workflow. Before the rectified imagery is available, either a physical sensor model or a replacement sensor model should be used for the image-to-ground geolocation. A physical sensor model uses the physical configuration of the sensor to geolocate the georeferenceable imagery. A replacement sensor model uses a functional-fit (e.g. polynomial) model derived from the results of physical sensor modeling.

(3) Uncertainty propagation: The uncertainty or error in the image-to-ground geo-location should be passed along in the georeferenceable imagery workflow. Users at different stages should have a clear estimate of the geolocation accuracy as well as use the uncertainty statistics in further improving the geo-location. Propagation of the uncertainty should be supported either physically or virtually. In physical support, the uncertainty statistics are exchanged through image pixels and support parameters. In virtual support, the uncertainty statistics are accessible by some service created in the previous process.

7 Standard service-oriented architecture

7.1 Related geospatial specifications (OGC)

The georeferenceable imagery workflow is a use case that makes use of all the services developed under OGC Sensor Web Enablement. SPS is needed for the acquisition planning of georeferenceable imagery. SOS serves the georeferenceable imagery, encoded as specified by Observations and Measurements (O&M). The Sensor Alert Service (SAS) or Web Notification Service (WNS) is required to notify users of the availability of imagery at different processing stages.

Besides the special services for the Sensor Web, common OGC Web services are needed. WCS provides persistent storage services for imagery. The WPS has a geo-rectification process.

OGC Web services are published as standard Web services, defined by W3C and OASIS. General Web service tools and utility packages can be used to handle OGC-compliant geospatial Web services. For example, BPEL and its design tools can be used for workflow design, execution, and management.

7.2 Workflow design

BPEL is adopted as the primary workflow scripting language that takes advantage of the popular design tools and service descriptions. A BPEL engine is to be used in executing and managing workflows. The use case requires a reduction of the time delay in the delivery of sensor observations. A new sensor observation should be made available to user with instant notification once the observations are received by the sensors. A notification service, specifically WNS, was designed into the georeferenceable imagery workflow to deliver instant messages to the user when imagery at different processing

stages is available. This Georeferenceable Imagery workflow is required to demonstrate three aspects of sensor web technology:

(1) Instant access to time-sensitive imagery at different processing levels

(2) Geolocating the imagery of interest

(3) Uncertainty propagation.

Figure 1 shows the the components and their roles in the workflow for distribution and processing of georeferenceable imagery.

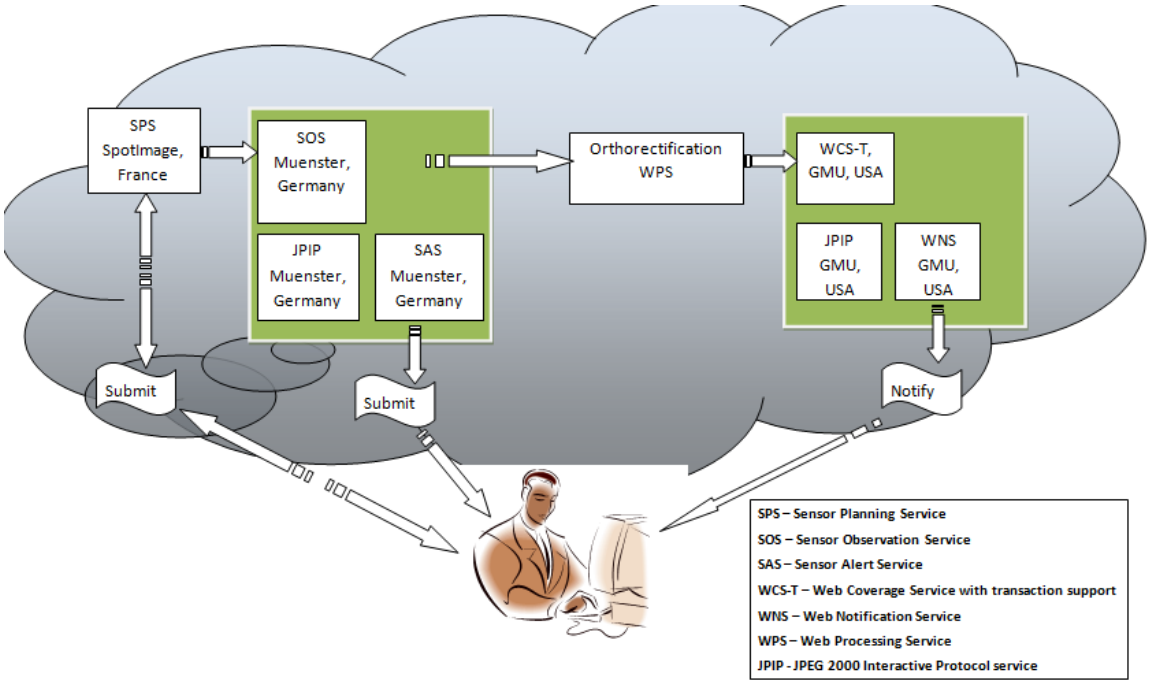

Figure 1. Georeferenceable Imagery Workflow

The interaction chart shows the workflow to be as follows.

1. The user initiates an observation plan through the SPS. The SPS is responsible for receiving submitted acquisition requests, retrieving the image data or observations requested, and uploading the observations to the SOS through its transaction operations, either the *InsertObservation* operation or the service SOS-T. SOS-T is SOS with transaction capability.

2. SOS-T serves the unrectified imagery uploaded as users demand through SPS. Both observation and sensor metadata should be accessible from SOS-T. Quick viewing capability should be supported, perhaps through the tandem JPIP image interactive protocol service.

3. An orthorectification service, following the OGC WPS specification, is set up to rectify the imagery. In a WPS, this service is called a geospatial Web process.

The Web process should be able to take the input imagery from the SOS-T and output orthorectified imagery and associated metadata (containing uncertainties). The outputs should be readily passed along to the WCS-T of the next step.

4. A WCS-T, capable of accepting inputs from the outputs of the Web process in the third step, is set up. A JPIP service is also set up in tandem with the WCS-T. The in-tandem JPIP service allows users to preview the imagery quickly. The rectified image and its associated metadata should be supported by the WCS-T, especially the preservation of error statistics.

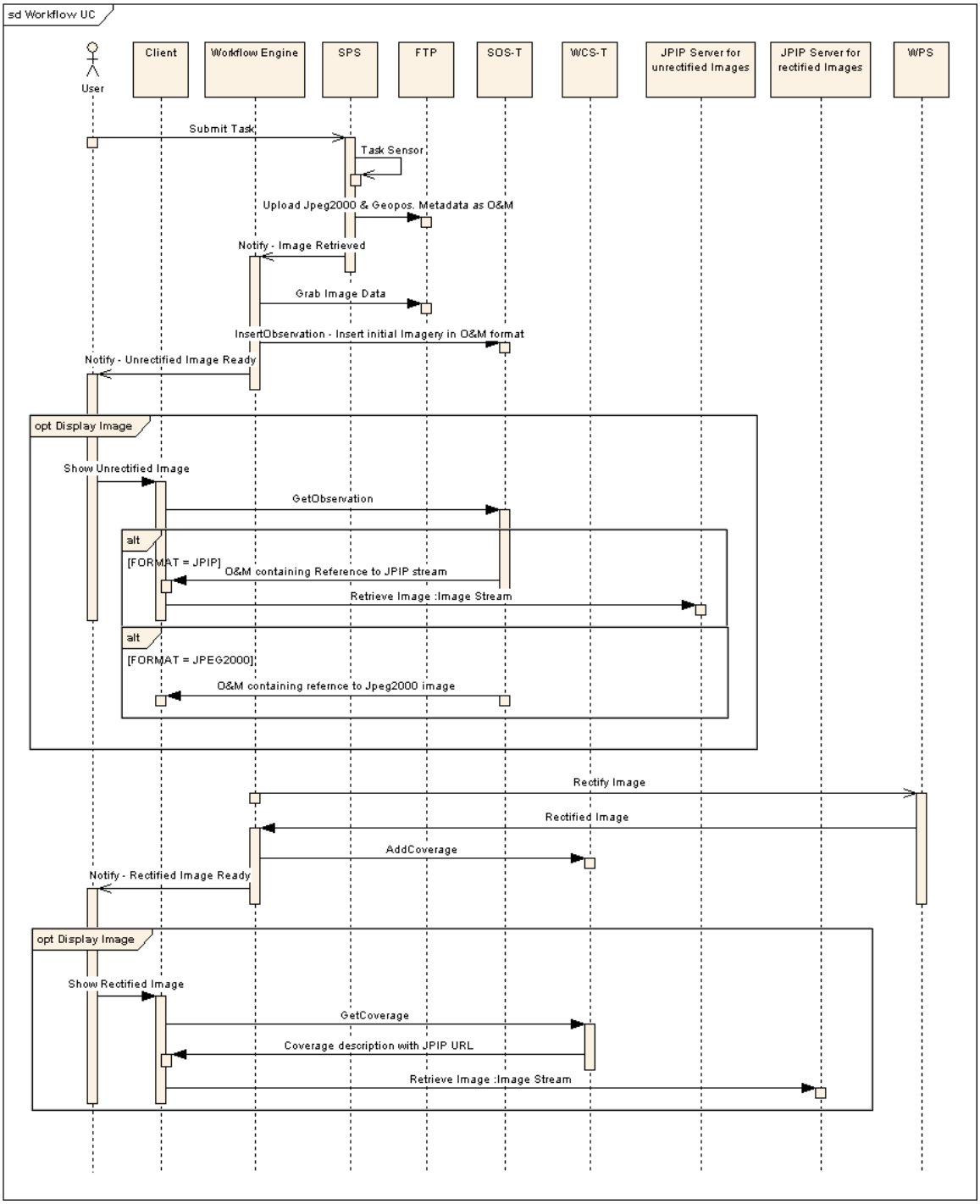

Figure 2. Sequence chart for the georeferenceable image workflow

The workflow was designed to use the BPEL engine instead of actual participants as a coordinator. Therefore, as shown in Figure 3, the engine does not participate in the actual relaying of data or imagery, but passing the messages. In Figure 3, thin arrows represent the paths of message flow and thick and wide arrows represent the paths of data/imagery flow. At each step, the workflow engine parses the message and forms the URL to extract the data. This URL is passed to the next Web service for formal process. This method

reduces the unnecessary network traffic of downloading data to the workflow engine and feeding it into another service.

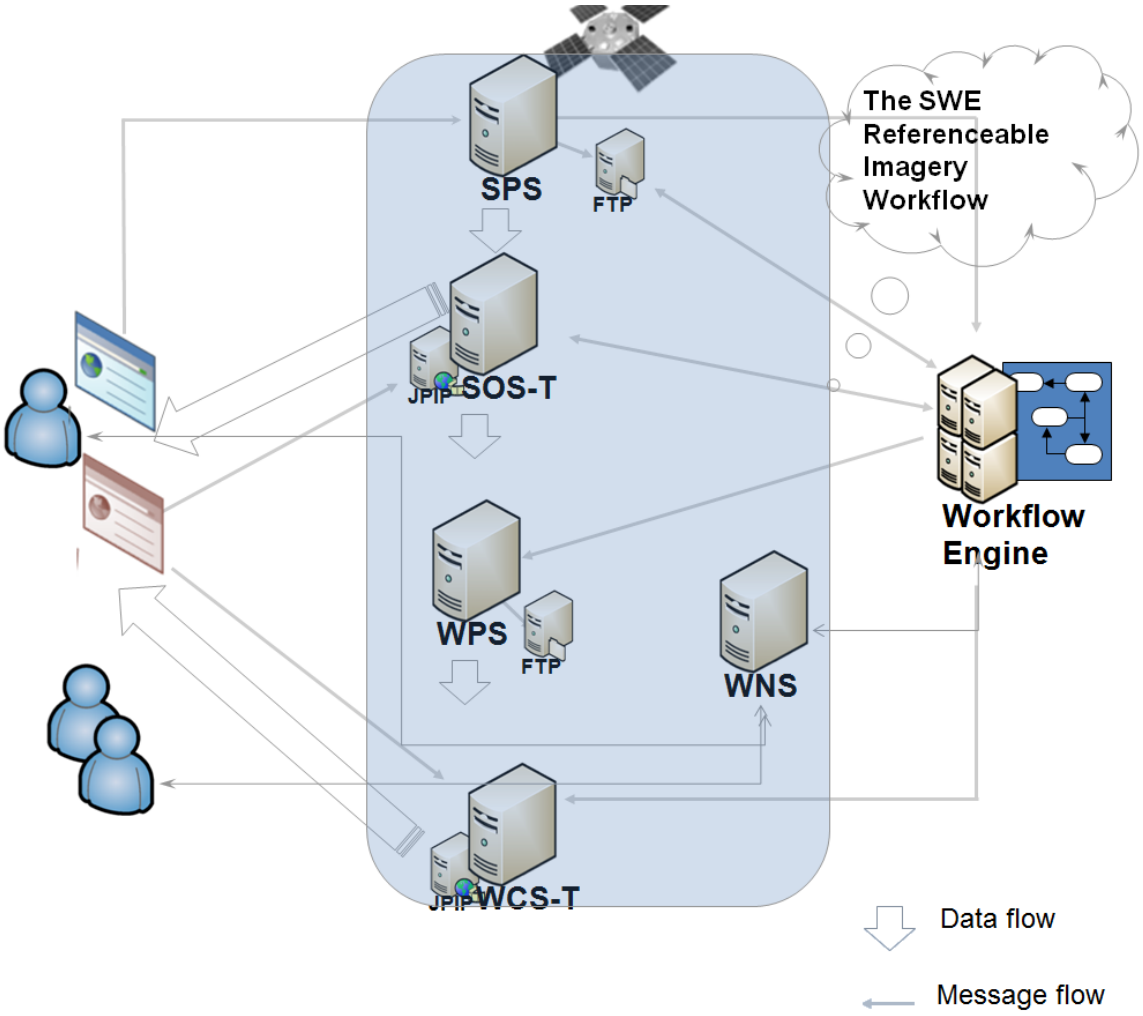

Figure 3. Data and message flow of the georeferenceable image workflow

7.3 Technical details

7.3.1 Planning, notification, and accessing

SPS is used for planning the acquisition of georeferenceable imagery. SAS is used for the delivery of notification messages. SOS, WCS, and JPIP are the access services for perishable observation, persistent storage, and imagery view.

7.3.2 Uncertainty propagation

Existing services may need augmentation to support the propagation of uncertainty statistics.

The uncertainty statistics are to be preserved and passed along the workflow by encoding them in the metadata section. The uncertainty statistics include both the quality information for sensing and encoding at sensors or the processing nodes and covariance matrices introduced in the processing by comparing the input and outputs at the node. The metadata should be usable within sensor models to describe parameter uncertainties as well as in datasets to report geometric (and radiometric) accuracy.

The mechanism and strategy by which uncertainty information to propagates along the workflow is one of the core concepts to be demonstrated in the OWS-6 testbed. Both rectified and unrectified imagery should have relevant uncertainty information, the metadata for unrectified imagery should consist of observation (O&M) metadata, a sensor model with adjustable parameters, and parameter uncertainty information. The metadata for rectified imagery should consist of coverage metadata and geometric positioning uncertainty.

The uncertainty information is proposed to be encoded in SensorML and SWE Common, following the Community Sensor Model WG profiles. Table 3 shows one example of the error matrix described in SensorML. In this demonstration, examples of the following sensor models are given.

- Frame Camera Model
- Pushbroom Model
- Whiskbroom Model
- Pushbroom Model
- RPC/RSM polynomial model
- SAR model

Table 3. An example of uncertainty error matrix

<sml:parameter name="UncertaintyInformation">
- <swe:DataRecord>
- <swe:field name="AdjustableParameters">
- <swe:DataRecord>
<swe:field name="PlatformLocationX" xlink:href="#LOC_X"/>
<swe:field name="PlatformLocationY" xlink:href="#LOC_Y"/>
<swe:field name="PlatformLocationZ" xlink:href="#LOC_Z"/>

```
                    <swe:field name="PlatformAttitudeX" xlink:href="#YAW"/>
                    <swe:field name="PlatformAttitudeY" xlink:href="#PITCH"/>
                    <swe:field name="PlatformAttitudeZ" xlink:href="#ROLL"/>
                    <swe:field name="FocalLength" xlink:href="#FOCAL_LENGTH"/>
                </swe:DataRecord>
            </swe:field>
- <swe:field name="CovarianceMatrix">
- <swe:DataArray definition="urn:ogc:def:property:CSM:COVARIANCE_MATRIX">
- <swe:elementCount>
- <swe:Count>
                            <swe:value>7</swe:value>
                        </swe:Count>
                    </swe:elementCount>
- <swe:elementType name="Row">
- <swe:DataArray>
- <swe:elementCount>
- <swe:Count>
                                    <swe:value>7</swe:value>
                                </swe:Count>
                            </swe:elementCount>
- <swe:elementType name="Value">
                                    <swe:Quantity/>
                            </swe:elementType>
                        </swe:DataArray>
                    </swe:elementType>
- <swe:encoding>
                        <swe:TextBlock tokenSeparator="" blockSeparator="" decimalSeparator="."/>
                    </swe:encoding>
```

```
                    <swe:values>1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 1</swe:values>

                </swe:DataArray>

            </swe:field>

        </swe:DataRecord>

</sml:parameter>
```

The usage of the uncertainty information should be demonstrated at the client-side. The client concerns access to the metadata information. Three types of data access services are involved in this demonstration effort: Web Coverage Service (WCS), the JPEG 2000 Interactive Protocol (JPIP), and Sensor Observation Service (SOS). The processing service should be able use WCS to account for the introduction of its error and present the uncertainty statistics in an acceptable format. The uncertainty statistics are served in the following ways:

- SPS - The uncertainty information/statistics are provided as part of the O&M encoded observation.
- SOS – The uncertainty information/statistics are encoded as part of the O&M encoded observation.
- WCS – The uncertainty information/statistics is encoded in the metadata section of the coverage description. The information should be retrieved through *DescribeCoverage* and *GetCoverage*.
- WPS – The orthorectification WPS process introduces error. The error during the rectification process should be recorded and passed along to the users. The uncertainty statistics are required to be encoded in a format acceptable for the WCS.

8 Geo-positioning

8.1 Sensor model

Sensor parameters can be used to locate the image to approximate ground coordinates. A sensor observation is described in SensorML. Two example models were given in Appendix A.

8.2 Geo-locating the imagery of interest

The question is how to realize the services under the umbrella of the OGC Web Services. Further discussion is to be provided.

9 Service components

9.1 SPS for planning

The Sensor Planning Service (SPS) has been implemented by SpotImage. The specification for the service is the developing SPS 2.0. The UML models and their generated schema can be found at http://dev.igsi.eu/. The operations to be used in this demonstration include *DescribeSensor, GetFeasibility, DescribeResultAccess, DescribeTasking, GetStatus, submit,* and *subscribe*.

The endpoint for the SPS is at http://ws.spotimage.com/axis2/services/SPSv20. The demo page is at http://ws.spotimage.com/client_ows/. The WSDL for the SPS 2.0 is at http://csiss.gmu.edu/sensorweb/wsdls/ows6/sps/csiss4spotimageSPSv20.wsdl. See Section D.2 of Appendix D for detailed example request and response on the typical operations.

9.2 SOS with JPIP

Münster University, Germany has implemented SOS. The specification for the service is the OGC's SOS 1.0 specification OGC 06-009r6. The implementation of the SOS supports the *GetCapabilities*, *DescribeSensor*, *GetObservation*, *RegisterSensor*, and *InsertObservation* operations. These operations support the description of sensors and their observations, acquisition and retrieval of sensor observations, and insertion of observations from outside of the server the capability of transactions. Therefore, its short form is SOS-T, where the ending T stands for transaction capability.

The *GetCapabilities* and *DescribeSensor* operations are mainly related to the retrieval of metadata and descriptions of sensors and their observation offerings. Their responses are encoded mainly in SensorML 1.0.1, a sensor model language developed as a standard specification under the Open Geospatial Consortium. The reference documents are encoding languages OGC 07-122r2 (for version 1.0.1) and OGC 07-000 (for version 1.0).

The observations are retrievable through the operation *GetObservation*. The responses are encoded following the OpenGIS® Observations and Measurements Encoding Standard (O&M) 1.0 specification. The document reference numbers are OGC 07-022r1 (for observation schema), OGC 08-022r1 (namespace correction), and OGC 07-002r3 (sampling features).

The actual image data is provided "out-of-band", or the image is not actually delivered with the request/response message but through URLs. Image data can be fed into the SOS through the operation *InsertObservation* once the sensor has been registered with the SOS through the operation *RegisterSensor*.

One of the unique features for the SOS-T is the tandem support of the JPEG 2000 Interactive Protocol (JPIP) publication of sensor image data. The JPIP service allows the user to view and manipulate the dataset instantly and efficiently through the specifically optimized protocol for interaction on JPEG images. The specification is ISO/IEC 15444-9.

The endpoint for the new version of SOS is at http://v-swsl.uni-muenster.de:8080/52nSOS-OWS6/sos. Basic test clients with example requests can be found at http://v-swsl.uni-muenster.de:8080/52nSOS-OWS6. The WSDL for the SOS is at http://csiss.gmu.edu/sensorweb/wsdls/ows6/sos/gmu4muensterSOS.wsdl. See Section D.3 of Appendix D for detailed example request and response on the typical operations.

9.3 WCS-T for JPIP

WCS with transaction support has been implemented at George Mason University. The specification uses WCS version 1.1.0 as its base. The specification for the standard interface, the version 1.1.0 Implementation Specification for WCS is OGC 06-083r8 , OGC 07-067r2 for the Corrigendum 1 on Version 1.1.1, and OGC 06-043r3 for the Change Request to have the *Add* Transaction operation. The implementation specifically supports the transaction with the *Add* operation. This minor change will not affect the namespace. So, all WCS versions 1.1.x are generally the same in that they lack the Transaction operation. The transaction is still in the early stage of development.

The WCS-T is also in tandem with a JPIP server, deployed on the same server as on the same server a JPIP service. The image can be accessed through both JPIP service interfaces and WCS specific interfaces.

The released WCS-T is at endpoint: http://ws.csiss.gmu.edu/cgi-bin/wcs-t. The example is available at http://ws.csiss.gmu.edu/wcst_add.htm. Its WSDL is published at http://csiss.gmu.edu/sensorweb/wsdls/ows6/wcst/ows-6_wcs_110_transaction.wsdl. See Section D.6 of Appendix D for detailed example request and response on the typical operations.

9.4 Workflow Engine

The BPELPower BPEL engine of George Mason University was used in the testing and execution of the Georeferenceable Imagery Workflow. BPELPower was initially developed in 2004 and has been enhanced and adapted over several phases of OWS to support the OGC-specific Web services. Figure 4 shows the overall architecture of the workflow engine. It was implemented using service-oriented architecture. The engine has back-end databases to manage and store the WSDL descriptions and BPEL workflows. During the execution of workflows, instances and activities/events of each workflow script are managed with in-memory databases for the speed.

From the user point of view, the engine provides two sets of functionalities. One is for human interactions through the portal. A user can interactively deploy and undeploy a service or a BPEL process. The service or the process can be tested and debugged

through the portal. The portal also allows the visual examining the processes and associated descriptions, such as WSDL and BPEL scripts.

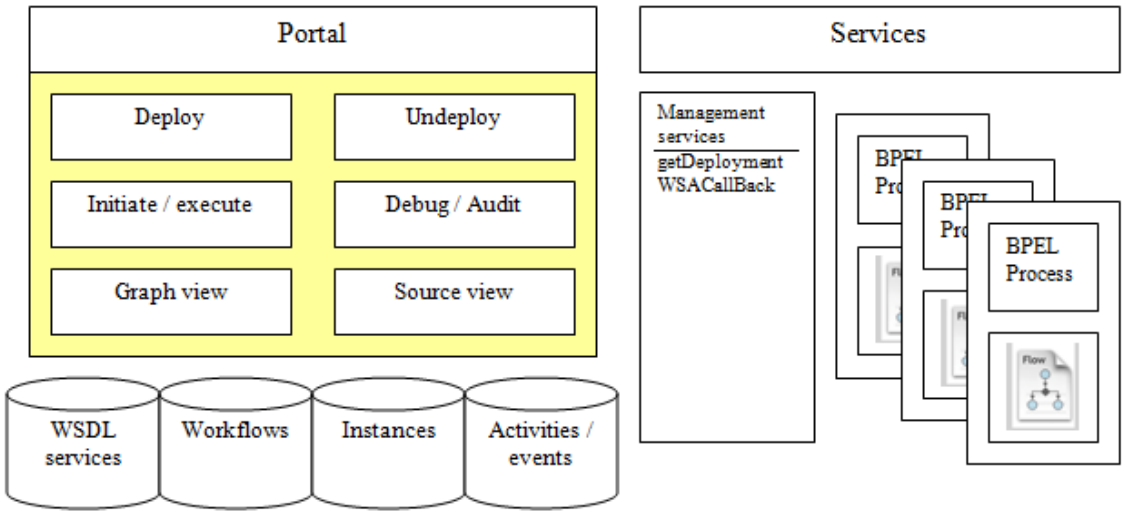

Figure 4. Architecture of the BPELPower workflow engine (excerpted from Yu, Di, Moses et al. 2008[4])

The other is for machine-to-machine interoperation. Once a service or a BPEL process has been deployed in the workflow, it becomes a standard Web service with proper description in WSDL. A user's program can list and retrieve the information through operations such as *getProcesses* for listing processes and *getServices* for listing services. Bindings of HTTP GET, HTTP POST, and SOAP support invoking a deployed service. The engine also provides a service to invoke a process by dynamic deployment of a BPEL script invoking a deployed service through the operation *getDeployment*.

10 GeoReferenceable imagery clients

The workflow engine notifies subscribed users during the execution of the georeferenceable imagery workflow what imagery is available. Users can access the images once they have received the notification. All data are served through standard OGC-compliant data services. The client software can be provided by any vendor as long as the program supports the access to services specified by the OGC specifications. In this testbed, two clients have been given as examples of access to the data at different stages. First is the one used by the team at University of Muenster, Muenster, Germany. Figure 5 shows the client. The client allows users to access raw data from SOS and rectified data from WCS. Both WCS and SOS provide options to access the data through a JPIP server. The client can use the JPIP streaming service to quickly access and preview the data.

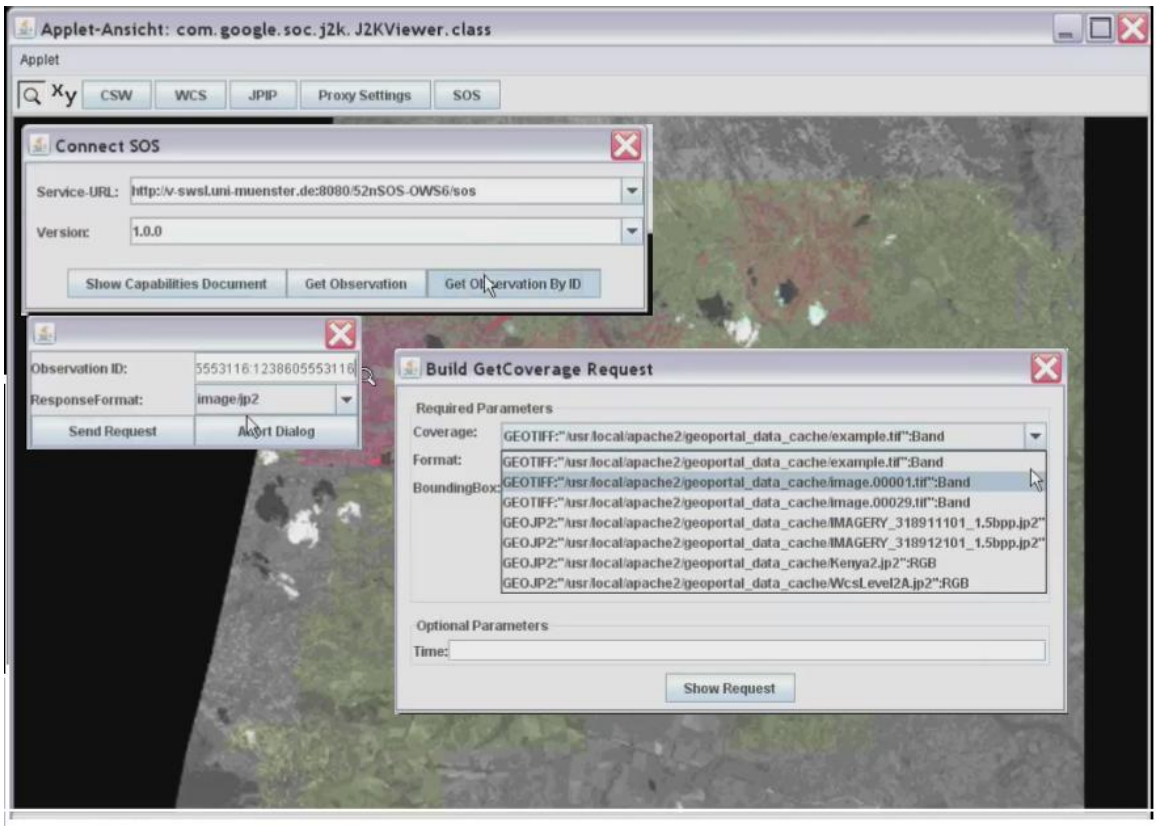

Figure 5. A geospatial client with the support of JPIP

Another client is the GeoBrain Online Analysis System (URL: http://geobrain.laits.gmu.edu:81/OnAS/). This is an online analysis service. This client is best used through discovering all the data falling into an area of interest. As shown in Figure 6, GeOnAS allows users to discover all data meeting the user-defined criteria in the area of interest. Here, three bands of data are loaded into the project. Further analyses, such as computation of NDVI or any other processing algorithms available in the open source GRASS software, are possible by invoking geospatial Web services. For this SWE Referenceable Imagery workflow case, when the rectified data in the WCS become available and are registered into the catalogue service, they can be found and then loaded into the working project.

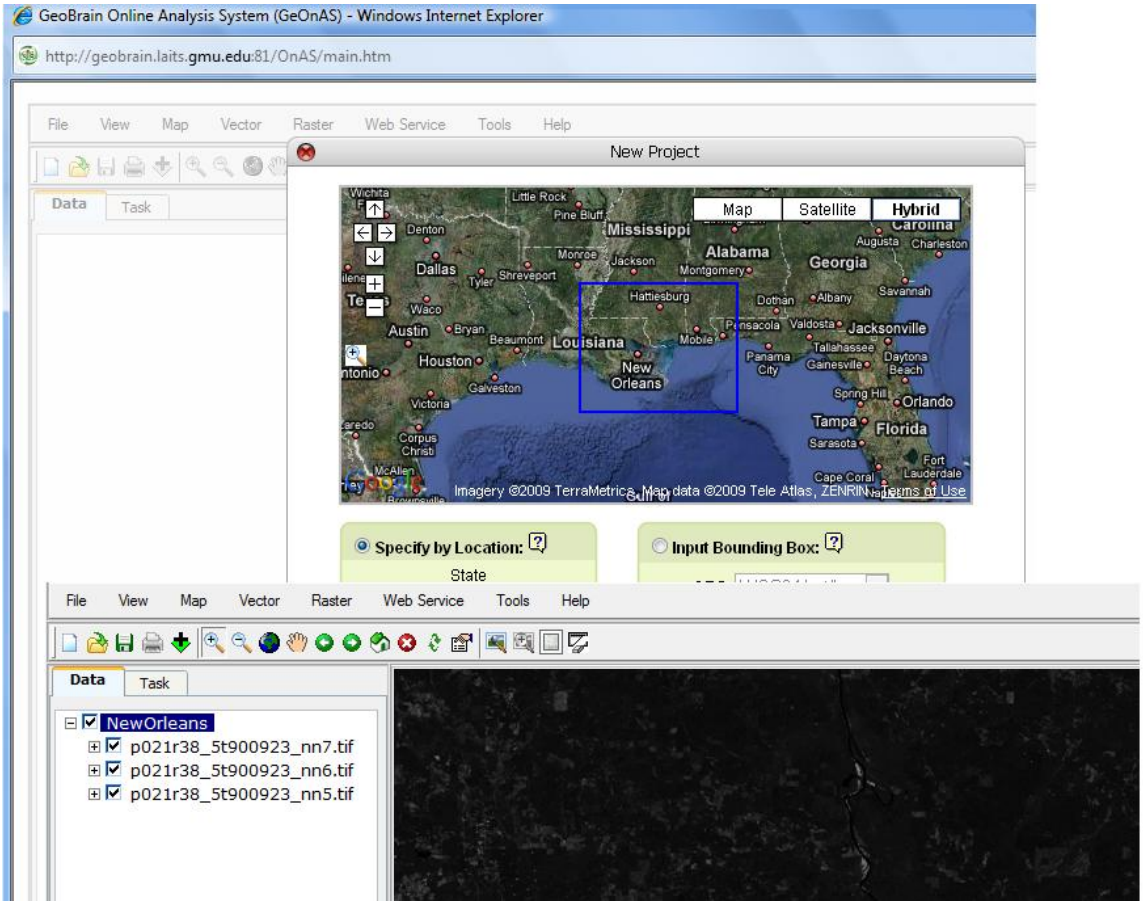

Figure 6. The GeoBrain Online Analysis System (GeoOnAS)

11 Use cases (implementation and evaluation)

11.1 Access georeferenceable imagery from data streams

A JPIP server is capable of streaming JPEG2000 imagery while using the least bandwidth. Both a fast preview of the whole image at low resolution and a quick zoom in to part of the imagery at high resolution are possible. This protocol provides a mechanism for shortening the time to preview and identify the area of interest in a large image. It is important for a quick response to an emergency.

The time delay in viewing the imagery from a live sensor was reduced by binding the JPIP server with the data provider services. The services providing data for georeferenceable imagery are SOS and WCS. The observation retrieval operations for the SOS-T used in the workflow, ,GetObservation and GetObservationById, respond with messages containing the link to the JPIP server. Table 4 shows a sample request to the *GetObservationById* operation of the SOS-T. Table 5 shows part of the sample response to the *GetObservationById* operation. The reference link to the JPIP server can be retrieved using the following XPath query:
/Observation/result/swe:DataArray/swe:values/@xlink:href

Table 4. Sample request to retrieve an observation from the SOS-T

```
<?xml version="1.0" encoding="UTF-8"?>

<GetObservationById xmlns="http://www.opengis.net/sos/1.0">

    <ObservationId>HRG-HMB:1226480153116:1226480153116</ObservationId>

    <responseFormat>image/jpp-stream</responseFormat>

</GetObservationById>
```

Table 5. A sample response (omitted) to the operation of GetObservationById from the SOS-T

```
<?xml version="1.0" encoding="UTF-8"?>

<Observation ...>

    ......

    <result ...>

        <swe:DataArray>

            ......

            <swe:values xlink:href="jpip://v-swsl.uni-muenster.de:8090/org_HRG-
HMB_1226480153116_1226480153116.jp2"/>

        </swe:DataArray>

    </result>

</Observation>
```

Similar measures were taken for the implementation of the WCS-T. The data can be served through both standard WCS and JPIP. Table 6 shows a sample *getCoverage* request to WCS-T to retrieve the JPIP reference, formed in KVP. The WCS specification is not designed to return a JPIP streaming reference. A temporary solution can be provided by adapting an implicit protocol. In this case, the implicit protocol is defined as follws: if the return *format* is *image/jpeg2000* and *store* parameter is set to *true*, the response will contain the JPIP streaming reference. ***A change request may be submitted to specify that the protocol reply with a streaming reference.*** Table 7 shows a sample response to a *getCoverage* request. The XPath query to retrieve the reference is as follows.

/Coverages/Coverage/Reference/@href

Table 6. A sample KVP request to the operation of getCoverage from the WCS-T (no space between lines)

http://ws.csiss.gmu.edu/cgi-bin/wcs-t?

service=WCS&request=getCoverage&version=1.1

&identifier=GEOJP2:%22/usr/local/apache2/geoportal_data_cache/

WcsLevel2A.jp2%22:RGB&format=image/jpeg2000&store=true&

bbox=94.9504,5.11868,95.7619,5.79925,urn:ogc:def:crs:EPSG:6.3:4326

Table 7. A sample response to the operation of getCoverage from the WCS-T

```
<Coverages xsi:schemaLocation="http://www.opengis.net/ows/1.1
http://schemas.opengis.net/ows/1.1.0/owsCoverages.xsd">

   <Coverage>

      <Abstract>Coverage created from GetCoverage operation request to a WCS</Abstract>

      <Reference href="jpip://ws.csiss.gmu.edu/restore/BBBA07F2-789C-429A-BE4A-
36FCF9EB7E4C.jp2" role="urn:ogc:def:role:WCS:1.1:coverage"/>

   </Coverage>

</Coverages>
```

Client software that supports the JPIP protocol can process the JPIP reference. Figure 7 shows a JPIP client that retrieve imagery from the GMU WCS-T by parsing the response. If the user desires tehm quick previews and quick zooming-in are ease.

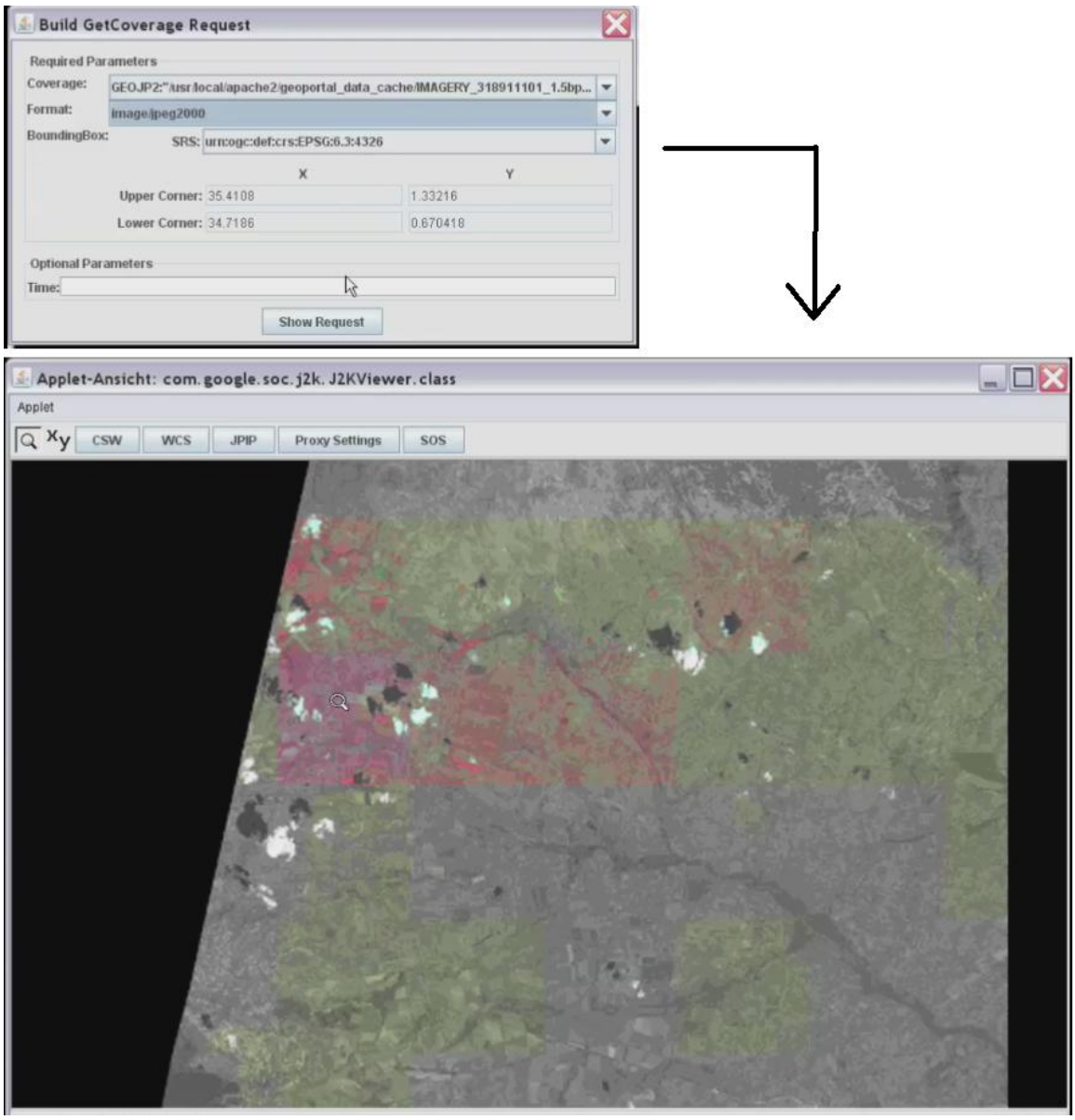

Figure 7. A JPIP client to access the stream data from the WCS

11.2 Extract sensor and/or replacement sensor model parameters along with uncertainty (error propagation) parameters

Uncertainty parameters are passed along the workflow. Users can retrieve the error matrix at different stages of processing. Table 8 shows one brief version of the response to invoking the SOS-T *GetObservationById* operation. The response contains the error model in the form of an error matrix. Users who who need the error matrices can process this information.

Table 8. A sample response (omitted) to the GetObservationById of the SOS-T (contains an error matrix)

```
<Observation ...>
.....
<featureOfInterest ...>
 <GeoreferenceableSwath ...>
  ......
  <groundToImageModel ...>
   <ProcessModel ...>
    ......
    <parameters ...>
     <ParameterLis ...>
      ......
      <parameter ...>
       <DataRecord ...>
        ......
        <field ...>
         <DataArray ...>
          ......
          <values ...>
            1 0.003 0.0024 0.0019 0.0154 0.0021 0.0024
            0.003 1 0.0032 0.0054 0.012 0.0098 0.0043
            0.0024 0.0032 1 0.0021 0.015 0.0028 0.0045
            0.019 0.0054 0.0021 1 0.0032 0.0076 0.0102
            0.0154 0.012 0.015 0.0032 1 0.0102 0.0097
            0.0021 0.0098 0.0028 0.0076 0.0102 1 0.056
            0.0024 0.0043 0.0045 0.0102 0.0097 0.056 1
          </values>
```

```
            </DataArray>
          </field>
        </DataRecord>
      </parameter>
    </ParameterLis>
  </parameters>
 </ProcessModel>
</groundToImageModel>
</GeoreferenceableSwath>
</featureOfInterest>
</Observation>
```

The XPath query to retrieve the error matrix has the following form:

/Observation/featureOfInterest/ceos:GeoreferenceableSwath/ceos:groundToImageModel /sml:ProcessModel/sml:parameters/sml:ParameterList/sml:parameter[6]/swe:DataRecord/swe:field[2]/swe:DataArray/swe:values

The error matrix can be processed by client software that handles the uncertainty. Figure 8 shows a client displaying the error matrix associated with the imagery of interest retrieved from the SOS-T.

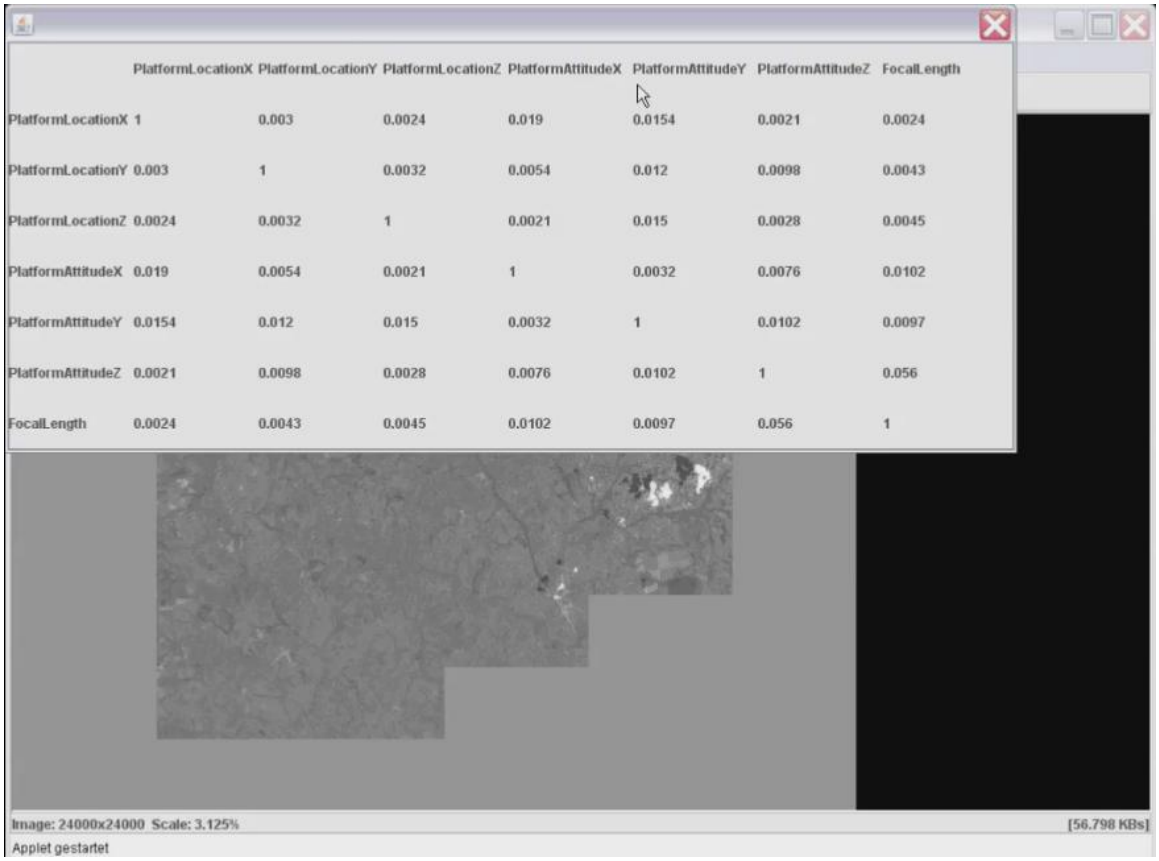

Figure 8. Retrieving the error matrix for the imagery

11.3 Retrieve area-of-interest data at user-selected resolution

JPIP allows a quick preview of the whole image and quick zooming-in to an area of interest (AOI). This can be useful in roughly determining the geo-location of AOI through visual inspection. Table 9 shows a sample request to retrieve the JPIP reference to a coverage. Table 10 shows the response to *getCoverage* from WCS-T.

Table 9. A sample request to retrieve the JPIP reference from the WCS-T

http://ws.csiss.gmu.edu/cgi-bin/wcs-t?service=WCS&request=getCoverage&version=1.1
&identifier=GEOJP2:%22/usr/local/apache2/geoportal_data_cache/WcsLevel2A.jp2%22:RGB
&format=image/jpeg2000&store=true

Table 10. The sample response to *getCoverage* from WCS-T

<?xml version="1.0" encoding="UTF-8"?>

```
<Coverages xmlns="http://www.opengis.net/wcs/1.1"

xmlns:ows="http://www.opengis.net/ows"

xmlns:owcs="http://www.opengis.net/wcs/1.1/ows"

xmlns:xlink="http://www.w3.org/1999/xlink"

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://schemas.opengis.net/ows/1.1.0 ../owsCoverages.xsd">

  <Coverage>

    <Abstract>Coverage created from GetCoverage operation request to a WCS</Abstract>

    <Reference xlink:href="jpip://ws.csiss.gmu.edu:6666/1F4EF202-E72B-481F-8190-
D75C8D85211A.jp2"

    xlink:role="urn:ogc:def:role:WCS:1.1:coverage"/>

    <Reference xlink:href="http://ws.csiss.gmu.edu/temp/1F4EF202-E72B-481F-8190-
D75C8D85211A.met"

    xlink:role="urn:ogc:def:role:WCS:1.1:metadata"/>

  </Coverage>

</Coverages>
```

The image reference can be retrieved using the following XPath query:

/Coverages/Coverage/Reference[1]/@xlink:href

The image can be viewed quickly in a JPIP server as shown in Figure 9. In a JPIP client, it is possible to retrieve the basic metadata of the image. The example in Figure 9 gives the bounding box of the large image in geographical coordinates. The image coordinates of the image can be also obtained as shown in Figure 9. This could enable the quick determination of the rough location of the interested target area. If there is a need, you may retrieve the AOI use the standard request. A pair of example request and response of the AOI was captured in Table 11 and Table 12. The exact information of the subset, including geospatial references, can be examined as shown in Figure 10. This approach reduces the network traffic. It can be significant when time is critical.

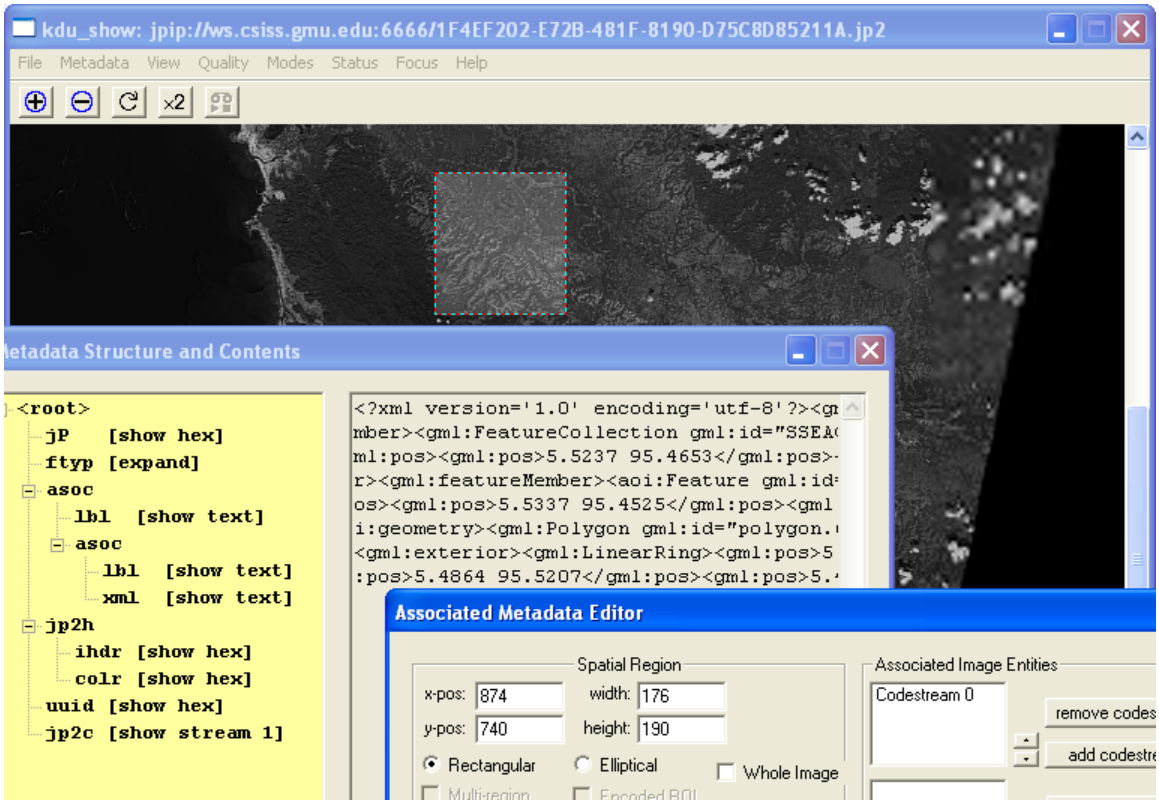

Figure 9. Retrieving the metadata through JPIP server and selecting an area of interest

Table 11. An example request to retrieving the area of interest from the WCS-T

http://ws.csiss.gmu.edu/cgi-bin/wcs-t?service=WCS&request=getCoverage&version=1.1
&identifier=GEOJP2:%22/usr/local/apache2/geoportal_data_cache/WcsLevel2A.jp2%22:RGB
&format=image/gtiff&store=true&BoundingBox=874,740,1050,940,urn:ogc:def:crs:OGC:0.0:imageCRS

Table 12. The sample response to the subset request from the WCS-T

<?xml version="1.0" encoding="UTF-8"?>
<Coverages xmlns="http://www.opengis.net/wcs/1.1"
xmlns:ows="http://www.opengis.net/ows"
xmlns:owcs="http://www.opengis.net/wcs/1.1/ows"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

```
xsi:schemaLocation="http://schemas.opengis.net/ows/1.1.0 ../owsCoverages.xsd">
  <Coverage>
    <Abstract>Coverage created from GetCoverage operation request to a WCS</Abstract>
    <Reference xlink:href="http://ws.csiss.gmu.edu/temp/DEF0DEFF-4C91-4BAB-BD04-
C185363D0AA5.tif"
    xlink:role="urn:ogc:def:role:WCS:1.1:coverage"/>
  </Coverage>
</Coverages>
```

Figure 10. Retrieving the exact position by using any geospatial image processing package

12 Summary and outlook

12.1 Specification improvements, technical developments and evaluation

In this OWS-6 SWE referenceable imagery workflow demonstration, changes have been called for to support the requirements defined in Section 6.1, especially the introduction of uncertainty propagation. Current versions of individual Web services, including SPS, SOS, WPS, and WCS, are not designed to propagate errors along a workflow. New versions of the geospatial services have been developed to handle error propagation. Specifications and related schemas have been adapted for two services, SPS and SOS, to meet the error propagation requirements in their emerging versions 2.0. The development

of these new versions is out of the scope of this document. The SWE georeferenceable workflow case successfully used the developing versions of SPS and SOS. Related schemas can be previewed in the descriptions of each new service in WSDL and the associated schemas.

WCS does not officially support transaction operations. Transaction operations are still at the discussion paper stage. This SWE georeferenceable imagery workflow project found that transactions can be very useful in the sensor Web environment. They provide a standard mechanism to store and manage data and data products.

The current version of WCS lacks formal support for the insertion and retrieval of error matrices. It is even difficult to describe the self-generated error matrix explicitly and pass along the accumulated error matrices if the data source is the result of a workflow or a composite service.

12.2 Issues

In this use case, BPEL was used as the scripting language to define a workflow. The following issues have emerged.

(1) Workflow – WSDLs: One of the main operations is to refine the WSDL for each individual service and associate proper schemas. This is necessary to pass parameters from one service to another service. Currently, the BPEL engine and designer cannot use the rich *GetCapabilities* information for every OGC-service. It is recommended that OWS-7 open a thread, under either the GPW or the SWE or a cross-thread, to develop a specification and techniques specifically to handle the OGC geospatial Web services and workflows with the BPEL specification. This would reduce the work of refining WSDL.

(2) Error propagation is a new addition to the SWE workflow. UncertML may be a candidate to describe the quality of service and data. The problem of describing and propagating the uncertainty information along a workflow can become unworkable under the current system when the following aspects are considered.

   a. Appending of an error matrix to the collection of error matrices and growing the collection along the workflow

   b. Inserting a self-introduced error matrix into the collection of error matrices.

(3) Extensions to the current BPEL scripts are clearly needed for dealing with security or other information that must be embedded in the header of the SOAP message. The current BPEL specification does not support embedding, retrieving, and passing the information available in the SOAP header. If the invocation of the service does not recognize the WS-Security policy tag in the header, the information is ignored and lost. If BPEL is the choice of scripting language, a revision with support for accessing the optional header information must be provided. It is also necessary to support the newly-emerged WSDL 2.0 and to

comply with the new WS-Addressing and WS-Security standards, to achieve asynchronous/stateful Web services and security of information. In summary, the following areas of the current BPEL specification should be reconsidered and extended.

a. Security

b. Asynchronous

c. WSDL 2.0

Annex A

Sensor Models

A.1 Introduction

Two observations were acquired. The associated sensor model descriptions can be used as examples to show the metadata for each observation using SensorML.

A.2 Example 1

```
<?xml version="1.0" encoding="UTF-8"?>
<Observation
   xmlns="http://www.opengis.net/om/1.0"
   xmlns:swe="http://www.opengis.net/swe/1.0.1"
   xmlns:sa="http://www.opengis.net/sampling/1.0"
   xmlns:ceos="http://www.ceos.org/sa/1.0"
   xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
   xmlns:xlink="http://www.w3.org/1999/xlink"
   xmlns:gml="http://www.opengis.net/gml"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.opengis.net/om/1.0
http://schemas.opengis.net/om/1.0.0/om.xsd http://www.ceos.org/sa/1.0 swathFOI.xsd">
   <!-- -->
   <gml:metaDataProperty xlink:role="urn:ogc:def:role:OGC:metadata:identification">
      <sml:IdentifierList>
         <sml:identifier name="Product Type UID">
            <sml:Term definition="urn:ogc:def:property:CEOS:eop:ProductTypeUID">
               <sml:value>urn:ogc:id:CEOS:product:SPOT5:PA+XS:1A:v01</sml:value>
            </sml:Term>
         </sml:identifier>
         <sml:identifier name="Short Name">
            <sml:Term definition="urn:ogc:def:property:OGC:shortName">
               <sml:value>SPOT-5 SCENE - Level 1A - 3 Bands</sml:value>
            </sml:Term>
         </sml:identifier>
      </sml:IdentifierList>
   </gml:metaDataProperty>
   <!-- -->
   <samplingTime>
      <gml:TimePeriod>
         <gml:beginPosition>2008-11-26T08:06:03</gml:beginPosition>
         <gml:endPosition>2008-11-26T08:06:12</gml:endPosition>
      </gml:TimePeriod>
```

```
    </samplingTime>
    <!-- -->
    <procedure xlink:href="urn:ogc:id:CEOS:process:SPOT:PAN_SHARPENING"/>
    <observedProperty xlink:href="urn:ogc:def:property:OGC:radiance"/>
    <!-- -->
    <featureOfInterest>
      <ceos:GeoreferenceableSwath>
        <sa:sampledFeature xlink:href="urn:ogc:object:feature:earthSurface"/>
        <sa:shape>
          <gml:Polygon srsName="urn:ogc:def:crs:EPSG:6.17:4326">
            <gml:exterior>
              <gml:LinearRing>
                <gml:pos>1.332146 34.836908</gml:pos>
                <gml:pos>1.201156 35.410792</gml:pos>
                <gml:pos>0.670446 35.292459</gml:pos>
                <gml:pos>0.801248 34.718573</gml:pos>
              </gml:LinearRing>
            </gml:exterior>
          </gml:Polygon>
        </sa:shape>
        <ceos:imageToGroundModel>
          <sml:ProcessModel>
                                    <!-- -->
                                    <gml:description>Rigorous Sensor Model for
SPOT-5 HRG SuperMode Pushbroom instrument</gml:description>
                                    <sml:inputs>
                                        <sml:InputList>
                                            <sml:input
name="PixelGridCoordinates">
                                                <swe:Vector
referenceFrame="urn:ogc:def:crs:CSM:pixelGridCRS">
                                                    <swe:coordinate
name="row">

    <swe:Quantity>

    <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>

    </swe:Quantity>
                                                    </swe:coordinate>
                                                    <swe:coordinate
name="col">

    <swe:Quantity>

    <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
```

```
    </swe:Quantity>
                                                                </swe:coordinate>
                                                            </swe:Vector>
                                                        </sml:input>
                                                        <sml:input
name="SegmentStartTime">
                                                            <swe:Time
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                                                                <swe:uom
code="s"/>
                                                            </swe:Time>
                                                        </sml:input>
                                                    </sml:InputList>
                                                </sml:inputs>
                                                <sml:outputs>
                                                    <sml:OutputList>
                                                        <sml:output name="ViewVector">
                                                            <swe:Vector
referenceFrame="urn:ogc:def:crs:EPSG:4979">
                                                                <swe:coordinate
name="x">

    <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">

    <swe:uom code="m"/>

    </swe:Quantity>
                                                                </swe:coordinate>
                                                                <swe:coordinate
name="y">

    <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">

    <swe:uom code="m"/>

    </swe:Quantity>
                                                                </swe:coordinate>
                                                                <swe:coordinate
name="z">

    <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">

    <swe:uom code="m"/>

    </swe:Quantity>
                                                                </swe:coordinate>
```

```
                                                    </swe:Vector>
                                                </sml:output>
                                            </sml:OutputList>
                                        </sml:outputs>
                                        <sml:parameters>
                                            <sml:ParameterList>
                                                <sml:parameter
name="PixelGridCharacteristics">
                                                    <swe:DataRecord>
                                                        <swe:field
name="NumberOfRows">

    <swe:Count definition="urn:ogc:def:property:CSM:NROWS">

    <swe:value>1</swe:value>

    </swe:Count>
                                                        </swe:field>
                                                        <swe:field
name="NumberOfColumns">

    <swe:Count definition="urn:ogc:def:property:CSM:NCOLS">

    <swe:value>24000</swe:value>

    </swe:Count>
                                                        </swe:field>
                                                        <swe:field
name="RowSpacing">

    <swe:Quantity definition="urn:ogc:def:property:CSM:ROW_SPACING">

    <swe:uom code="m"/>

    <swe:value>3.25e-6</swe:value>

    </swe:Quantity>
                                                        </swe:field>
                                                        <swe:field
name="ColumnSpacing">

    <swe:Quantity definition="urn:ogc:def:property:CSM:COL_SPACING">

    <swe:uom code="m"/>

    <swe:value>3.25e-6</swe:value>
```

```
      </swe:Quantity>
                                                                  </swe:field>
                                                                  <swe:field
name="RowAxisOffset">
      <swe:Quantity definition="urn:ogc:def:property:CSM:ROW_AXIS_OFFSET">
      <swe:uom code="m"/>
      <swe:value>-1.625e-6</swe:value>
      </swe:Quantity>
                                                                  </swe:field>
                                                                  <swe:field
name="ColumnAxisOffset">
      <swe:Quantity definition="urn:ogc:def:property:CSM:COL_AXIS_OFFSET">
      <swe:uom code="m"/>
      <swe:value>-3.9e-2</swe:value>
      </swe:Quantity>
                                                                  </swe:field>
                                                            </swe:DataRecord>
                                                      </sml:parameter>
                                                      <sml:parameter
name="IdealOpticalCharacteristics">
                                                            <swe:DataRecord>
                                                                  <swe:field
name="CalibratedFocalLength">
      <swe:Quantity gml:id="FOCAL_LENGTH"
definition="urn:ogc:def:property:CSM:FOCAL_LENGTH_CAL">
      <swe:uom code="m"/>
      <swe:value>1.082</swe:value>
      </swe:Quantity>
                                                                  </swe:field>
                                                            </swe:DataRecord>
                                                      </sml:parameter>
                                                      <sml:parameter
name="PushbroomTimingCharacteristics">
                                                            <swe:DataRecord>
```

```
                                                                    <swe:field
name="FrameSamplingPeriod">

    <swe:Quantity
definition="urn:ogc:def:property:CSM:FRAME_SAMPLING_PERIOD">

    <swe:uom code="s"/>

    <swe:value>3.76e-4</swe:value>

    </swe:Quantity>
                                                                    </swe:field>
                                                                </swe:DataRecord>
                                                            </sml:parameter>
                                                            <sml:parameter
name="PlatformLocation">
                                                                <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_TABLE">

    <swe:elementCount>

    <swe:Count>

    <swe:value>6</swe:value>

    </swe:Count>

    </swe:elementCount>
                                                                    <swe:elementType
name="Location">

    <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">

    <swe:coordinate name="time">

        <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">

            <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>

        </swe:Time>

    </swe:coordinate>

    <swe:coordinate name="x">
```

```
            <swe:Quantity gml:id="LOC_X"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">
                    <swe:uom code="m"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="y">
            <swe:Quantity gml:id="LOC_Y"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">
                    <swe:uom code="m"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="z">
            <swe:Quantity gml:id="LOC_Z"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">
                    <swe:uom code="m"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="vx">
            <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED" axisID="X">
                    <swe:uom code="m/s"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="vy">
            <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED" axisID="Y">
                    <swe:uom code="m/s"/>
```

```
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="vz">
            <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED" axisID="Z">
                    <swe:uom code="m/s"/>
            </swe:Quantity>
        </swe:coordinate>
        </swe:Vector>
        </swe:elementType>
                                                    <swe:encoding>
        <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
                                                    </swe:encoding>
                                                    <swe:values>
                                                        2009-01-
01T10:30:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                                                        2009-01-
01T10:30:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                                                        2009-01-
01T10:31:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                                                        2009-01-
01T10:31:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                                                        2009-01-
01T10:32:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                                                        2009-01-
01T10:32:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                                                    </swe:values>
                                                </swe:DataArray>
                                            </sml:parameter>
                                            <sml:parameter
name="PlatformAttitude">
```

```
                                                    <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_ATTITUDE_TABLE">

    <swe:elementCount>

    <swe:Count>

    <swe:value>10</swe:value>

    </swe:Count>

    </swe:elementCount>
                                                        <swe:elementType
name="Attitude">

    <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_ORIENTATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">

    <swe:coordinate name="time">

        <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">

                <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>

        </swe:Time>

    </swe:coordinate>

    <swe:coordinate name="yaw">

        <swe:Quantity gml:id="YAW"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Z">

                <swe:uom code="rad"/>

        </swe:Quantity>

    </swe:coordinate>

    <swe:coordinate name="pitch">

        <swe:Quantity gml:id="PITCH"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="X">

                <swe:uom code="rad"/>
```

```
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="roll">
            <swe:Quantity gml:id="ROLL"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Y">
                <swe:uom code="rad"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="yaw_speed">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Z">
                <swe:uom code="rad/s"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="pitch_speed">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="X">
                <swe:uom code="rad/s"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="roll_speed">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Y">
                <swe:uom code="rad/s"/>
            </swe:Quantity>
```

```
      </swe:coordinate>

      </swe:Vector>

      </swe:elementType>
                                                        <swe:encoding>

      <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
                                                        </swe:encoding>
                                                        <swe:values>
                                                              2009-01-
01T10:30:00Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:30:10Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:30:20Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:30:30Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:30:40Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:30:50Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:31:00Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:31:10Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:31:20Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                              2009-01-
01T10:31:30Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                        </swe:values>
                                                  </swe:DataArray>
                                            </sml:parameter>
                                            <sml:parameter
name="UncertaintyInformation">
```

```
                                                    <swe:DataRecord>
                                                        <swe:field
name="AdjustableParameters">
    <swe:DataRecord>
    <swe:field name="PlatformLocationX" xlink:href="#LOC_X"/>
    <swe:field name="PlatformLocationY" xlink:href="#LOC_Y"/>
    <swe:field name="PlatformLocationZ" xlink:href="#LOC_Z"/>
    <swe:field name="PlatformAttitudeX" xlink:href="#YAW"/>
    <swe:field name="PlatformAttitudeY" xlink:href="#PITCH"/>
    <swe:field name="PlatformAttitudeZ" xlink:href="#ROLL"/>
    <swe:field name="FocalLength" xlink:href="#FOCAL_LENGTH"/>
    </swe:DataRecord>
                                                        </swe:field>
                                                        <swe:field
name="CovarianceMatrix">
    <swe:DataArray
definition="urn:ogc:def:property:CSM:COVARIANCE_MATRIX">
    <swe:elementCount>
        <swe:Count>
            <swe:value>7</swe:value>
        </swe:Count>
    </swe:elementCount>
    <swe:elementType name="Row">
        <swe:DataArray>
            <swe:elementCount>
                <swe:Count>
                    <swe:value>7</swe:value>
```

```
                    </swe:Count>
                </swe:elementCount>
                <swe:elementType name="Value">
                    <swe:Quantity/>
                </swe:elementType>
            </swe:DataArray>
        </swe:elementType>
        <swe:encoding>
            <swe:TextBlock tokenSeparator=" " blockSeparator=" " decimalSeparator="."/>
        </swe:encoding>
        <swe:values>
            1 0 0 0 0 0 0
            0 1 0 0 0 0 0
            0 0 1 0 0 0 0
            0 0 0 1 0 0 0
            0 0 0 0 1 0 0
            0 0 0 0 0 1 0
            0 0 0 0 0 0 1
        </swe:values>
        </swe:DataArray>
                                                    </swe:field>
                                                </swe:DataRecord>
                                            </sml:parameter>
                                        </sml:ParameterList>
                                    </sml:parameters>
                                    <sml:method
xlink:href="urn:ogc:def:process:CSM:ImageToGroundPushbroomSensorModel"/>
```

```
                                </sml:ProcessModel>
            </ceos:imageToGroundModel>
        </ceos:GeoreferenceableSwath>
    </featureOfInterest>
    <!-- -->
    <result xsi:type="swe:DataArrayPropertyType">
        <swe:DataArray>
            <swe:elementCount>
                <swe:Count>
                    <swe:value>24000</swe:value>
                </swe:Count>
            </swe:elementCount>
            <swe:elementType name="row">
                <swe:DataArray>
                    <swe:elementCount>
                        <swe:Count>
                            <swe:value>24000</swe:value>
                        </swe:Count>
                    </swe:elementCount>
                    <swe:elementType name="sample">
                        <swe:DataRecord>
                            <swe:field name="xs1">
                                <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                                    <gml:name>XS1 Band</gml:name>
                                    <swe:uom code="W.m-2.sr-1.um-1"/>
                                </swe:Quantity>
                            </swe:field>
                            <swe:field name="xs2">
                                <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                                    <gml:name>XS2 Band</gml:name>
                                    <swe:uom code="W.m-2.sr-1.um-1"/>
                                </swe:Quantity>
                            </swe:field>
                            <swe:field name="xs3">
                                <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                                    <gml:name>XS3 Band</gml:name>
                                    <swe:uom code="W.m-2.sr-1.um-1"/>
                                </swe:Quantity>
                            </swe:field>
                        </swe:DataRecord>
                    </swe:elementType>
                </swe:DataArray>
            </swe:elementType>
            <swe:encoding>
                <swe:StandardFormat mimeType="image/jp2"/>
            </swe:encoding>
```

```
        <swe:values
xlink:href="http://ws.spotimage.com/ows/IMAGERY_318911101_1.5bpp.jp2"/>
      </swe:DataArray>
   </result>
</Observation>
```

A.3 Example 2

```
<?xml version="1.0" encoding="UTF-8"?>
<Observation
   xmlns="http://www.opengis.net/om/1.0"
   xmlns:swe="http://www.opengis.net/swe/1.0.1"
   xmlns:sa="http://www.opengis.net/sampling/1.0"
   xmlns:ceos="http://www.ceos.org/sa/1.0"
   xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
   xmlns:xlink="http://www.w3.org/1999/xlink"
   xmlns:gml="http://www.opengis.net/gml"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.opengis.net/om/1.0
http://schemas.opengis.net/om/1.0.0/om.xsd http://www.ceos.org/sa/1.0 swathFOI.xsd">
   <!-- -->
   <gml:metaDataProperty xlink:role="urn:ogc:def:role:OGC:metadata:identification">
      <sml:IdentifierList>
         <sml:identifier name="Product Type UID">
            <sml:Term definition="urn:ogc:def:property:CEOS:eop:ProductTypeUID">
               <sml:value>urn:ogc:id:CEOS:product:SPOT5:PA+XS:1A:v01</sml:value>
            </sml:Term>
         </sml:identifier>
         <sml:identifier name="Short Name">
            <sml:Term definition="urn:ogc:def:property:OGC:shortName">
               <sml:value>SPOT-5 SCENE - Level 1A - 3 Bands</sml:value>
            </sml:Term>
         </sml:identifier>
      </sml:IdentifierList>
   </gml:metaDataProperty>
   <!-- -->
   <samplingTime>
      <gml:TimePeriod>
         <gml:beginPosition>2008-11-26T08:06:12</gml:beginPosition>
         <gml:endPosition>2008-11-26T08:06:21</gml:endPosition>
      </gml:TimePeriod>
   </samplingTime>
   <!-- -->
   <procedure xlink:href="urn:ogc:id:CEOS:process:SPOT:PAN_SHARPENING"/>
```

```
<observedProperty xlink:href="urn:ogc:def:property:OGC:radiance"/>
<!-- -->
<featureOfInterest>
  <ceos:GeoreferenceableSwath>
    <sa:sampledFeature xlink:href="urn:ogc:object:feature:earthSurface"/>
    <sa:shape>
      <gml:Polygon srsName="urn:ogc:def:crs:EPSG:6.17:4326">
        <gml:exterior>
          <gml:LinearRing>
            <gml:pos>0.831310 34.725269</gml:pos>
            <gml:pos>0.700498 35.299154</gml:pos>
            <gml:pos>0.169741 35.181028</gml:pos>
            <gml:pos>0.300372 34.607095</gml:pos>
          </gml:LinearRing>
        </gml:exterior>
      </gml:Polygon>
    </sa:shape>
    <ceos:imageToGroundModel>
      <sml:ProcessModel>
                                    <!-- -->
                                    <gml:description>Rigorous Sensor Model for
SPOT-5 HRG SuperMode Pushbroom instrument</gml:description>
                                    <sml:inputs>
                                          <sml:InputList>
                                                <sml:input
name="PixelGridCoordinates">
                                                      <swe:Vector
referenceFrame="urn:ogc:def:crs:CSM:pixelGridCRS">
                                                            <swe:coordinate
name="row">

    <swe:Quantity>

    <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>

    </swe:Quantity>
                                                            </swe:coordinate>
                                                            <swe:coordinate
name="col">

    <swe:Quantity>

    <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>

    </swe:Quantity>
                                                            </swe:coordinate>
                                                      </swe:Vector>
```

```
                                        </sml:input>
                                        <sml:input
name="SegmentStartTime">
                                            <swe:Time
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                                                <swe:uom
code="s"/>
                                            </swe:Time>
                                        </sml:input>
                                    </sml:InputList>
                                </sml:inputs>
                                <sml:outputs>
                                    <sml:OutputList>
                                        <sml:output name="ViewVector">
                                            <swe:Vector
referenceFrame="urn:ogc:def:crs:EPSG:4979">
                                                <swe:coordinate
name="x">
    <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">
    <swe:uom code="m"/>
    </swe:Quantity>
                                                </swe:coordinate>
                                                <swe:coordinate
name="y">
    <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">
    <swe:uom code="m"/>
    </swe:Quantity>
                                                </swe:coordinate>
                                                <swe:coordinate
name="z">
    <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">
    <swe:uom code="m"/>
    </swe:Quantity>
                                                </swe:coordinate>
                                            </swe:Vector>
                                        </sml:output>
                                    </sml:OutputList>
                                </sml:outputs>
```

```
                                    <sml:parameters>
                                        <sml:ParameterList>
                                            <sml:parameter
name="PixelGridCharacteristics">
                                                <swe:DataRecord>
                                                    <swe:field
name="NumberOfRows">

    <swe:Count definition="urn:ogc:def:property:CSM:NROWS">

    <swe:value>1</swe:value>

    </swe:Count>
                                                    </swe:field>
                                                    <swe:field
name="NumberOfColumns">

    <swe:Count definition="urn:ogc:def:property:CSM:NCOLS">

    <swe:value>24000</swe:value>

    </swe:Count>
                                                    </swe:field>
                                                    <swe:field
name="RowSpacing">

    <swe:Quantity definition="urn:ogc:def:property:CSM:ROW_SPACING">

    <swe:uom code="m"/>

    <swe:value>3.25e-6</swe:value>

    </swe:Quantity>
                                                    </swe:field>
                                                    <swe:field
name="ColumnSpacing">

    <swe:Quantity definition="urn:ogc:def:property:CSM:COL_SPACING">

    <swe:uom code="m"/>

    <swe:value>3.25e-6</swe:value>

    </swe:Quantity>
                                                    </swe:field>
                                                    <swe:field
name="RowAxisOffset">
```

```
        <swe:Quantity definition="urn:ogc:def:property:CSM:ROW_AXIS_OFFSET">

        <swe:uom code="m"/>

        <swe:value>-1.625e-6</swe:value>

        </swe:Quantity>
                                                                    </swe:field>
                                                                    <swe:field
name="ColumnAxisOffset">

        <swe:Quantity definition="urn:ogc:def:property:CSM:COL_AXIS_OFFSET">

        <swe:uom code="m"/>

        <swe:value>-3.9e-2</swe:value>

        </swe:Quantity>
                                                                    </swe:field>
                                                                </swe:DataRecord>
                                                            </sml:parameter>
                                                            <sml:parameter
name="IdealOpticalCharacteristics">
                                                                <swe:DataRecord>
                                                                    <swe:field
name="CalibratedFocalLength">

        <swe:Quantity gml:id="FOCAL_LENGTH"
definition="urn:ogc:def:property:CSM:FOCAL_LENGTH_CAL">

        <swe:uom code="m"/>

        <swe:value>1.082</swe:value>

        </swe:Quantity>
                                                                    </swe:field>
                                                                </swe:DataRecord>
                                                            </sml:parameter>
                                                            <sml:parameter
name="PushbroomTimingCharacteristics">
                                                                <swe:DataRecord>
                                                                    <swe:field
name="FrameSamplingPeriod">

        <swe:Quantity
definition="urn:ogc:def:property:CSM:FRAME_SAMPLING_PERIOD">
```

```
        <swe:uom code="s"/>

        <swe:value>3.76e-4</swe:value>

        </swe:Quantity>
                                                                    </swe:field>
                                                                </swe:DataRecord>
                                                            </sml:parameter>
                                                            <sml:parameter
name="PlatformLocation">
                                                                <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_TABLE">

        <swe:elementCount>

        <swe:Count>

        <swe:value>6</swe:value>

        </swe:Count>

        </swe:elementCount>
                                                                    <swe:elementType
name="Location">

        <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">

        <swe:coordinate name="time">

            <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">

                    <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>

            </swe:Time>

        </swe:coordinate>

        <swe:coordinate name="x">

            <swe:Quantity gml:id="LOC_X"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">

                    <swe:uom code="m"/>
```

```
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="y">
            <swe:Quantity gml:id="LOC_Y"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">
                <swe:uom code="m"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="z">
            <swe:Quantity gml:id="LOC_Z"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">
                <swe:uom code="m"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="vx">
            <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED" axisID="X">
                <swe:uom code="m/s"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="vy">
            <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED" axisID="Y">
                <swe:uom code="m/s"/>
            </swe:Quantity>
        </swe:coordinate>
```

```
<swe:coordinate name="vz">
<swe:Quantity definition="urn:ogc:def:property:CSM:SPEED" axisID="Z">
<swe:uom code="m/s"/>
</swe:Quantity>
</swe:coordinate>
</swe:Vector>
</swe:elementType>
<swe:encoding>
<swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
</swe:encoding>
<swe:values>
2009-01-
01T10:30:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
2009-01-
01T10:30:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
2009-01-
01T10:31:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
2009-01-
01T10:31:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
2009-01-
01T10:32:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
2009-01-
01T10:32:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -
2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
</swe:values>
</swe:DataArray>
</sml:parameter>
<sml:parameter
name="PlatformAttitude">
<swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_ATTITUDE_TABLE">
<swe:elementCount>
```

```
        <swe:Count>
        <swe:value>10</swe:value>
        </swe:Count>
        </swe:elementCount>
                                                        <swe:elementType
name="Attitude">
        <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_ORIENTATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">
        <swe:coordinate name="time">
            <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                    <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>
            </swe:Time>
        </swe:coordinate>
        <swe:coordinate name="yaw">
            <swe:Quantity gml:id="YAW"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Z">
                    <swe:uom code="rad"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="pitch">
            <swe:Quantity gml:id="PITCH"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="X">
                    <swe:uom code="rad"/>
            </swe:Quantity>
        </swe:coordinate>
```

```
        <swe:coordinate name="roll">
            <swe:Quantity gml:id="ROLL"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Y">
                <swe:uom code="rad"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="yaw_speed">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Z">
                <swe:uom code="rad/s"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="pitch_speed">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="X">
                <swe:uom code="rad/s"/>
            </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="roll_speed">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Y">
                <swe:uom code="rad/s"/>
            </swe:Quantity>
        </swe:coordinate>
    </swe:Vector>
```

```
      </swe:elementType>
                                                    <swe:encoding>
      <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
                                                    </swe:encoding>
                                                    <swe:values>
                                                          2009-01-
01T10:30:00Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:30:10Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:30:20Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:30:30Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:30:40Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:30:50Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:31:00Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:31:10Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:31:20Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                          2009-01-
01T10:31:30Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04
2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                                                    </swe:values>
                                              </swe:DataArray>
                                        </sml:parameter>
                                        <sml:parameter
name="UncertaintyInformation">
                                              <swe:DataRecord>
                                                    <swe:field
name="AdjustableParameters">
```

```
        <swe:DataRecord>
        <swe:field name="PlatformLocationX" xlink:href="#LOC_X"/>
        <swe:field name="PlatformLocationY" xlink:href="#LOC_Y"/>
        <swe:field name="PlatformLocationZ" xlink:href="#LOC_Z"/>
        <swe:field name="PlatformAttitudeX" xlink:href="#YAW"/>
        <swe:field name="PlatformAttitudeY" xlink:href="#PITCH"/>
        <swe:field name="PlatformAttitudeZ" xlink:href="#ROLL"/>
        <swe:field name="FocalLength" xlink:href="#FOCAL_LENGTH"/>
        </swe:DataRecord>
                                                                </swe:field>
                                                                <swe:field
name="CovarianceMatrix">
        <swe:DataArray
definition="urn:ogc:def:property:CSM:COVARIANCE_MATRIX">
        <swe:elementCount>
            <swe:Count>
                    <swe:value>7</swe:value>
            </swe:Count>
        </swe:elementCount>
        <swe:elementType name="Row">
            <swe:DataArray>
                    <swe:elementCount>
                        <swe:Count>
                                <swe:value>7</swe:value>
                        </swe:Count>
```

```
                </swe:elementCount>
                <swe:elementType name="Value">
                        <swe:Quantity/>
                </swe:elementType>
            </swe:DataArray>
        </swe:elementType>
        <swe:encoding>
            <swe:TextBlock tokenSeparator=" " blockSeparator=" " decimalSeparator="."/>
        </swe:encoding>
        <swe:values>
            1 0 0 0 0 0 0
            0 1 0 0 0 0 0
            0 0 1 0 0 0 0
            0 0 0 1 0 0 0
            0 0 0 0 1 0 0
            0 0 0 0 0 1 0
            0 0 0 0 0 0 1
        </swe:values>
        </swe:DataArray>
                                                        </swe:field>
                                                    </swe:DataRecord>
                                                </sml:parameter>
                                            </sml:ParameterList>
                                        </sml:parameters>
                                        <sml:method
xlink:href="urn:ogc:def:process:CSM:ImageToGroundPushbroomSensorModel"/>
                                    </sml:ProcessModel>
            </ceos:imageToGroundModel>
```

```
      </ceos:GeoreferenceableSwath>
    </featureOfInterest>
    <!-- -->
    <result xsi:type="swe:DataArrayPropertyType">
      <swe:DataArray>
        <swe:elementCount>
          <swe:Count>
            <swe:value>24000</swe:value>
          </swe:Count>
        </swe:elementCount>
        <swe:elementType name="row">
          <swe:DataArray>
            <swe:elementCount>
              <swe:Count>
                <swe:value>24000</swe:value>
              </swe:Count>
            </swe:elementCount>
            <swe:elementType name="sample">
              <swe:DataRecord>
                <swe:field name="xs1">
                  <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                    <gml:name>XS1 Band</gml:name>
                    <swe:uom code="W.m-2.sr-1.um-1"/>
                  </swe:Quantity>
                </swe:field>
                <swe:field name="xs2">
                  <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                    <gml:name>XS2 Band</gml:name>
                    <swe:uom code="W.m-2.sr-1.um-1"/>
                  </swe:Quantity>
                </swe:field>
                <swe:field name="xs3">
                  <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                    <gml:name>XS3 Band</gml:name>
                    <swe:uom code="W.m-2.sr-1.um-1"/>
                  </swe:Quantity>
                </swe:field>
              </swe:DataRecord>
            </swe:elementType>
          </swe:DataArray>
        </swe:elementType>
        <swe:encoding>
          <swe:StandardFormat mimeType="image/jp2"/>
        </swe:encoding>
        <swe:values
xlink:href="http://ws.spotimage.com/ows/IMAGERY_318912101_1.5bpp.jp2"/>
      </swe:DataArray>
```

```
    </result>
</Observation>
```

Annex B

XML Schema Documents

In addition to this document, this report includes several XML Schema Documents. These XML Schema Documents are bundled in a zip file with the present document.

The uncertainty information model and abilities now specified in this document use SPS 2.0 and SOS 2.0 specified XML Schema Documents included in the zip file with this document. These XML Schema Documents combine the XML schema fragments listed in various subclauses of this document, eliminating duplications.

References to the preliminary schemas can be found in the WSDL files. The following are the links.

- SPS: http://csiss.gmu.edu/sensorweb/wsdls/ows6/sps/csiss4spotimageSPSv20.wsdl
- SOS-T: http://csiss.gmu.edu/sensorweb/wsdls/ows6/sos/gmu4muensterSOS.wsdl
- WCS-T: http://csiss.gmu.edu/sensorweb/wsdls/ows6/wcst/ows-6_wcs_110_transaction.wsdl
- CS/W: http://csiss.gmu.edu/sensorweb/wsdls/ows5/csw/CSW_Publication_laits_cswdbvm.wsdl
- WNS: http://csiss.gmu.edu/sensorweb/wsdls/ows6/wns/gmu4muensterWNS.wsdl
- WPS: http://csiss.gmu.edu/sensorweb/wsdls/ows6/wps/gmu4spotimageWPS.wsdl

Annex C

Error Models

C.1 Introduction

Error models are described in SensorML and embedded into the observation. Three examples were given here. One is for the unrectified image. Two for rectified images.

C.2 Unrectified image

```
<?xml version="1.0" encoding="UTF-8"?>
<Observation
   xmlns="http://www.opengis.net/om/1.0"
   xmlns:swe="http://www.opengis.net/swe/1.0.1"
   xmlns:sa="http://www.opengis.net/sampling/1.0"
   xmlns:ceos="http://www.ceos.org/sa/1.0"
   xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
   xmlns:xlink="http://www.w3.org/1999/xlink"
   xmlns:gml="http://www.opengis.net/gml"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.opengis.net/om/1.0
http://schemas.opengis.net/om/1.0.0/om.xsd http://www.ceos.org/sa/1.0 swathFOI.xsd">
   <!-- -->
   <gml:metaDataProperty xlink:role="urn:ogc:def:role:OGC:metadata:identification">
      <sml:IdentifierList>
         <sml:identifier name="Product Type UID">
            <sml:Term definition="urn:ogc:def:property:CEOS:eop:ProductTypeUID">
               <sml:value>urn:ogc:id:CEOS:product:SPOT5:PA:1A:v01</sml:value>
            </sml:Term>
         </sml:identifier>
         <sml:identifier name="Short Name">
            <sml:Term definition="urn:ogc:def:property:OGC:shortName">
               <sml:value>SPOT-5 SCENE - Level 1A - 4 Bands</sml:value>
            </sml:Term>
         </sml:identifier>
      </sml:IdentifierList>
   </gml:metaDataProperty>
   <!-- -->
   <samplingTime>
      <gml:TimePeriod>
         <gml:beginPosition>2002-08-16T08:42:00</gml:beginPosition>
         <gml:endPosition>2002-08-16T08:42:08</gml:endPosition>
      </gml:TimePeriod>
```

```
    </samplingTime>
    <!-- -->
    <procedure xlink:href="urn:ogc:id:CEOS:instrument:SPOT5:HRG:XS"/>
    <observedProperty xlink:href="urn:ogc:def:property:OGC:radiance"/>
    <!-- -->
    <featureOfInterest>
      <ceos:GeoreferenceableSwath>
        <sa:sampledFeature xlink:href="urn:ogc:object:feature:earthSurface"/>
        <sa:shape>
          <gml:Polygon srsName="urn:ogc:def:crs:EPSG:6.17:4326">
            <gml:exterior>
              <gml:LinearRing>
                <gml:pos>-23.171482 27.196035</gml:pos>
                <gml:pos>-23.310563 27.951421</gml:pos>
                <gml:pos>-23.839041 27.836929</gml:pos>
                <gml:pos>-23.700150 27.078285</gml:pos>
              </gml:LinearRing>
            </gml:exterior>
          </gml:Polygon>
        </sa:shape>
        <ceos:groundToImageModel>
          <sml:ProcessModel gml:id="RPC_PROCESS">
            <sml:inputs>
              <sml:InputList>
                <sml:input name="target_location">
                  <swe:Vector referenceFrame="urn:ogc:def:crs:EPSG:6.17:4979">
                    <swe:coordinate name="x">
                      <swe:Quantity definition="urn:ogc:def:property:OGC:angle"
axisID="Long">
                        <gml:name>longitude</gml:name>
                        <swe:uom code="deg" />
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="y">
                      <swe:Quantity definition="urn:ogc:def:property:OGC:angle"
axisID="Lat">
                        <gml:name>latitude</gml:name>
                        <swe:uom code="deg" />
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="z">
                      <swe:Quantity definition="urn:ogc:def:property:OGC:distance"
axisID="h">
                        <gml:name>altitude</gml:name>
                        <swe:uom code="m" />
                      </swe:Quantity>
                    </swe:coordinate>
```

```
                </swe:Vector>
            </sml:input>
        </sml:InputList>
    </sml:inputs>
    <sml:outputs>
        <sml:OutputList>
            <sml:output name="image_location">
                <swe:Vector definition="urn:ogc:def:data:OGC:locationVector"
referenceFrame="urn:ogc:def:crs:OGC:ImageCRSpixelCenter:RSA_SCENE1">
                    <swe:coordinate name="x">
                        <swe:Quantity definition="urn:ogc:def:property:OGC:distance"
axisID="X">
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel" />
                        </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="y">
                        <swe:Quantity definition="urn:ogc:def:property:OGC:distance"
axisID="Y">
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel" />
                        </swe:Quantity>
                    </swe:coordinate>
                </swe:Vector>
            </sml:output>
        </sml:OutputList>
    </sml:outputs>
    <!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~-->
    <!--RPC Parameters-->
    <!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~-->
    <sml:parameters>
        <sml:ParameterList>
            <sml:parameter name="rpc_parameter_series">
                <swe:DataArray>
                    <swe:elementCount>
                        <swe:Count>
                            <swe:value>1</swe:value>
                        </swe:Count>
                    </swe:elementCount>
                    <swe:elementType name="rpc_parameter_set">
                        <swe:DataRecord
definition="urn:ogc:def:data:CSM:rpcParameters">
                            <!-- -->
                            <swe:field name="image_region">
                                <swe:DataRecord>
                                    <swe:field name="zone_minX">
                                        <swe:Quantity>
                                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
```

```
                        </swe:Quantity>
                    </swe:field>
                    <swe:field name="zone_minY">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                        </swe:Quantity>
                    </swe:field>
                    <swe:field name="zone_maxX">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                        </swe:Quantity>
                    </swe:field>
                    <swe:field name="zone_maxY">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                        </swe:Quantity>
                    </swe:field>
                </swe:DataRecord>
            </swe:field>
            <!-- -->
            <swe:field name="image_adjustment">
                <swe:DataRecord>
                    <swe:field name="image_x_offset">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                        </swe:Quantity>
                    </swe:field>
                    <swe:field name="image_x_scale">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:none"
/>
                        </swe:Quantity>
                    </swe:field>
                    <swe:field name="image_y_offset">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                        </swe:Quantity>
                    </swe:field>
                    <swe:field name="image_y_scale">
                        <swe:Quantity>
                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:none"
/>
```

```
                                    </swe:Quantity>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                        <!-- -->
                        <swe:field name="target_adjustment">
                            <swe:DataRecord>
                                <swe:field name="target_x_offset">
                                    <swe:Quantity>
                                        <swe:uom code="deg" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="target_x_scale">
                                    <swe:Quantity>
                                        <swe:uom xlink:href="urn:ogc:def:unit:OGC:none"
/>
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="target_y_offset">
                                    <swe:Quantity>
                                        <swe:uom code="deg" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="target_y_scale">
                                    <swe:Quantity>
                                        <swe:uom xlink:href="urn:ogc:def:unit:OGC:none"
/>
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="target_z_offset">
                                    <swe:Quantity>
                                        <swe:uom code="m" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="target_z_scale">
                                    <swe:Quantity>
                                        <swe:uom xlink:href="urn:ogc:def:unit:OGC:none"
/>
                                    </swe:Quantity>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                        <!-- -->
                        <swe:field name="x_numerator_coefficients">
                            <swe:DataRecord gml:id="PolyCoeff"
definition="urn:ogc:def:data:CSM:rpcCoefficients">
                                <swe:field name="constant">
```

```
    <swe:Quantity />
</swe:field>
<swe:field name="x">
    <swe:Quantity />
</swe:field>
<swe:field name="y">
    <swe:Quantity />
</swe:field>
<swe:field name="z">
    <swe:Quantity />
</swe:field>
<swe:field name="xx">
    <swe:Quantity />
</swe:field>
<swe:field name="xy">
    <swe:Quantity />
</swe:field>
<swe:field name="xz">
    <swe:Quantity />
</swe:field>
<swe:field name="yy">
    <swe:Quantity />
</swe:field>
<swe:field name="yz">
    <swe:Quantity />
</swe:field>
<swe:field name="zz">
    <swe:Quantity />
</swe:field>
<swe:field name="xxx">
    <swe:Quantity />
</swe:field>
<swe:field name="xxy">
    <swe:Quantity />
</swe:field>
<swe:field name="xxz">
    <swe:Quantity />
</swe:field>
<swe:field name="xyy">
    <swe:Quantity />
</swe:field>
<swe:field name="xyz">
    <swe:Quantity />
</swe:field>
<swe:field name="xzz">
    <swe:Quantity />
</swe:field>
```

```
                                    <swe:field name="yyy">
                                        <swe:Quantity />
                                    </swe:field>
                                    <swe:field name="yyz">
                                        <swe:Quantity />
                                    </swe:field>
                                    <swe:field name="yzz">
                                        <swe:Quantity />
                                    </swe:field>
                                    <swe:field name="zzz">
                                        <swe:Quantity />
                                    </swe:field>
                                </swe:DataRecord>
                            </swe:field>
                            <!-- other three coefficient record descriptions same as above
-->
                            <swe:field name="x_denominator_coefficients"
xlink:href="#PolyCoeff" />
                            <swe:field name="y_numerator_coefficients"
xlink:href="#PolyCoeff" />
                            <swe:field name="y_denominator_coefficients"
xlink:href="#PolyCoeff" />
                            <!-- -->
                            <swe:field name="error_parameters">
                                <swe:DataRecord>
                                    <swe:field name="error_bias">
                                        <swe:Quantity>
                                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                                        </swe:Quantity>
                                    </swe:field>
                                    <swe:field name="error_random">
                                        <swe:Quantity>
                                            <swe:uom xlink:href="urn:ogc:def:unit:OGC:pixel"
/>
                                        </swe:Quantity>
                                    </swe:field>
                                </swe:DataRecord>
                            </swe:field>
                        </swe:DataRecord>
                    </swe:elementType>
                    <swe:encoding>
                        <swe:TextBlock decimalSeparator="." tokenSeparator=","
blockSeparator="@@" />
                    </swe:encoding>
                    <swe:values>
```

```
0,0,5999,5999,0.0,6000.0,0.0,6000.0,27.078285,0.8731359999999988,-
23.839041,0.6675590000000007,0.0,1.0,
                        0.03926941641308965,1.1083689351027264,-
0.18874262804145372,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,
                        0.9605186585045906,0.04828014980697991,-
0.013154113856949848,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,
                        1.2531982228233605,-0.29230125400900814,-
1.213778850973431,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,
                        0.9998332996143047,-5.076461877886081E-
4,0.004783811811464411,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0
,
                        0.0,0.0
                    </swe:values>
                </swe:DataArray>
            </sml:parameter>
        </sml:ParameterList>
    </sml:parameters>
    <sml:method xlink:href="urn:ogc:def:process:CSM:RPC:1.0" />
  </sml:ProcessModel>
 </ceos:groundToImageModel>
</ceos:GeoreferenceableSwath>
</featureOfInterest>
<!-- -->
<result xsi:type="swe:DataArrayPropertyType">
 <swe:DataArray>
  <swe:elementCount>
   <swe:Count>
    <swe:value>6000</swe:value>
   </swe:Count>
  </swe:elementCount>
  <swe:elementType name="row">
   <swe:DataArray>
    <swe:elementCount>
     <swe:Count>
      <swe:value>6000</swe:value>
     </swe:Count>
    </swe:elementCount>
    <swe:elementType name="sample">
     <swe:DataRecord>
      <swe:field name="xs1">
       <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
        <gml:name>XS1 Band</gml:name>
        <swe:uom code="W.m-2.sr-1.um-1"/>
       </swe:Quantity>
      </swe:field>
      <swe:field name="xs2">
```

```
                    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                      <gml:name>XS2 Band</gml:name>
                      <swe:uom code="W.m-2.sr-1.um-1"/>
                    </swe:Quantity>
                  </swe:field>
                  <swe:field name="xs3">
                    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                      <gml:name>XS3 Band</gml:name>
                      <swe:uom code="W.m-2.sr-1.um-1"/>
                    </swe:Quantity>
                  </swe:field>
                  <swe:field name="swir">
                    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
                      <gml:name>SWIR Band</gml:name>
                      <swe:uom code="W.m-2.sr-1.um-1"/>
                    </swe:Quantity>
                  </swe:field>
                </swe:DataRecord>
              </swe:elementType>
            </swe:DataArray>
          </swe:elementType>
          <swe:encoding>
            <swe:StandardFormat mimeType="image/jp2"/>
          </swe:encoding>
          <swe:values
xlink:href="http://ws.spotimage.com/ows/SPOT5UnrectifiedImagery.jp2"/>
        </swe:DataArray>
    </result>
</Observation>
```

C.3 Rigorous Sensor Model for SPOT-5 HRG Pushbroom instrument – Example 1

```
<?xml version="1.0" encoding="UTF-8"?>
<?oxygen SCHSchema="../RelaxNG/v1.0.1/profiles/CSM/pushbroom-sensor-
model.rng"?>
<?oxygen RNGSchema="../RelaxNG/v1.0.1/profiles/CSM/pushbroom-sensor-model.rng"
type="xml"?>
<sml:ProcessModel
    xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
    xmlns:swe="http://www.opengis.net/swe/1.0.1"
    xmlns:gml="http://www.opengis.net/gml"
    xmlns:xlink="http://www.w3.org/1999/xlink">
    <!-- -->
    <gml:description>Rigorous Sensor Model for SPOT-5 HRG Pushbroom
instrument</gml:description>
```

```
<sml:inputs>
  <sml:InputList>
    <sml:input name="PixelGridCoordinates">
      <swe:Vector referenceFrame="urn:ogc:def:crs:CSM:pixelGridCRS">
        <swe:coordinate name="row">
          <swe:Quantity>
            <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
          </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="col">
          <swe:Quantity>
            <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
          </swe:Quantity>
        </swe:coordinate>
      </swe:Vector>
    </sml:input>
    <sml:input name="SegmentStartTime">
      <swe:Time referenceFrame="urn:ogc:def:crs:OGC:TAI">
        <swe:uom code="s"/>
      </swe:Time>
    </sml:input>
  </sml:InputList>
</sml:inputs>
<sml:outputs>
  <sml:OutputList>
    <sml:output name="ViewVector">
      <swe:Vector referenceFrame="urn:ogc:def:crs:EPSG:4979">
        <swe:coordinate name="x">
          <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="X">
            <swe:uom code="m"/>
          </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="y">
          <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="Y">
            <swe:uom code="m"/>
          </swe:Quantity>
        </swe:coordinate>
        <swe:coordinate name="z">
          <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="Z">
            <swe:uom code="m"/>
          </swe:Quantity>
        </swe:coordinate>
      </swe:Vector>
    </sml:output>
```

```
      </sml:OutputList>
    </sml:outputs>
    <sml:parameters>
      <sml:ParameterList>
        <sml:parameter name="PixelGridCharacteristics">
          <swe:DataRecord>
            <swe:field name="NumberOfRows">
              <swe:Count definition="urn:ogc:def:property:CSM:NROWS">
                <swe:value>1</swe:value>
              </swe:Count>
            </swe:field>
            <swe:field name="NumberOfColumns">
              <swe:Count definition="urn:ogc:def:property:CSM:NCOLS">
                <swe:value>12000</swe:value>
              </swe:Count>
            </swe:field>
            <swe:field name="RowSpacing">
              <swe:Quantity
definition="urn:ogc:def:property:CSM:ROW_SPACING">
                <swe:uom code="m"/>
                <swe:value>6.5e-6</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="ColumnSpacing">
              <swe:Quantity definition="urn:ogc:def:property:CSM:COL_SPACING">
                <swe:uom code="m"/>
                <swe:value>6.5e-6</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="RowAxisOffset">
              <swe:Quantity
definition="urn:ogc:def:property:CSM:ROW_AXIS_OFFSET">
                <swe:uom code="m"/>
                <swe:value>-3.25e-6</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="ColumnAxisOffset">
              <swe:Quantity
definition="urn:ogc:def:property:CSM:COL_AXIS_OFFSET">
                <swe:uom code="m"/>
                <swe:value>-3.9e-2</swe:value>
              </swe:Quantity>
            </swe:field>
          </swe:DataRecord>
        </sml:parameter>
        <sml:parameter name="IdealOpticalCharacteristics">
          <swe:DataRecord>
```

```
            <swe:field name="CalibratedFocalLength">
              <swe:Quantity gml:id="FOCAL_LENGTH"
definition="urn:ogc:def:property:CSM:FOCAL_LENGTH_CAL">
                <swe:uom code="m"/>
                <swe:value>1.082</swe:value>
              </swe:Quantity>
            </swe:field>
          </swe:DataRecord>
        </sml:parameter>
        <sml:parameter name="PushbroomTimingCharacteristics">
          <swe:DataRecord>
            <swe:field name="FrameSamplingPeriod">
              <swe:Quantity
definition="urn:ogc:def:property:CSM:FRAME_SAMPLING_PERIOD">
                <swe:uom code="s"/>
                <swe:value>7.52e-4</swe:value>
              </swe:Quantity>
            </swe:field>
          </swe:DataRecord>
        </sml:parameter>
        <sml:parameter name="PlatformLocation">
          <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_TABLE">
            <swe:elementCount>
              <swe:Count>
                <swe:value>6</swe:value>
              </swe:Count>
            </swe:elementCount>
            <swe:elementType name="Location">
              <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">
                <swe:coordinate name="time">
                  <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                    <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>
                  </swe:Time>
                </swe:coordinate>
                <swe:coordinate name="x">
                  <swe:Quantity gml:id="LOC_X"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">
                    <swe:uom code="m"/>
                  </swe:Quantity>
                </swe:coordinate>
                <swe:coordinate name="y">
                  <swe:Quantity gml:id="LOC_Y"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">
```

```
                        <swe:uom code="m"/>
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="z">
                      <swe:Quantity gml:id="LOC_Z"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">
                        <swe:uom code="m"/>
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="vx">
                      <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="X">
                        <swe:uom code="m/s"/>
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="vy">
                      <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="Y">
                        <swe:uom code="m/s"/>
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="vz">
                      <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="Z">
                        <swe:uom code="m/s"/>
                      </swe:Quantity>
                    </swe:coordinate>
                  </swe:Vector>
                </swe:elementType>
                <swe:encoding>
                  <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
                </swe:encoding>
                <swe:values>
                  2009-01-01T10:30:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                  2009-01-01T10:30:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                  2009-01-01T10:31:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                  2009-01-01T10:31:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                  2009-01-01T10:32:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                  2009-01-01T10:32:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
                </swe:values>
```

```
            </swe:DataArray>
          </sml:parameter>
          <sml:parameter name="PlatformAttitude">
            <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_ATTITUDE_TABLE">
              <swe:elementCount>
                <swe:Count>
                  <swe:value>10</swe:value>
                </swe:Count>
              </swe:elementCount>
              <swe:elementType name="Attitude">
                <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_ORIENTATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">
                  <swe:coordinate name="time">
                    <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                      <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>
                    </swe:Time>
                  </swe:coordinate>
                  <swe:coordinate name="yaw">
                    <swe:Quantity gml:id="YAW"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Z">
                      <swe:uom code="rad"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="pitch">
                    <swe:Quantity gml:id="PITCH"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="X">
                      <swe:uom code="rad"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="roll">
                    <swe:Quantity gml:id="ROLL"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Y">
                      <swe:uom code="rad"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="yaw_speed">
                    <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Z">
                      <swe:uom code="rad/s"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="pitch_speed">
                    <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="X">
```

```
                        <swe:uom code="rad/s"/>
                      </swe:Quantity>
                    </swe:coordinate>
                    <swe:coordinate name="roll_speed">
                      <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Y">
                        <swe:uom code="rad/s"/>
                      </swe:Quantity>
                    </swe:coordinate>
                  </swe:Vector>
                </swe:elementType>
                <swe:encoding>
                  <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
                </swe:encoding>
                <swe:values>
                  2009-01-01T10:30:00Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:30:10Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:30:20Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:30:30Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:30:40Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:30:50Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:31:00Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:31:10Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:31:20Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                  2009-01-01T10:31:30Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                </swe:values>
              </swe:DataArray>
            </sml:parameter>
            <sml:parameter name="UncertaintyInformation">
              <swe:DataRecord>
                <swe:field name="AdjustableParameters">
                  <swe:DataRecord>
                    <swe:field name="PlatformLocationX" xlink:href="#LOC_X"/>
                    <swe:field name="PlatformLocationY" xlink:href="#LOC_Y"/>
                    <swe:field name="PlatformLocationZ" xlink:href="#LOC_Z"/>
                    <swe:field name="PlatformAttitudeX" xlink:href="#YAW"/>
```

```
                    <swe:field name="PlatformAttitudeY" xlink:href="#PITCH"/>
                    <swe:field name="PlatformAttitudeZ" xlink:href="#ROLL"/>
                    <swe:field name="FocalLength" xlink:href="#FOCAL_LENGTH"/>
                  </swe:DataRecord>
                </swe:field>
                <swe:field name="CovarianceMatrix">
                  <swe:DataArray
definition="urn:ogc:def:property:CSM:COVARIANCE_MATRIX">
                    <swe:elementCount>
                      <swe:Count>
                        <swe:value>7</swe:value>
                      </swe:Count>
                    </swe:elementCount>
                    <swe:elementType name="Row">
                      <swe:DataArray>
                        <swe:elementCount>
                          <swe:Count>
                            <swe:value>7</swe:value>
                          </swe:Count>
                        </swe:elementCount>
                        <swe:elementType name="Value">
                          <swe:Quantity/>
                        </swe:elementType>
                      </swe:DataArray>
                    </swe:elementType>
                    <swe:encoding>
                      <swe:TextBlock tokenSeparator=" " blockSeparator=" "
decimalSeparator="."/>
                    </swe:encoding>
                    <swe:values>
                      1 0 0 0 0 0 0
                      0 1 0 0 0 0 0
                      0 0 1 0 0 0 0
                      0 0 0 1 0 0 0
                      0 0 0 0 1 0 0
                      0 0 0 0 0 1 0
                      0 0 0 0 0 0 1
                    </swe:values>
                  </swe:DataArray>
                </swe:field>
              </swe:DataRecord>
            </sml:parameter>
          </sml:ParameterList>
        </sml:parameters>
        <sml:method
xlink:href="urn:ogc:def:process:CSM:ImageToGroundPushbroomSensorModel"/>
</sml:ProcessModel>
```

C.4 Rigorous Sensor Model for SPOT-5 HRG Pushbroom instrument – Example 2

```
<?xml version="1.0" encoding="UTF-8"?>
<?oxygen SCHSchema="../RelaxNG/v1.0.1/profiles/CSM/pushbroom-sensor-model.rng"?>
<?oxygen RNGSchema="../RelaxNG/v1.0.1/profiles/CSM/pushbroom-sensor-model.rng" type="xml"?>
<sml:ProcessModel
   xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
   xmlns:swe="http://www.opengis.net/swe/1.0.1"
   xmlns:gml="http://www.opengis.net/gml"
   xmlns:xlink="http://www.w3.org/1999/xlink">
   <!-- -->
   <gml:description>Rigorous Sensor Model for SPOT-5 HRG SuperMode Pushbroom instrument</gml:description>
   <sml:inputs>
      <sml:InputList>
         <sml:input name="PixelGridCoordinates">
            <swe:Vector referenceFrame="urn:ogc:def:crs:CSM:pixelGridCRS">
               <swe:coordinate name="row">
                  <swe:Quantity>
                     <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
                  </swe:Quantity>
               </swe:coordinate>
               <swe:coordinate name="col">
                  <swe:Quantity>
                     <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
                  </swe:Quantity>
               </swe:coordinate>
            </swe:Vector>
         </sml:input>
         <sml:input name="SegmentStartTime">
            <swe:Time referenceFrame="urn:ogc:def:crs:OGC:TAI">
               <swe:uom code="s"/>
            </swe:Time>
         </sml:input>
      </sml:InputList>
   </sml:inputs>
   <sml:outputs>
      <sml:OutputList>
         <sml:output name="ViewVector">
            <swe:Vector referenceFrame="urn:ogc:def:crs:EPSG:4979">
               <swe:coordinate name="x">
                  <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">
                     <swe:uom code="m"/>
```

```
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="y">
                <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="Y">
                  <swe:uom code="m"/>
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="z">
                <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="Z">
                  <swe:uom code="m"/>
                </swe:Quantity>
              </swe:coordinate>
            </swe:Vector>
          </sml:output>
        </sml:OutputList>
    </sml:outputs>
    <sml:parameters>
      <sml:ParameterList>
        <sml:parameter name="PixelGridCharacteristics">
          <swe:DataRecord>
            <swe:field name="NumberOfRows">
              <swe:Count definition="urn:ogc:def:property:CSM:NROWS">
                <swe:value>1</swe:value>
              </swe:Count>
            </swe:field>
            <swe:field name="NumberOfColumns">
              <swe:Count definition="urn:ogc:def:property:CSM:NCOLS">
                <swe:value>24000</swe:value>
              </swe:Count>
            </swe:field>
            <swe:field name="RowSpacing">
              <swe:Quantity
definition="urn:ogc:def:property:CSM:ROW_SPACING">
                <swe:uom code="m"/>
                <swe:value>3.25e-6</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="ColumnSpacing">
              <swe:Quantity definition="urn:ogc:def:property:CSM:COL_SPACING">
                <swe:uom code="m"/>
                <swe:value>3.25e-6</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="RowAxisOffset">
```

```
                <swe:Quantity
definition="urn:ogc:def:property:CSM:ROW_AXIS_OFFSET">
                  <swe:uom code="m"/>
                  <swe:value>-1.625e-6</swe:value>
                </swe:Quantity>
              </swe:field>
              <swe:field name="ColumnAxisOffset">
                <swe:Quantity
definition="urn:ogc:def:property:CSM:COL_AXIS_OFFSET">
                  <swe:uom code="m"/>
                  <swe:value>-3.9e-2</swe:value>
                </swe:Quantity>
              </swe:field>
            </swe:DataRecord>
          </sml:parameter>
          <sml:parameter name="IdealOpticalCharacteristics">
            <swe:DataRecord>
              <swe:field name="CalibratedFocalLength">
                <swe:Quantity gml:id="FOCAL_LENGTH"
definition="urn:ogc:def:property:CSM:FOCAL_LENGTH_CAL">
                  <swe:uom code="m"/>
                  <swe:value>1.082</swe:value>
                </swe:Quantity>
              </swe:field>
            </swe:DataRecord>
          </sml:parameter>
          <sml:parameter name="PushbroomTimingCharacteristics">
            <swe:DataRecord>
              <swe:field name="FrameSamplingPeriod">
                <swe:Quantity
definition="urn:ogc:def:property:CSM:FRAME_SAMPLING_PERIOD">
                  <swe:uom code="s"/>
                  <swe:value>3.76e-4</swe:value>
                </swe:Quantity>
              </swe:field>
            </swe:DataRecord>
          </sml:parameter>
          <sml:parameter name="PlatformLocation">
            <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_TABLE">
              <swe:elementCount>
                <swe:Count>
                  <swe:value>6</swe:value>
                </swe:Count>
              </swe:elementCount>
              <swe:elementType name="Location">
```

```
                <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">
                  <swe:coordinate name="time">
                    <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                      <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>
                    </swe:Time>
                  </swe:coordinate>
                  <swe:coordinate name="x">
                    <swe:Quantity gml:id="LOC_X"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">
                      <swe:uom code="m"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="y">
                    <swe:Quantity gml:id="LOC_Y"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">
                      <swe:uom code="m"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="z">
                    <swe:Quantity gml:id="LOC_Z"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">
                      <swe:uom code="m"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="vx">
                    <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="X">
                      <swe:uom code="m/s"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="vy">
                    <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="Y">
                      <swe:uom code="m/s"/>
                    </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="vz">
                    <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="Z">
                      <swe:uom code="m/s"/>
                    </swe:Quantity>
                  </swe:coordinate>
                </swe:Vector>
              </swe:elementType>
```

```
            <swe:encoding>
              <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
            </swe:encoding>
            <swe:values>
              2009-01-01T10:30:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
              2009-01-01T10:30:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
              2009-01-01T10:31:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
              2009-01-01T10:31:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
              2009-01-01T10:32:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
              2009-01-01T10:32:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
            </swe:values>
          </swe:DataArray>
        </sml:parameter>
        <sml:parameter name="PlatformAttitude">
          <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_ATTITUDE_TABLE">
            <swe:elementCount>
              <swe:Count>
                <swe:value>10</swe:value>
              </swe:Count>
            </swe:elementCount>
            <swe:elementType name="Attitude">
              <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_ORIENTATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">
                <swe:coordinate name="time">
                  <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">
                    <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>
                  </swe:Time>
                </swe:coordinate>
                <swe:coordinate name="yaw">
                  <swe:Quantity gml:id="YAW"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Z">
                    <swe:uom code="rad"/>
                  </swe:Quantity>
                </swe:coordinate>
                <swe:coordinate name="pitch">
                  <swe:Quantity gml:id="PITCH"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="X">
```

```
                        <swe:uom code="rad"/>
                     </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="roll">
                     <swe:Quantity gml:id="ROLL"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Y">
                        <swe:uom code="rad"/>
                     </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="yaw_speed">
                     <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Z">
                        <swe:uom code="rad/s"/>
                     </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="pitch_speed">
                     <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="X">
                        <swe:uom code="rad/s"/>
                     </swe:Quantity>
                  </swe:coordinate>
                  <swe:coordinate name="roll_speed">
                     <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Y">
                        <swe:uom code="rad/s"/>
                     </swe:Quantity>
                  </swe:coordinate>
               </swe:Vector>
            </swe:elementType>
            <swe:encoding>
               <swe:TextBlock tokenSeparator=" " blockSeparator="&#xA;"
decimalSeparator="."/>
            </swe:encoding>
            <swe:values>
               2009-01-01T10:30:00Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
               2009-01-01T10:30:10Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
               2009-01-01T10:30:20Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
               2009-01-01T10:30:30Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
               2009-01-01T10:30:40Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
               2009-01-01T10:30:50Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
```

```
                2009-01-01T10:31:00Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                2009-01-01T10:31:10Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                2009-01-01T10:31:20Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
                2009-01-01T10:31:30Z 8.1161153986e-04 -6.5864093377e-04
3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07
              </swe:values>
            </swe:DataArray>
          </sml:parameter>
          <sml:parameter name="UncertaintyInformation">
            <swe:DataRecord>
              <swe:field name="AdjustableParameters">
                <swe:DataRecord>
                  <swe:field name="PlatformLocationX" xlink:href="#LOC_X"/>
                  <swe:field name="PlatformLocationY" xlink:href="#LOC_Y"/>
                  <swe:field name="PlatformLocationZ" xlink:href="#LOC_Z"/>
                  <swe:field name="PlatformAttitudeX" xlink:href="#YAW"/>
                  <swe:field name="PlatformAttitudeY" xlink:href="#PITCH"/>
                  <swe:field name="PlatformAttitudeZ" xlink:href="#ROLL"/>
                  <swe:field name="FocalLength" xlink:href="#FOCAL_LENGTH"/>
                </swe:DataRecord>
              </swe:field>
              <swe:field name="CovarianceMatrix">
                <swe:DataArray
definition="urn:ogc:def:property:CSM:COVARIANCE_MATRIX">
                  <swe:elementCount>
                    <swe:Count>
                      <swe:value>7</swe:value>
                    </swe:Count>
                  </swe:elementCount>
                  <swe:elementType name="Row">
                    <swe:DataArray>
                      <swe:elementCount>
                        <swe:Count>
                          <swe:value>7</swe:value>
                        </swe:Count>
                      </swe:elementCount>
                      <swe:elementType name="Value">
                        <swe:Quantity/>
                      </swe:elementType>
                    </swe:DataArray>
                  </swe:elementType>
                  <swe:encoding>
                    <swe:TextBlock tokenSeparator=" " blockSeparator=" "
decimalSeparator="."/>
```

```
                    </swe:encoding>
                    <swe:values>
                       1 0 0 0 0 0 0
                       0 1 0 0 0 0 0
                       0 0 1 0 0 0 0
                       0 0 0 1 0 0 0
                       0 0 0 0 1 0 0
                       0 0 0 0 0 1 0
                       0 0 0 0 0 0 1
                    </swe:values>
                 </swe:DataArray>
              </swe:field>
           </swe:DataRecord>
        </sml:parameter>
     </sml:ParameterList>
  </sml:parameters>
  <sml:method
xlink:href="urn:ogc:def:process:CSM:ImageToGroundPushbroomSensorModel"/>
</sml:ProcessModel>
```

Annex D

Examples for Individual Web Services

D.1 Introduction

The SWE Georeferenceable Imagery Workflow consists of SPS, SOS-T, WNS, WCS-T, WPS, and CSW.

D.2 SPS

This service was implemented by the group at SpotImage, France, following the developing SPS 2.0.

D.2.1 Service endpoint

The service was deployed at http://ws.spotimage.com/axis2/services/SPSv20. SpotImage provides a demo page at http://ws.spotimage.com/client_ows/. The revised WSDL description for the service is at http://csiss.gmu.edu/sensorweb/wsdls/ows5/sps/gmu4spotimagesps.wsdl.

D.2.2 Operation "DescribeSensor"

D.2.2.1 Request sample with the HTTP POST binding

```
<?xml version='1.0' encoding='utf-8'?>

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">

  <soapenv:Body>

    <swes:DescribeSensor xmlns:swes="http://www.opengis.net/sweService/1.0"
service="SPS" version="2.0.0">

      <swes:sensorID>urn:spot:sensors:SPOT5:HRG</swes:sensorID>

    </swes:DescribeSensor>

  </soapenv:Body>

</soapenv:Envelope>
```

D.2.2.2 Response sample

<?xml version="1.0" encoding="UTF-8"?><soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"><soapenv:Body><sml:SensorML xmlns:sml="http://www.opengis.net/sensorML/1.0.1" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml" xmlns:swe="http://www.opengis.net/swe/1.0.1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.opengis.net/sensorML/1.0.1 http://schemas.opengis.net/sensorML/1.0.1/sensorML.xsd" version="1.0.1">

<!-- -->

<sml:member xlink:role="urn:ogc:def:dictionary:CEOS:documentRoles:v01#instrument_capabilities">

<!-- -->

<sml:System gml:id="SPOT5_HRG">

<!-- == -->

<!-- System Description -->

<!-- == -->

<gml:description>

The HRG instrument on board SPOT5 is a high resolution multispectral imager. It uses a pushbroom scanning

technique to acquire images of the earth with 2.5m/5m/10m resolutions depending what detectors are used.

</gml:description>

<!-- == -->

<!-- System Identifiers -->

<!-- == -->

<sml:identification>

<sml:IdentifierList>

<sml:identifier name="Instrument UID">

<sml:Term definition="urn:ogc:def:property:CEOS:eop:InstrumentID">

```
            <sml:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG</sml:value>
          </sml:Term>
        </sml:identifier>
        <sml:identifier name="Platform UID">
          <sml:Term definition="urn:ogc:def:property:CEOS:eop:PlatformID">
            <sml:value>urn:ogc:id:CEOS:platform:SPOT5</sml:value>
          </sml:Term>
        </sml:identifier>
        <sml:identifier name="Short Name">
          <sml:Term definition="urn:ogc:def:property:OGC:shortName">
            <sml:value>SPOT-5 HRG1</sml:value>
          </sml:Term>
        </sml:identifier>
        <sml:identifier name="Long Name">
          <sml:Term definition="urn:ogc:def:property:OGC:longName">
            <sml:value>Spot-5 High Resolution Geometric</sml:value>
          </sml:Term>
        </sml:identifier>
      </sml:IdentifierList>
    </sml:identification>
    <!-- ================================================ -->
    <!--              System Classifiers                  -->
    <!-- ================================================ -->
    <sml:classification>
      <sml:ClassifierList>
        <sml:classifier name="Instrument Type">
```

```
            <sml:Term definition="urn:ogc:def:property:OGC:sensorType">
              <sml:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:InstrumentTypes:v01"/>
              <sml:value>Imaging Multispectral Radiometer</sml:value>
            </sml:Term>
          </sml:classifier>
          <sml:classifier name="Acquisition Method">
            <sml:Term definition="urn:ogc:def:property:OGC:sensorType">
              <sml:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:AcquisitionMethods:v01"/>
              <sml:value>Pushbroom</sml:value>
            </sml:Term>
          </sml:classifier>
          <sml:classifier name="Application">
            <sml:Term definition="urn:ogc:def:property:OGC:application">
              <sml:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:InstrumentApplications:v01"/>
              <sml:value>Land - Multi-purpose Imagery</sml:value>
            </sml:Term>
          </sml:classifier>
        </sml:ClassifierList>
      </sml:classification>
      <!-- ================================================ -->
      <!--       Temporal Validity of this description       -->
      <!-- ================================================ -->
      <sml:validTime>
        <gml:TimePeriod>
```

```
            <gml:beginPosition>2002-05-04T00:00:00Z</gml:beginPosition>
            <gml:endPosition indeterminatePosition="now"/>
          </gml:TimePeriod>
        </sml:validTime>
        <!-- ================================================= -->
        <!--       Instrument Geometric Characteristics        -->
        <!-- ================================================= -->
        <sml:characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:GeometricCharacteristics">
          <swe:DataRecord>
            <gml:name>Geometric Characteristics</gml:name>
            <swe:field name="Across-Track FOV">
              <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:AcrossTrackFov">
                <swe:uom code="deg"/>
                <swe:value>4.13</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="Across-Track Pointing Range">
              <swe:QuantityRange
definition="urn:ogc:def:property:CEOS:eop:AcrossTrackPointingRange">
                <swe:uom code="deg"/>
                <swe:value>-27 +27</swe:value>
              </swe:QuantityRange>
            </swe:field>
            <swe:field name="Along-Track Pointing Range">
```

```
            <swe:QuantityRange
definition="urn:ogc:def:property:CEOS:eop:AlongTrackPointingRange">
              <swe:uom code="deg"/>
              <swe:value>-0 +0</swe:value>
            </swe:QuantityRange>
          </swe:field>
          <swe:field name="Swath Width">
            <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:NadirSwathWidth">
              <swe:uom code="km"/>
              <swe:value>60</swe:value>
            </swe:Quantity>
          </swe:field>
          <swe:field name="Ground Location Accuracy">
            <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:GroundLocationAccuracy">
              <swe:uom code="m"/>
              <swe:value>50</swe:value>
            </swe:Quantity>
          </swe:field>
          <swe:field name="Revisit Time">
            <swe:Quantity definition="urn:ogc:def:property:CEOS:eop:RevisitTime">
              <swe:uom code="d"/>
              <swe:value>3</swe:value>
            </swe:Quantity>
          </swe:field>
        </swe:DataRecord>
```

```
        </sml:characteristics>

        <!-- ================================================= -->

        <!--      Instrument Measurement Characteristics       -->

        <!-- ================================================= -->

        <sml:characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:MeasurementCharacteristics">

          <swe:DataRecord>

            <gml:name>Measurement Characteristics</gml:name>

            <swe:field name="Number of Bands">

              <swe:Count definition="urn:ogc:def:property:CEOS:opt:NumberOfBands">

                <gml:description>Total number of bands for this
instrument</gml:description>

                <swe:value>5</swe:value>

              </swe:Count>

            </swe:field>

          </swe:DataRecord>

        </sml:characteristics>

        <!-- ================================================= -->

        <!--       Instrument Physical Characteristics        -->

        <!-- ================================================= -->

        <sml:characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:PhysicalCharacteristics">

          <swe:DataRecord>

            <gml:name>Physical Characteristics</gml:name>

            <swe:field name="Mass">

              <swe:Quantity definition="urn:ogc:def:property:OGC:mass">

                <swe:uom code="kg"/>
```

```
                <swe:value>356</swe:value>
              </swe:Quantity>
            </swe:field>
            <swe:field name="Maximum Power Consumption">
              <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:MaximumPowerConsumption">
                <swe:uom code="W"/>
                <swe:value>344</swe:value>
              </swe:Quantity>
            </swe:field>
          </swe:DataRecord>
        </sml:characteristics>
        <!-- ================================================= -->
        <!--       Possible Instrument Configurations        -->
        <!-- ================================================= -->
        <sml:characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:InstrumentConfigurations">
          <swe:DataRecord>
            <gml:name>Possible Instrument Configurations</gml:name>
            <swe:field name="PA Mode">
              <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">
                <swe:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG:PA-
HMA:v01</swe:value>
              </swe:Category>
            </swe:field>
            <swe:field name="PA+XS Mode">
```

```
            <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">

<swe:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG:PA+XS:v01</swe:value>

            </swe:Category>

          </swe:field>

          <swe:field name="PA Super Mode">

            <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">

              <swe:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG:PA-
Super:v01</swe:value>

            </swe:Category>

          </swe:field>

          <swe:field name="PA+XS Super Mode">

            <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">

              <swe:value>urn:ogc:id:CEOS:instrument:SPOT5:HRG:PA+XS-
Super:v01</swe:value>

            </swe:Category>

          </swe:field>

        </swe:DataRecord>

      </sml:characteristics>

      <!-- ================================================ -->

      <!--              Relevant Contacts               -->

      <!-- ================================================ -->

      <sml:contact xlink:role="urn:ogc:def:role:OGC:contact:distributor">

        <sml:ResponsibleParty>

          <sml:individualName>Didier Giacobbo</sml:individualName>
```

```
            <sml:organizationName>Spot-Image</sml:organizationName>
            <sml:contactInfo>
              <sml:phone>
                <sml:voice>+33 5 62 19 42 52</sml:voice>
              </sml:phone>
              <sml:address>
                <sml:deliveryPoint>5, rue des satellites, BP 4359</sml:deliveryPoint>
                <sml:city>TOULOUSE, Cedex 4</sml:city>
                <sml:postalCode>31030</sml:postalCode>
                <sml:country>FRANCE</sml:country>
              </sml:address>
            </sml:contactInfo>
          </sml:ResponsibleParty>
        </sml:contact>
        <!-- =============================================== -->
        <!--              System Documentation               -->
        <!-- =============================================== -->
        <sml:documentation xlink:role="urn:ogc:def:role:OGC:document:datasheet">
          <sml:Document>
            <gml:description>Page of CNES Website describing the HRG
Instrument</gml:description>
            <sml:onlineResource
xlink:href="http://spot5.cnes.fr/gb/satellite/camerasHRG.htm"/>
          </sml:Document>
        </sml:documentation>
        <!-- =============================================== -->
        <!--           Instrument Reference Frame            -->
```

```
<!-- ================================================ -->
<sml:spatialReferenceFrame>
  <gml:EngineeringCRS gml:id="INSTRUMENT_FRAME">
    <gml:srsName>Instrument Reference System</gml:srsName>
    <gml:usesCS xlink:href="urn:ogc:def:cs:OGC:cartesianCS"/>
    <gml:usesEngineeringDatum>
      <gml:EngineeringDatum gml:id="INSTRUMENT_DATUM">
        <gml:datumName>Instrument Datum</gml:datumName>
        <gml:anchorPoint/>
      </gml:EngineeringDatum>
    </gml:usesEngineeringDatum>
  </gml:EngineeringCRS>
</sml:spatialReferenceFrame>
<!-- ================================================ -->
<!--                System Inputs                 -->
<!-- ================================================ -->
<sml:inputs>
  <sml:InputList>
    <sml:input name="Radiation">
      <swe:ObservableProperty definition="urn:ogc:def:property:OGC:radiation"/>
    </sml:input>
  </sml:InputList>
</sml:inputs>
<!-- ================================================ -->
<!--              System Components               -->
<!-- ================================================ -->
```

```
        <sml:components>

          <sml:ComponentList>

            <!--  Link to HMA Detector Description -->

            <sml:component name="HMA Detector"
xlink:href="http://ws.spotimage.com/SensorML/Spot/Detector_SPOT5-HRG-
HMA_v01_draft03.xml#HRG-HMA"/>

            <!--  Link to HMB Detector Description -->

            <sml:component name="HMB Detector"
xlink:href="http://ws.spotimage.com/SensorML/Spot/Detector_SPOT5-HRG-
HMB_v01_draft03.xml#HRG-HMB"/>

            <!--  Link to XS1 Detector Description -->

            <sml:component name="XS1 Detector"
xlink:href="http://ws.spotimage.com/SensorML/Spot/Detector_SPOT5-HRG-
XS1_v01_draft03.xml#HRG-XS1"/>

            <!--  Link to XS2 Detector Description -->

            <sml:component name="XS2 Detector"
xlink:href="http://ws.spotimage.com/SensorML/Spot/Detector_SPOT5-HRG-
XS2_v01_draft03.xml#HRG-XS2"/>

            <!--  Link to XS3 Detector Description -->

            <sml:component name="XS3 Detector"
xlink:href="http://ws.spotimage.com/SensorML/Spot/Detector_SPOT5-HRG-
XS3_v01_draft03.xml#HRG-XS3"/>

            <!--  Link to SWIR Detector Description -->

            <sml:component name="SWIR Detector"
xlink:href="http://ws.spotimage.com/SensorML/Spot/Detector_SPOT5-HRG-
SWIR_v01_draft03.xml#HRG-SWIR"/>

          </sml:ComponentList>

        </sml:components>

      </sml:System>

    </sml:member>

</sml:SensorML></soapenv:Body></soapenv:Envelope>
```

D.2.3 Operation “DescribeTasking”

D.2.3.1 Request sample with the HTTP POST binding

```
<?xml version='1.0' encoding='utf-8'?>

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">

  <soapenv:Body>

    <sps:DescribeTasking xmlns:sps="http://www.opengis.net/sps/2.0" service="SPS"
version="2.0.0">

      <sps:sensorID>urn:spot:sensors:SPOT5:HRG</sps:sensorID>

    </sps:DescribeTasking>

  </soapenv:Body>

</soapenv:Envelope>
```

D.2.3.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">

      <soapenv:Body>

            <sps:DescribeTaskingResponse xmlns:sps="http://www.opengis.net/sps/2.0"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:swe="http://www.opengis.net/swe/2.0">

                  <sps:taskingParameters name="CoverageProgrammingRequest">

                        <swe:DataRecord>

                              <swe:field name="QualityOfService" optional="true">

                                    <swe:DataRecord>

                                          <gml:name>Quality of Service</gml:name>

                                          <swe:field name="Priority">

                                                <swe:Category
definition="urn:ogc:def:property:CEOS:eop:PriorityLevel">
```

```
                                        <swe:constraint>
                                            <swe:AllowedTokens>
                                                <swe:enumeration>STANDARD
HIGH</swe:enumeration>
                                            </swe:AllowedTokens>
                                        </swe:constraint>
                                        <swe:value>STANDARD</swe:value>
                                    </swe:Category>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                        <swe:field name="RegionOfInterest">
                            <swe:DataChoice
definition="urn:ogc:def:property:CEOS:eop:RegionOfInterest">
                                <gml:name>Region of Interest</gml:name>
                                <swe:item name="Polygon">
                                    <swe:DataRecord
definition="urn:ogc:def:property:ISO-19107:Polygon" gml:id="POLYGON">
                                        <swe:field name="Exterior">
                                            <swe:DataArray
definition="urn:ogc:def:property:ISO-19107:LinearRing">
                                                <swe:elementCount>
                                                    <swe:Count/>
                                                </swe:elementCount>
                                                <swe:elementType name="Point">
                                                    <swe:Vector is="Record"
referenceFrame="urn:ogc:def:crs:EPSG:6.2:4326">
```

```
                                        <swe:coordinate is="field"
name="Lat">
                                            <swe:Quantity axisID="Y">
                                                <swe:uom code="deg"/>
                                            </swe:Quantity>
                                        </swe:coordinate>
                                        <swe:coordinate is="field"
name="Lon">
                                            <swe:Quantity axisID="X">
                                                <swe:uom code="deg"/>
                                            </swe:Quantity>
                                        </swe:coordinate>
                                    </swe:Vector>
                                </swe:elementType>
                            </swe:DataArray>
                        </swe:field>
                    </swe:DataRecord>
                </swe:item>
                <swe:item name="Circle">
                    <swe:DataRecord
definition="urn:ogc:def:property:ISO-19107:Circle">
                        <swe:field name="Center">
                            <swe:Vector is="Record"
referenceFrame="urn:ogc:def:crs:EPSG:6.2:4326">
                                <swe:coordinate is="field" name="Lat">
                                    <swe:Quantity axisID="Y">
                                        <swe:uom code="deg"/>
```

```
                                    </swe:Quantity>
                                </swe:coordinate>
                                <swe:coordinate is="field" name="Lon">
                                    <swe:Quantity axisID="X">
                                        <swe:uom code="deg"/>
                                    </swe:Quantity>
                                </swe:coordinate>
                            </swe:Vector>
                        </swe:field>
                        <swe:field name="Radius">
                            <swe:Quantity>
                                <swe:uom code="km"/>
                            </swe:Quantity>
                        </swe:field>
                    </swe:DataRecord>
                </swe:item>
            </swe:DataChoice>
        </swe:field>
        <swe:field name="TimeOfInterest">
            <swe:DataChoice
definition="urn:ogc:def:property:CEOS:eop:TimeOfInterest">
                <swe:item name="SurveyPeriod">
                    <swe:TimeRange
definition="urn:ogc:def:property:CEOS:eop:SurveyPeriod">
                        <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                    </swe:TimeRange>
```

```
                    </swe:item>
                    <swe:item name="TemporalSeries">
                        <swe:DataRecord>
                            <swe:field name="SurveyPeriod">
                                <swe:TimeRange
definition="urn:ogc:def:property:CEOS:eop:SurveyPeriod">
                                    <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                </swe:TimeRange>
                            </swe:field>
                            <swe:field name="Occurences">
                                <swe:Count
definition="urn:ogc:def:property:CEOS:eop:TemporalSeriesOccurences">
                                    <gml:description>Number of times the
region should be fully covered</gml:description>
                                    <gml:name>Number of
Occurences</gml:name>
                                </swe:Count>
                            </swe:field>
                            <swe:field name="PeriodicityRange">
                                <swe:TimeRange
definition="urn:ogc:def:property:CEOS:eop:TemporalSeriesPeriodicity">
                                    <swe:uom code="d"/>
                                </swe:TimeRange>
                            </swe:field>
                            <swe:field name="LatestStart">
                                <swe:Time
definition="urn:ogc:def:property:CEOS:eop:TemporalSeriesLatestStart">
                                    <gml:name>Latest Start</gml:name>
```

```
                                        <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                    </swe:Time>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:item>
                    </swe:DataChoice>
                </swe:field>
                <swe:field name="AcquisitionType">
                    <swe:DataChoice
definition="urn:ogc:def:property:CEOS:eop:AcquisitionType">
                        <swe:item name="MonoscopicAcquisition">
                            <swe:DataRecord
definition="urn:ogc:def:property:CEOS:eop:MonoscopicAcquisition">
                                <swe:field name="CoverageType">
                                    <swe:Category
definition="urn:ogc:def:property:CEOS:eop:CoverageType">
                                        <gml:name>Coverage Type</gml:name>
                                        <swe:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:CoverageTypes"/>
                                        <swe:constraint>
                                            <swe:AllowedTokens>

    <swe:enumeration>SINGLE_SWATH MULTIPASS</swe:enumeration>
                                            </swe:AllowedTokens>
                                        </swe:constraint>
                                        <swe:value>MULTIPASS</swe:value>
                                    </swe:Category>
```

```
                                    </swe:field>
                                    <swe:field name="IncidenceAngle">
                                        <swe:DataRecord>
                                            <swe:field name="Azimuth"
optional="true">
                                                <swe:QuantityRange
definition="urn:ogc:def:property:CEOS:eop:AzimuthIncidenceAngle">
                                                    <swe:uom code="deg"/>
                                                    <swe:constraint>
                                                        <swe:AllowedValues>
                                                            <swe:interval>-180.0
180.0</swe:interval>
                                                        </swe:AllowedValues>
                                                    </swe:constraint>
                                                    <swe:value>-180.0
180.0</swe:value>
                                                </swe:QuantityRange>
                                            </swe:field>
                                            <swe:field name="Elevation">
                                                <swe:QuantityRange
definition="urn:ogc:def:property:CEOS:eop:ElevationIncidenceAngle">
                                                    <swe:uom code="deg"/>
                                                    <swe:constraint>
                                                        <swe:AllowedValues>
                                                            <swe:interval>0.0
31.0</swe:interval>
                                                        </swe:AllowedValues>
                                                    </swe:constraint>
```

```
                                        <swe:value>0.0 31.0</swe:value>
                                    </swe:QuantityRange>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                        <swe:field name="AcquisitionParametersOPT">
                            <swe:DataRecord>
                                <swe:field name="GroundResolution">
                                    <swe:QuantityRange
definition="urn:ogc:def:property:CEOS:eop:GroundResolution">
                                        <swe:uom code="m"/>
                                        <swe:constraint>
                                            <swe:AllowedValues>
                                                <swe:interval>2.5
20.0</swe:interval>
                                            </swe:AllowedValues>
                                        </swe:constraint>
                                        <swe:value>2.5 20.0</swe:value>
                                    </swe:QuantityRange>
                                </swe:field>
                                <swe:field name="InstrumentMode">
                                    <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">
                                        <gml:name>Instrument
Mode</gml:name>
                                        <swe:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:SpectralModes"/>
                                        <swe:constraint>
```

```
                                                    <swe:AllowedTokens>
        <swe:enumeration>PANCHROMATIC MULTISPECTRAL</swe:enumeration>
                                                    </swe:AllowedTokens>
                                                </swe:constraint>
        <swe:value>MULTISPECTRAL</swe:value>
                                            </swe:Category>
                                        </swe:field>
                                        <swe:field name="FusionAccepted"
optional="true">
                                            <swe:Boolean
definition="urn:ogc:def:property:CEOS:eop:FusionAccepted">
                                                <gml:name>Fusion
Accepted</gml:name>
                                                <swe:value>true</swe:value>
                                            </swe:Boolean>
                                        </swe:field>
                                    </swe:DataRecord>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:item>
                    </swe:DataChoice>
                </swe:field>
                <swe:field name="ValidationParametersOPT">
                    <swe:DataRecord>
                        <swe:field name="MaxCloudCover">
```

```
                                    <swe:Quantity
definition="urn:ogc:def:property:CEOS:opt:MaxCloudCover">
                                        <gml:description>Maximum acceptable cloud
coverage</gml:description>
                                        <gml:name>Max Cloud Cover</gml:name>
                                        <swe:uom code="%"/>
                                        <swe:constraint>
                                            <swe:AllowedValues>
                                                <swe:interval>0.0 100.0</swe:interval>
                                            </swe:AllowedValues>
                                        </swe:constraint>
                                        <swe:value>50.0</swe:value>
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="MaxSnowCover" optional="true">
                                    <swe:Quantity
definition="urn:ogc:def:property:CEOS:opt:MaxSnowCover">
                                        <gml:description>Maximum acceptable snow
coverage</gml:description>
                                        <gml:name>Max Snow Cover</gml:name>
                                        <swe:uom code="%"/>
                                        <swe:constraint>
                                            <swe:AllowedValues>
                                                <swe:interval>0.0 100.0</swe:interval>
                                            </swe:AllowedValues>
                                        </swe:constraint>
                                        <swe:value>0.0</swe:value>
```

```
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="HazeAccepted" optional="true">
                                    <swe:Boolean
definition="urn:ogc:def:property:CEOS:opt:HazeAccepted">
                                        <gml:description>Specifies if haze is
acceptable</gml:description>
                                        <gml:name>Haze Accepted</gml:name>
                                        <swe:value>true</swe:value>
                                    </swe:Boolean>
                                </swe:field>
                                <swe:field name="SandWindAccepted" optional="true">
                                    <swe:Boolean
definition="urn:ogc:def:property:CEOS:opt:SandWindAccepted">
                                        <gml:description>Specifies of sand winds are
acceptable</gml:description>
                                        <gml:name>Sand Wind Accepted</gml:name>
                                        <swe:value>true</swe:value>
                                    </swe:Boolean>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                    </swe:DataRecord>
                </sps:taskingParameters>
                <sps:feasibilityReportExtendedData name="FeasibilityStudy">
                    <swe:DataRecord>
                        <swe:field name="EstimatedCost">
```

```
                    <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:EstimatedCost">
                        <gml:name>Estimated Coverage Cost</gml:name>
                        <swe:uom xlink:href="urn:ogc:def:unit:OGC:euro"/>
                    </swe:Quantity>
                </swe:field>
                <swe:field name="GridCells">
                    <swe:DataArray
definition="urn:ogc:def:property:CEOS:eop:CellList">
                        <swe:elementCount>
                            <swe:Count/>
                        </swe:elementCount>
                        <swe:elementType name="Cell">
                            <swe:DataRecord>
                                <swe:field name="ID">
                                    <swe:Text
definition="urn:ogc:def:property:CEOS:eop:ObjectID"/>
                                </swe:field>
                                <swe:field name="SuccessRate">
                                    <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:SuccessRate">
                                        <gml:name>Success Rate</gml:name>
                                        <swe:uom code="%"/>
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="EstimatedSuccessDate">
                                    <swe:Time
definition="urn:ogc:def:property:CEOS:eop:EstimatedSuccessDate">
```

```
                                        <gml:name>Estimated Success
Date</gml:name>
                                        <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                    </swe:Time>
                                </swe:field>
                                <swe:field name="NextAttemptDate">
                                    <swe:Time
definition="urn:ogc:def:property:CEOS:eop:NextAttemptDate">
                                        <gml:name>Next Attempt
Date</gml:name>
                                        <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                    </swe:Time>
                                </swe:field>
                                <swe:field name="RemainingAttempts">
                                    <swe:Count
definition="urn:ogc:def:property:CEOS:eop:RemainingAttempts">
                                        <gml:name>Remaining
Attempts</gml:name>
                                    </swe:Count>
                                </swe:field>
                                <swe:field name="Footprint">
                                    <swe:DataRecord
definition="urn:ogc:def:property:ISO-19107:Polygon" gml:id="POLYGON">
                                        <swe:field name="Exterior">
                                            <swe:DataArray
definition="urn:ogc:def:property:ISO-19107:LinearRing">
                                                <swe:elementCount>
                                                    <swe:Count/>
```

```
                                        </swe:elementCount>
                                        <swe:elementType name="Point">
                                            <swe:Vector is="Record"
referenceFrame="urn:ogc:def:crs:EPSG:6.2:4326">
                                                <swe:coordinate is="field"
name="Lat">
                                                    <swe:Quantity
axisID="Y">
                                                        <swe:uom
code="deg"/>
                                                    </swe:Quantity>
                                                </swe:coordinate>
                                                <swe:coordinate is="field"
name="Lon">
                                                    <swe:Quantity
axisID="X">
                                                        <swe:uom
code="deg"/>
                                                    </swe:Quantity>
                                                </swe:coordinate>
                                            </swe:Vector>
                                        </swe:elementType>
                                    </swe:DataArray>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                    </swe:DataRecord>
                </swe:elementType>
            </swe:DataArray>
```

```
                    </swe:field>
                    <swe:field name="EstimatedSegments">
                        <swe:DataArray
definition="urn:ogc:def:property:CEOS:eop:SegmentList">
                            <swe:elementCount>
                                <swe:Count/>
                            </swe:elementCount>
                            <swe:elementType name="Segment">
                                <swe:DataRecord>
                                    <swe:field name="ID">
                                        <swe:Text
definition="urn:ogc:def:property:CEOS:eop:ObjectID"/>
                                    </swe:field>
                                    <swe:field name="Platform">
                                        <swe:Category
definition="urn:ogc:def:property:CEOS:eop:PlatformName">
                                            <gml:name>Platform</gml:name>
                                            <swe:constraint>
                                                <swe:AllowedTokens>
                                                    <swe:enumeration>SPOT-2 SPOT-
4 SPOT-5</swe:enumeration>
                                                </swe:AllowedTokens>
                                            </swe:constraint>
                                        </swe:Category>
                                    </swe:field>
                                    <swe:field name="Instrument">
                                        <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentName">
```

```
                                        <gml:name>Instrument</gml:name>
                                        <swe:constraint>
                                            <swe:AllowedTokens>
                                                <swe:enumeration>HRG1 HRG2
HRVIR1 HRVIR2 HRV1 HRV2</swe:enumeration>
                                            </swe:AllowedTokens>
                                        </swe:constraint>
                                    </swe:Category>
                                </swe:field>
                                <swe:field name="InstrumentMode">
                                    <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">
                                        <gml:name>Instrument Mode</gml:name>
                                        <swe:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:SpectralModes"/>
                                        <swe:constraint>
                                            <swe:AllowedTokens>
                                                <swe:enumeration>PAN XS
SUPER</swe:enumeration>
                                            </swe:AllowedTokens>
                                        </swe:constraint>
                                    </swe:Category>
                                </swe:field>
                                <swe:field name="StartTime">
                                    <swe:Time
definition="urn:ogc:def:property:CEOS:eop:AcquisitionStart">
                                        <gml:name>Acquisition Start</gml:name>
```

```
                                        <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                    </swe:Time>
                                </swe:field>
                                <swe:field name="StopTime">
                                    <swe:Time
definition="urn:ogc:def:property:CEOS:eop:AcquisitionStop">
                                        <gml:name>Acquisition Stop</gml:name>
                                        <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                    </swe:Time>
                                </swe:field>
                                <swe:field name="IncidenceAngle">
                                    <swe:DataRecord>
                                        <swe:field name="Elevation">
                                            <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:ElevationIncidenceAngle">
                                                <gml:name>Incidence
Angle</gml:name>
                                                <swe:uom code="deg"/>
                                                <swe:constraint>
                                                    <swe:AllowedValues>
                                                        <swe:interval>0.0
31.0</swe:interval>
                                                    </swe:AllowedValues>
                                                </swe:constraint>
                                            </swe:Quantity>
                                        </swe:field>
```

```
                    </swe:DataRecord>
                </swe:field>
                <swe:field name="Footprint">
                    <swe:DataRecord
definition="urn:ogc:def:property:ISO-19107:Polygon" gml:id="POLYGON">
                        <swe:field name="Exterior">
                            <swe:DataArray
definition="urn:ogc:def:property:ISO-19107:LinearRing">
                                <swe:elementCount>
                                    <swe:Count/>
                                </swe:elementCount>
                                <swe:elementType name="Point">
                                    <swe:Vector is="Record"
referenceFrame="urn:ogc:def:crs:EPSG:6.2:4326">
                                        <swe:coordinate is="field"
name="Lat">
                                            <swe:Quantity
axisID="Y">
                                                <swe:uom
code="deg"/>
                                            </swe:Quantity>
                                        </swe:coordinate>
                                        <swe:coordinate is="field"
name="Lon">
                                            <swe:Quantity
axisID="X">
                                                <swe:uom
code="deg"/>
                                            </swe:Quantity>
                                        </swe:coordinate>
```

```
                                                    </swe:Vector>
                                                </swe:elementType>
                                            </swe:DataArray>
                                        </swe:field>
                                    </swe:DataRecord>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:elementType>
                    </swe:DataArray>
                </swe:field>
            </swe:DataRecord>
        </sps:feasibilityReportExtendedData>
        <sps:statusReportExtendedData name="ProgrammingStatus">
            <swe:DataRecord>
                <swe:field name="ProgrammedSegments">
                    <swe:DataArray
definition="urn:ogc:def:property:CEOS:eop:SegmentList">
                        <swe:elementCount>
                            <swe:Count/>
                        </swe:elementCount>
                        <swe:elementType name="Segment">
                            <swe:DataRecord>
                                <swe:field name="ID">
                                    <swe:Text
definition="urn:ogc:def:property:CEOS:eop:ObjectID"/>
                                </swe:field>
```

```
                                        <swe:field name="Status">
                                            <swe:Category
definition="urn:ogc:def:property:CEOS:eop:Status">
                                                <gml:name>Segment Status</gml:name>
                                                <swe:codeSpace
xlink:href="urn:ogc:def:property:CEOS:eop:SegmentStatus"/>
                                            </swe:Category>
                                        </swe:field>
                                        <swe:field name="Platform">
                                            <swe:Category
definition="urn:ogc:def:property:CEOS:eop:PlatformName">
                                                <gml:name>Platform</gml:name>
                                                <swe:constraint>
                                                    <swe:AllowedTokens>
                                                        <swe:enumeration>SPOT-2 SPOT-
4 SPOT-5</swe:enumeration>
                                                    </swe:AllowedTokens>
                                                </swe:constraint>
                                            </swe:Category>
                                        </swe:field>
                                        <swe:field name="Instrument">
                                            <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentName">
                                                <gml:name>Instrument</gml:name>
                                                <swe:constraint>
                                                    <swe:AllowedTokens>
                                                        <swe:enumeration>HRG1 HRG2
HRVIR1 HRVIR2 HRV1 HRV2</swe:enumeration>
```

```
                                        </swe:AllowedTokens>
                                    </swe:constraint>
                                </swe:Category>
                            </swe:field>
                            <swe:field name="InstrumentMode">
                                <swe:Category
definition="urn:ogc:def:property:CEOS:eop:InstrumentMode">
                                    <gml:name>Instrument Mode</gml:name>
                                    <swe:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:SpectralModes"/>
                                    <swe:constraint>
                                        <swe:AllowedTokens>
                                            <swe:enumeration>PAN XS
SUPER</swe:enumeration>
                                        </swe:AllowedTokens>
                                    </swe:constraint>
                                </swe:Category>
                            </swe:field>
                            <swe:field name="StartTime">
                                <swe:Time
definition="urn:ogc:def:property:CEOS:eop:AcquisitionStart">
                                    <gml:name>Acquisition Start</gml:name>
                                    <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                </swe:Time>
                            </swe:field>
                            <swe:field name="StopTime">
```

```
                                        <swe:Time
definition="urn:ogc:def:property:CEOS:eop:AcquisitionStop">
                                            <gml:name>Acquisition Stop</gml:name>
                                            <swe:uom
xlink:href="urn:ogc:def:unit:ISO:8601"/>
                                        </swe:Time>
                                    </swe:field>
                                    <swe:field name="IncidenceAngle">
                                        <swe:DataRecord>
                                            <swe:field name="Elevation">
                                                <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:ElevationIncidenceAngle">
                                                    <gml:name>Incidence
Angle</gml:name>
                                                    <swe:uom code="deg"/>
                                                    <swe:constraint>
                                                        <swe:AllowedValues>
                                                            <swe:interval>0.0
31.0</swe:interval>
                                                        </swe:AllowedValues>
                                                    </swe:constraint>
                                                </swe:Quantity>
                                            </swe:field>
                                        </swe:DataRecord>
                                    </swe:field>
                                    <swe:field name="Footprint">
                                        <swe:DataRecord
definition="urn:ogc:def:property:ISO-19107:Polygon" gml:id="POLYGON">
```

```
                                        <swe:field name="Exterior">
                                            <swe:DataArray
definition="urn:ogc:def:property:ISO-19107:LinearRing">
                                                <swe:elementCount>
                                                    <swe:Count/>
                                                </swe:elementCount>
                                                <swe:elementType name="Point">
                                                    <swe:Vector is="Record"
referenceFrame="urn:ogc:def:crs:EPSG:6.2:4326">
                                                        <swe:coordinate is="field"
name="Lat">
                                                            <swe:Quantity
axisID="Y">
                                                                <swe:uom
code="deg"/>
                                                            </swe:Quantity>
                                                        </swe:coordinate>
                                                        <swe:coordinate is="field"
name="Lon">
                                                            <swe:Quantity
axisID="X">
                                                                <swe:uom
code="deg"/>
                                                            </swe:Quantity>
                                                        </swe:coordinate>
                                                    </swe:Vector>
                                                </swe:elementType>
                                            </swe:DataArray>
                                        </swe:field>
```

```
                                    </swe:DataRecord>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:elementType>
                    </swe:DataArray>
                </swe:field>
            </swe:DataRecord>
        </sps:statusReportExtendedData>
    </sps:DescribeTaskingResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

D.2.4 Operation “GetFeasibility”

D.2.4.1 Request sample with the HTTP POST binding

```
<?xml version='1.0' encoding='utf-8'?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
  <soapenv:Body>
    <sps:GetFeasibility xmlns:sps="http://www.opengis.net/sps/2.0" service="SPS"
version="2.0.0">
      <swes:extension xmlns:swes="http://www.opengis.net/sweService/1.0">
        <eo:FeasibilityLevel
xmlns:eo="urn:ogc:def:property:CEOS">FULL</eo:FeasibilityLevel>
      </swes:extension>
      <sps:sensorID>urn:spot:sensors:SPOT5:HRG</sps:sensorID>
      <sps:taskingParameters>
        <sps:ParameterData>
          <sps:encoding>
```

```
        <swe:XMLEncoding xmlns:swe="http://www.opengis.net/swe/2.0"
namespace="urn:ogc:def:property:CEOS"/>
      </sps:encoding>
      <sps:values>
       <eo:CoverageProgrammingRequest xmlns:eo="urn:ogc:def:property:CEOS">
        <eo:QualityOfService>
         <eo:Priority>HIGH</eo:Priority>
        </eo:QualityOfService>
        <eo:RegionOfInterest>
         <eo:Polygon>
          <eo:Exterior elementCount="5">
           <eo:Point>
            <eo:Lat>0.0</eo:Lat>
            <eo:Lon>0.0</eo:Lon>
           </eo:Point>
           <eo:Point>
            <eo:Lat>0.0</eo:Lat>
            <eo:Lon>1.0</eo:Lon>
           </eo:Point>
           <eo:Point>
            <eo:Lat>1.0</eo:Lat>
            <eo:Lon>1.0</eo:Lon>
           </eo:Point>
           <eo:Point>
            <eo:Lat>1.0</eo:Lat>
            <eo:Lon>0.0</eo:Lon>
```

```
      </eo:Point>
      <eo:Point>
        <eo:Lat>0.0</eo:Lat>
        <eo:Lon>0.0</eo:Lon>
      </eo:Point>
    </eo:Exterior>
  </eo:Polygon>
</eo:RegionOfInterest>
<eo:TimeOfInterest>
  <eo:SurveyPeriod>
    <eo:min>2009-07-30T10:47:27.032Z</eo:min>
    <eo:max>2009-08-31T10:47:27.032Z</eo:max>
  </eo:SurveyPeriod>
</eo:TimeOfInterest>
<eo:AcquisitionType>
  <eo:MonoscopicAcquisition>
    <eo:CoverageType>MULTIPASS</eo:CoverageType>
    <eo:IncidenceAngle>
      <eo:Azimuth>
        <eo:min>-180.0</eo:min>
        <eo:max>180.0</eo:max>
      </eo:Azimuth>
      <eo:Elevation>
        <eo:min>0.0</eo:min>
        <eo:max>30.0</eo:max>
      </eo:Elevation>
```

```
            </eo:IncidenceAngle>
            <eo:AcquisitionParametersOPT>
              <eo:GroundResolution>
                <eo:min>2.5</eo:min>
                <eo:max>10.0</eo:max>
              </eo:GroundResolution>
              <eo:InstrumentMode>PANCHROMATIC</eo:InstrumentMode>
              <eo:FusionAccepted>FALSE</eo:FusionAccepted>
            </eo:AcquisitionParametersOPT>
          </eo:MonoscopicAcquisition>
        </eo:AcquisitionType>
        <eo:ValidationParametersOPT>
          <eo:MaxCloudCover>100.0</eo:MaxCloudCover>
          <eo:MaxSnowCover>100.0</eo:MaxSnowCover>
          <eo:HazeAccepted>TRUE</eo:HazeAccepted>
          <eo:SandWindAccepted>FALSE</eo:SandWindAccepted>
        </eo:ValidationParametersOPT>
      </eo:CoverageProgrammingRequest>
    </sps:values>
  </sps:ParameterData>
 </sps:taskingParameters>
</sps:GetFeasibility>
</soapenv:Body>
</soapenv:Envelope>
```

D.2.4.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
    <soapenv:Body>
        <sps:GetFeasibilityResponse xmlns:sps="http://www.opengis.net/sps/2.0"
xmlns:eo="urn:ogc:def:property:CEOS" xmlns:swe="http://www.opengis.net/swe/2.0">
            <sps:result>
                <sps:FeasibilityReport>
                    <sps:title>Automatic Feasibility Results</sps:title>
                    <sps:sensorID>urn:spot:sensors:SPOT5:HRG</sps:sensorID>
                    <sps:taskID>http://www.spot.fr/sps/F00001</sps:taskID>
                    <sps:updateTime>2009-04-21T14:12:46.265Z</sps:updateTime>
                    <sps:statusCode>FEASIBLE</sps:statusCode>
                    <sps:extendedData>
                        <sps:ParameterData>
                            <sps:encoding>
                                <swe:XMLEncoding
namespace="urn:ogc:def:property:CEOS"/>
                            </sps:encoding>
                            <sps:values>
                                <eo:FeasibilityStudy>
                                    <eo:EstimatedCost>0.0</eo:EstimatedCost>
                                    <eo:GridCells elementCount="8">
                                        <eo:Cell>
                                            <eo:ID>CELL_0</eo:ID>
                                            <eo:SuccessRate>87.0</eo:SuccessRate>
                                            <eo:EstimatedSuccessDate>2009-08-
22T10:19:39.231Z</eo:EstimatedSuccessDate>
                                            <eo:NextAttemptDate>2009-08-
01T10:23:27.931Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>22</eo:RemainingAttempts>
                                            <eo:Footprint>
                                                <eo:Exterior elementCount="5">
                                                    <eo:Point>
                                                        <eo:Lat>0.780551</eo:Lat>
                                                        <eo:Lon>0.139613</eo:Lon>
                                                    </eo:Point>
                                                    <eo:Point>
                                                        <eo:Lat>0.722613</eo:Lat>
                                                        <eo:Lon>0.656207</eo:Lon>
                                                    </eo:Point>
                                                    <eo:Point>
                                                        <eo:Lat>1.235758</eo:Lat>
                                                        <eo:Lon>0.77131</eo:Lon>
                                                    </eo:Point>
                                                    <eo:Point>
```

```
                                        <eo:Lat>1.293697</eo:Lat>
                                        <eo:Lon>0.254717</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.780551</eo:Lat>
                                        <eo:Lon>0.139613</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Cell>
                        <eo:Cell>
                            <eo:ID>CELL_1</eo:ID>
                            <eo:SuccessRate>89.0</eo:SuccessRate>
                            <eo:EstimatedSuccessDate>2009-08-
27T10:23:39.931Z</eo:EstimatedSuccessDate>
                            <eo:NextAttemptDate>2009-08-
01T10:23:36.631Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>22</eo:RemainingAttempts>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.267399</eo:Lat>
                                        <eo:Lon>0.024524</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.209478</eo:Lat>
                                        <eo:Lon>0.541125</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.722619</eo:Lat>
                                        <eo:Lon>0.656192</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.78054</eo:Lat>
                                        <eo:Lon>0.13959</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.267399</eo:Lat>
                                        <eo:Lon>0.024524</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Cell>
                        <eo:Cell>
                            <eo:ID>CELL_2</eo:ID>
                            <eo:SuccessRate>86.0</eo:SuccessRate>
```

```
                                        <eo:EstimatedSuccessDate>2009-08-
27T10:23:48.631Z</eo:EstimatedSuccessDate>
                                        <eo:NextAttemptDate>2009-08-
01T10:23:45.431Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>20</eo:RemainingAttempts>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>-0.245744</eo:Lat>
                                                    <eo:Lon>-0.090533</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.303654</eo:Lat>
                                                    <eo:Lon>0.426074</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.20948</eo:Lat>
                                                    <eo:Lon>0.541115</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.26739</eo:Lat>
                                                    <eo:Lon>0.024509</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.245744</eo:Lat>
                                                    <eo:Lon>-0.090533</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Cell>
                                    <eo:Cell>
                                        <eo:ID>CELL_3</eo:ID>
                                        <eo:SuccessRate>88.0</eo:SuccessRate>
                                        <eo:EstimatedSuccessDate>2009-08-
28T10:04:11.531Z</eo:EstimatedSuccessDate>
                                        <eo:NextAttemptDate>2009-08-
01T10:23:26.631Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>20</eo:RemainingAttempts>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.780551</eo:Lat>
                                                    <eo:Lon>0.669203</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
```

```
                                        <eo:Lat>0.722613</eo:Lat>
                                        <eo:Lon>1.185796</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.235758</eo:Lat>
                                        <eo:Lon>1.3009</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.293697</eo:Lat>
                                        <eo:Lon>0.784307</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.780551</eo:Lat>
                                        <eo:Lon>0.669203</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Cell>
                        <eo:Cell>
                            <eo:ID>CELL_4</eo:ID>
                            <eo:SuccessRate>86.0</eo:SuccessRate>
                            <eo:EstimatedSuccessDate>2009-08-
28T10:04:20.331Z</eo:EstimatedSuccessDate>
                            <eo:NextAttemptDate>2009-08-
01T10:23:35.331Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>20</eo:RemainingAttempts>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.267399</eo:Lat>
                                        <eo:Lon>0.554114</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.209478</eo:Lat>
                                        <eo:Lon>1.070715</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.722619</eo:Lat>
                                        <eo:Lon>1.185782</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.78054</eo:Lat>
                                        <eo:Lon>0.66918</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.267399</eo:Lat>
```

```
                                        <eo:Lon>0.554114</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Cell>
                        <eo:Cell>
                            <eo:ID>CELL_5</eo:ID>
                            <eo:SuccessRate>88.0</eo:SuccessRate>
                            <eo:EstimatedSuccessDate>2009-08-
28T10:04:29.031Z</eo:EstimatedSuccessDate>
                            <eo:NextAttemptDate>2009-08-
01T10:23:44.031Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>20</eo:RemainingAttempts>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>-0.245744</eo:Lat>
                                        <eo:Lon>0.439057</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.303654</eo:Lat>
                                        <eo:Lon>0.955664</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.20948</eo:Lat>
                                        <eo:Lon>1.070705</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.26739</eo:Lat>
                                        <eo:Lon>0.554099</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.245744</eo:Lat>
                                        <eo:Lon>0.439057</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Cell>
                        <eo:Cell>
                            <eo:ID>CELL_6</eo:ID>
                            <eo:SuccessRate>88.0</eo:SuccessRate>
                            <eo:EstimatedSuccessDate>2009-08-
16T10:35:06.631Z</eo:EstimatedSuccessDate>
                            <eo:NextAttemptDate>2009-08-
01T10:23:29.331Z</eo:NextAttemptDate>
```

```
    <eo:RemainingAttempts>18</eo:RemainingAttempts>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.780551</eo:Lat>
                                                    <eo:Lon>-0.389977</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.722613</eo:Lat>
                                                    <eo:Lon>0.126617</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.235758</eo:Lat>
                                                    <eo:Lon>0.24172</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.293697</eo:Lat>
                                                    <eo:Lon>-0.274873</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.780551</eo:Lat>
                                                    <eo:Lon>-0.389977</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Cell>
                                    <eo:Cell>
                                        <eo:ID>CELL_7</eo:ID>
                                        <eo:SuccessRate>89.0</eo:SuccessRate>
                                        <eo:EstimatedSuccessDate>2009-08-
27T10:23:41.231Z</eo:EstimatedSuccessDate>
                                        <eo:NextAttemptDate>2009-08-
01T10:23:38.031Z</eo:NextAttemptDate>

    <eo:RemainingAttempts>18</eo:RemainingAttempts>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.267399</eo:Lat>
                                                    <eo:Lon>-0.505066</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.209478</eo:Lat>
                                                    <eo:Lon>0.011535</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
```

```
                                        <eo:Lat>0.722619</eo:Lat>
                                        <eo:Lon>0.126602</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.78054</eo:Lat>
                                        <eo:Lon>-0.39</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.267399</eo:Lat>
                                        <eo:Lon>-0.505066</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Cell>
                    </eo:GridCells>
                    <eo:EstimatedSegments elementCount="55">
                        <eo:Segment>
                            <eo:ID>SCENE_0</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
01T10:23:24.819Z</eo:StartTime>
                            <eo:StopTime>2009-08-
01T10:23:33.843Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>4.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.780562</eo:Lat>
                                        <eo:Lon>-0.408177</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.311707</eo:Lat>
                                        <eo:Lon>-0.289014</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.226366</eo:Lat>
                                        <eo:Lon>0.259594</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.695276</eo:Lat>
                                        <eo:Lon>0.140394</eo:Lon>
                                    </eo:Point>
```

```
                                        <eo:Point>
                                            <eo:Lat>0.780562</eo:Lat>
                                            <eo:Lon>-0.408177</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_1</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
01T10:23:33.519Z</eo:StartTime>
                                <eo:StopTime>2009-08-
01T10:23:42.543Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>4.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.268358</eo:Lat>
                                            <eo:Lon>-0.523036</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.7995</eo:Lat>
                                            <eo:Lon>-0.403917</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.714211</eo:Lat>
                                            <eo:Lon>0.144654</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.183117</eo:Lat>
                                            <eo:Lon>0.025544</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.268358</eo:Lat>
                                            <eo:Lon>-0.523036</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_2</eo:ID>
```

```
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
01T10:23:23.419Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
01T10:23:32.443Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>8.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.783662</eo:Lat>
                                                    <eo:Lon>0.118137</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.314757</eo:Lat>
                                                    <eo:Lon>0.237351</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.22784</eo:Lat>
                                                    <eo:Lon>0.795242</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.696848</eo:Lat>
                                                    <eo:Lon>0.675998</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.783662</eo:Lat>
                                                    <eo:Lon>0.118137</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_3</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
01T10:23:32.119Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
01T10:23:41.143Z</eo:StopTime>
                                        <eo:IncidenceAngle>
```

```
                                        <eo:Elevation>8.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.271486</eo:Lat>
                                                <eo:Lon>0.003309</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.802585</eo:Lat>
                                                <eo:Lon>0.122433</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.715765</eo:Lat>
                                                <eo:Lon>0.680295</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.184762</eo:Lat>
                                                <eo:Lon>0.561187</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.271486</eo:Lat>
                                                <eo:Lon>0.003309</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_4</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
01T10:23:40.919Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
01T10:23:49.943Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>8.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>-0.245857</eo:Lat>
                                                <eo:Lon>-0.112672</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
```

```
                                        <eo:Lat>0.285243</eo:Lat>
                                        <eo:Lon>0.006376</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.198523</eo:Lat>
                                        <eo:Lon>0.564255</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.332489</eo:Lat>
                                        <eo:Lon>0.445271</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.245857</eo:Lat>
                                        <eo:Lon>-0.112672</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_5</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
02T10:04:04.019Z</eo:StartTime>
                            <eo:StopTime>2009-08-
02T10:04:13.043Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>22.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.790578</eo:Lat>
                                        <eo:Lon>0.587218</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.320735</eo:Lat>
                                        <eo:Lon>0.706014</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.218535</eo:Lat>
                                        <eo:Lon>1.368406</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.688039</eo:Lat>
```

```
                                        <eo:Lon>1.249502</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.790578</eo:Lat>
                                        <eo:Lon>0.587218</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_6</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
02T10:04:12.719Z</eo:StartTime>
                            <eo:StopTime>2009-08-
02T10:04:21.743Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>22.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.279257</eo:Lat>
                                        <eo:Lon>0.472375</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.809359</eo:Lat>
                                        <eo:Lon>0.591457</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.706841</eo:Lat>
                                        <eo:Lon>1.253744</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.176391</eo:Lat>
                                        <eo:Lon>1.13461</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.279257</eo:Lat>
                                        <eo:Lon>0.472375</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
```

```
                                    <eo:Segment>
                                        <eo:ID>SCENE_7</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
02T10:04:21.419Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
02T10:04:30.443Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>22.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>-0.232057</eo:Lat>
                                                    <eo:Lon>0.35755</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.297989</eo:Lat>
                                                    <eo:Lon>0.476929</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.195148</eo:Lat>
                                                    <eo:Lon>1.139143</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.335254</eo:Lat>
                                                    <eo:Lon>1.019767</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.232057</eo:Lat>
                                                    <eo:Lon>0.35755</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_8</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
02T10:04:05.319Z</eo:StartTime>
```

```
                                    <eo:StopTime>2009-08-
02T10:04:14.343Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>26.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.796512</eo:Lat>
                                                <eo:Lon>0.035792</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.326334</eo:Lat>
                                                <eo:Lon>0.154534</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.217801</eo:Lat>
                                                <eo:Lon>0.858648</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.687558</eo:Lat>
                                                <eo:Lon>0.739782</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.796512</eo:Lat>
                                                <eo:Lon>0.035792</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_9</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
02T10:04:14.019Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
02T10:04:23.043Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>26.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.285467</eo:Lat>
```

```
                                        <eo:Lon>-0.07901</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.815227</eo:Lat>
                                        <eo:Lon>0.040063</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.706302</eo:Lat>
                                        <eo:Lon>0.744054</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.176112</eo:Lat>
                                        <eo:Lon>0.624916</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.285467</eo:Lat>
                                        <eo:Lon>-0.07901</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_10</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
02T10:04:14.119Z</eo:StartTime>
                            <eo:StopTime>2009-08-
02T10:04:23.143Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>26.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.280407</eo:Lat>
                                        <eo:Lon>-0.080154</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.810167</eo:Lat>
                                        <eo:Lon>0.038923</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.701204</eo:Lat>
                                        <eo:Lon>0.742904</eo:Lon>
```

```
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.171015</eo:Lat>
                                            <eo:Lon>0.623762</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.280407</eo:Lat>
                                            <eo:Lon>-0.080154</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_11</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
02T10:04:22.819Z</eo:StartTime>
                                <eo:StopTime>2009-08-
02T10:04:31.843Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>26.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>-0.230631</eo:Lat>
                                            <eo:Lon>-0.194939</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.299065</eo:Lat>
                                            <eo:Lon>-0.075518</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.189706</eo:Lat>
                                            <eo:Lon>0.628367</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.340428</eo:Lat>
                                            <eo:Lon>0.50894</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.230631</eo:Lat>
                                            <eo:Lon>-0.194939</eo:Lon>
                                        </eo:Point>
```

```
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_12</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
06T10:27:17.419Z</eo:StartTime>
                                <eo:StopTime>2009-08-
06T10:27:26.443Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>11.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.784081</eo:Lat>
                                            <eo:Lon>-0.41724</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.315092</eo:Lat>
                                            <eo:Lon>-0.297988</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.226056</eo:Lat>
                                            <eo:Lon>0.272735</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.695193</eo:Lat>
                                            <eo:Lon>0.153461</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.784081</eo:Lat>
                                            <eo:Lon>-0.41724</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_13</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
```

```
                                    <eo:StartTime>2009-08-
06T10:27:26.119Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
06T10:27:35.143Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>11.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.271963</eo:Lat>
                                                <eo:Lon>-0.532035</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.802983</eo:Lat>
                                                <eo:Lon>-0.41291</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.714086</eo:Lat>
                                                <eo:Lon>0.157793</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.183205</eo:Lat>
                                                <eo:Lon>0.038692</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.271963</eo:Lat>
                                                <eo:Lon>-0.532035</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_14</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
06T10:27:14.719Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
06T10:27:23.743Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>18.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
```

```
                                        <eo:Point>
                                            <eo:Lat>0.78694</eo:Lat>
                                            <eo:Lon>0.620021</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.317651</eo:Lat>
                                            <eo:Lon>0.73937</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.220874</eo:Lat>
                                            <eo:Lon>1.357661</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.690426</eo:Lat>
                                            <eo:Lon>1.238307</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.78694</eo:Lat>
                                            <eo:Lon>0.620021</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_15</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
06T10:27:23.419Z</eo:StartTime>
                                <eo:StopTime>2009-08-
06T10:27:32.443Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>18.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.275035</eo:Lat>
                                            <eo:Lon>0.50532</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.80577</eo:Lat>
                                            <eo:Lon>0.624454</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
```

```
                                        <eo:Lat>0.709239</eo:Lat>
                                        <eo:Lon>1.242749</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.17876</eo:Lat>
                                        <eo:Lon>1.123661</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.275035</eo:Lat>
                                        <eo:Lon>0.50532</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_16</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
06T10:27:32.119Z</eo:StartTime>
                            <eo:StopTime>2009-08-
06T10:27:41.143Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>18.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>-0.236861</eo:Lat>
                                        <eo:Lon>0.390629</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.293894</eo:Lat>
                                        <eo:Lon>0.509561</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.197604</eo:Lat>
                                        <eo:Lon>1.127898</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.332903</eo:Lat>
                                        <eo:Lon>1.009063</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.236861</eo:Lat>
```

```
                                        <eo:Lon>0.390629</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_17</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
07T10:07:59.319Z</eo:StartTime>
                            <eo:StopTime>2009-08-
07T10:08:08.343Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>23.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.791495</eo:Lat>
                                        <eo:Lon>-0.474886</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.321597</eo:Lat>
                                        <eo:Lon>-0.356093</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.218543</eo:Lat>
                                        <eo:Lon>0.311929</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.688091</eo:Lat>
                                        <eo:Lon>0.193027</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.791495</eo:Lat>
                                        <eo:Lon>-0.474886</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_18</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>
```

```
    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
07T10:08:08.019Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
07T10:08:17.043Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>23.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.28022</eo:Lat>
                                                <eo:Lon>-0.589721</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.810265</eo:Lat>
                                                <eo:Lon>-0.470637</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.706883</eo:Lat>
                                                <eo:Lon>0.197279</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.176479</eo:Lat>
                                                <eo:Lon>0.078141</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.28022</eo:Lat>
                                                <eo:Lon>-0.589721</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_19</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
07T10:07:57.919Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
07T10:08:06.943Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>20.0</eo:Elevation>
                                    </eo:IncidenceAngle>
```

```
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.791134</eo:Lat>
                                                <eo:Lon>0.074687</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.321527</eo:Lat>
                                                <eo:Lon>0.193531</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.223969</eo:Lat>
                                                <eo:Lon>0.82547</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.693298</eo:Lat>
                                                <eo:Lon>0.706531</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.791134</eo:Lat>
                                                <eo:Lon>0.074687</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_20</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
07T10:08:14.019Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
07T10:08:23.043Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>16.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>-0.237243</eo:Lat>
                                                <eo:Lon>0.389958</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.293308</eo:Lat>
                                                <eo:Lon>0.509265</eo:Lon>
```

```
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.19982</eo:Lat>
                                            <eo:Lon>1.111421</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.33096</eo:Lat>
                                            <eo:Lon>0.992132</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.237243</eo:Lat>
                                            <eo:Lon>0.389958</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_21</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
11T10:31:07.119Z</eo:StartTime>
                                <eo:StopTime>2009-08-
11T10:31:16.143Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>24.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.79445</eo:Lat>
                                            <eo:Lon>0.589559</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.324724</eo:Lat>
                                            <eo:Lon>0.70899</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.217096</eo:Lat>
                                            <eo:Lon>1.394175</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.687221</eo:Lat>
                                            <eo:Lon>1.274757</eo:Lon>
                                        </eo:Point>
```

```
                                        <eo:Point>
                                            <eo:Lat>0.79445</eo:Lat>
                                            <eo:Lon>0.589559</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_22</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
11T10:31:26.019Z</eo:StartTime>
                                <eo:StopTime>2009-08-
11T10:31:35.043Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>21.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>-0.239066</eo:Lat>
                                            <eo:Lon>-0.152899</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.29151</eo:Lat>
                                            <eo:Lon>-0.03401</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.190801</eo:Lat>
                                            <eo:Lon>0.612449</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.339469</eo:Lat>
                                            <eo:Lon>0.493671</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.239066</eo:Lat>
                                            <eo:Lon>-0.152899</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_23</eo:ID>
```

```
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
11T10:31:09.919Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
11T10:31:18.943Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>18.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.785069</eo:Lat>
                                                    <eo:Lon>-0.43755</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.315794</eo:Lat>
                                                    <eo:Lon>-0.318215</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.219712</eo:Lat>
                                                    <eo:Lon>0.295836</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.68924</eo:Lat>
                                                    <eo:Lon>0.176495</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.785069</eo:Lat>
                                                    <eo:Lon>-0.43755</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_24</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
11T10:31:18.619Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
11T10:31:27.643Z</eo:StopTime>
                                        <eo:IncidenceAngle>
```

```
                                    <eo:Elevation>18.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.273156</eo:Lat>
                                            <eo:Lon>-0.552256</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.803903</eo:Lat>
                                            <eo:Lon>-0.433129</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.708059</eo:Lat>
                                            <eo:Lon>0.180924</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.177557</eo:Lat>
                                            <eo:Lon>0.061842</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.273156</eo:Lat>
                                            <eo:Lon>-0.552256</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_25</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
12T10:11:50.419Z</eo:StartTime>
                                <eo:StopTime>2009-08-
12T10:11:59.443Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>13.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.783792</eo:Lat>
                                            <eo:Lon>0.100999</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
```

```
                                        <eo:Lat>1.314581</eo:Lat>
                                        <eo:Lon>0.219939</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.224556</eo:Lat>
                                        <eo:Lon>0.80192</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.693603</eo:Lat>
                                        <eo:Lon>0.682907</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.783792</eo:Lat>
                                        <eo:Lon>0.100999</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_26</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
12T10:11:59.119Z</eo:StartTime>
                            <eo:StopTime>2009-08-
12T10:12:08.143Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>13.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.271933</eo:Lat>
                                        <eo:Lon>-0.013898</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.802686</eo:Lat>
                                        <eo:Lon>0.105202</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.712506</eo:Lat>
                                        <eo:Lon>0.687115</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.18158</eo:Lat>
```

```
                                        <eo:Lon>0.567991</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.271933</eo:Lat>
                                        <eo:Lon>-0.013898</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_27</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
12T10:12:07.819Z</eo:StartTime>
                            <eo:StopTime>2009-08-
12T10:12:16.843Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>13.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>-0.239918</eo:Lat>
                                        <eo:Lon>-0.128783</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.290798</eo:Lat>
                                        <eo:Lon>-0.009511</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.200456</eo:Lat>
                                        <eo:Lon>0.572373</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.330439</eo:Lat>
                                        <eo:Lon>0.453125</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.239918</eo:Lat>
                                        <eo:Lon>-0.128783</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
```

```
                                    <eo:Segment>
                                        <eo:ID>SCENE_28</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
12T10:11:49.019Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
12T10:11:58.043Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>9.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.784918</eo:Lat>
                                                    <eo:Lon>0.641145</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.315861</eo:Lat>
                                                    <eo:Lon>0.760133</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.228539</eo:Lat>
                                                    <eo:Lon>1.324058</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.697485</eo:Lat>
                                                    <eo:Lon>1.205006</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.784918</eo:Lat>
                                                    <eo:Lon>0.641145</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_29</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
12T10:11:57.719Z</eo:StartTime>
```

```
                                    <eo:StopTime>2009-08-
12T10:12:06.743Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>9.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.272923</eo:Lat>
                                                <eo:Lon>0.526243</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.803837</eo:Lat>
                                                <eo:Lon>0.645346</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.71641</eo:Lat>
                                                <eo:Lon>1.209211</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.185376</eo:Lat>
                                                <eo:Lon>1.090092</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.272923</eo:Lat>
                                                <eo:Lon>0.526243</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_30</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
12T10:12:06.519Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
12T10:12:15.543Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>9.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>-0.244225</eo:Lat>
```

```
                                        <eo:Lon>0.410192</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.286659</eo:Lat>
                                        <eo:Lon>0.529423</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.199108</eo:Lat>
                                        <eo:Lon>1.093267</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.331902</eo:Lat>
                                        <eo:Lon>0.974068</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.244225</eo:Lat>
                                        <eo:Lon>0.410192</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_31</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
16T10:35:02.119Z</eo:StartTime>
                            <eo:StopTime>2009-08-
16T10:35:11.143Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>24.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.793889</eo:Lat>
                                        <eo:Lon>-0.466846</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.324183</eo:Lat>
                                        <eo:Lon>-0.347428</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.217533</eo:Lat>
                                        <eo:Lon>0.331726</eo:Lon>
```

```
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.687625</eo:Lat>
                                            <eo:Lon>0.212321</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.793889</eo:Lat>
                                            <eo:Lon>-0.466846</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_32</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
16T10:35:10.919Z</eo:StartTime>
                                <eo:StopTime>2009-08-
16T10:35:19.943Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>24.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.277182</eo:Lat>
                                            <eo:Lon>-0.582595</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.807511</eo:Lat>
                                            <eo:Lon>-0.463469</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.701253</eo:Lat>
                                            <eo:Lon>0.215728</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.171302</eo:Lat>
                                            <eo:Lon>0.096672</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.277182</eo:Lat>
                                            <eo:Lon>-0.582595</eo:Lon>
                                        </eo:Point>
```

```
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_33</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
16T10:35:02.119Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
16T10:35:11.143Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>24.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.793889</eo:Lat>
                                                <eo:Lon>-0.466846</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.324183</eo:Lat>
                                                <eo:Lon>-0.347428</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.217533</eo:Lat>
                                                <eo:Lon>0.331726</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.687625</eo:Lat>
                                                <eo:Lon>0.212321</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.793889</eo:Lat>
                                                <eo:Lon>-0.466846</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_34</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
```

```
                                    <eo:StartTime>2009-08-
16T10:35:10.919Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
16T10:35:19.943Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>24.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.277182</eo:Lat>
                                                <eo:Lon>-0.582595</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.807511</eo:Lat>
                                                <eo:Lon>-0.463469</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.701253</eo:Lat>
                                                <eo:Lon>0.215728</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.171302</eo:Lat>
                                                <eo:Lon>0.096672</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.277182</eo:Lat>
                                                <eo:Lon>-0.582595</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_35</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
17T10:15:42.619Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
17T10:15:51.643Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>6.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
```

```
                                        <eo:Point>
                                            <eo:Lat>0.784711</eo:Lat>
                                            <eo:Lon>0.117678</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.315729</eo:Lat>
                                            <eo:Lon>0.236707</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.229941</eo:Lat>
                                            <eo:Lon>0.790157</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.698854</eo:Lat>
                                            <eo:Lon>0.671073</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.784711</eo:Lat>
                                            <eo:Lon>0.117678</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_36</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
17T10:15:51.419Z</eo:StartTime>
                                <eo:StopTime>2009-08-
17T10:16:00.443Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>6.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.267476</eo:Lat>
                                            <eo:Lon>0.001623</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.798471</eo:Lat>
                                            <eo:Lon>0.120727</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
```

```
                                        <eo:Lat>0.71261</eo:Lat>
                                        <eo:Lon>0.674122</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.181539</eo:Lat>
                                        <eo:Lon>0.555008</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.267476</eo:Lat>
                                        <eo:Lon>0.001623</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_37</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
17T10:16:00.119Z</eo:StartTime>
                            <eo:StopTime>2009-08-
17T10:16:09.143Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>6.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>-0.244581</eo:Lat>
                                        <eo:Lon>-0.113265</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.286389</eo:Lat>
                                        <eo:Lon>0.005928</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.200457</eo:Lat>
                                        <eo:Lon>0.559313</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.330598</eo:Lat>
                                        <eo:Lon>0.440158</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.244581</eo:Lat>
```

```
                                        <eo:Lon>-0.113265</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_38</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
17T10:15:41.319Z</eo:StartTime>
                            <eo:StopTime>2009-08-
17T10:15:50.343Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>2.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.781521</eo:Lat>
                                        <eo:Lon>0.650869</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.312607</eo:Lat>
                                        <eo:Lon>0.769946</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>1.227752</eo:Lat>
                                        <eo:Lon>1.316659</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.696644</eo:Lat>
                                        <eo:Lon>1.197535</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.781521</eo:Lat>
                                        <eo:Lon>0.650869</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_39</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG2</eo:Instrument>
```

```
    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
17T10:15:50.019Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
17T10:15:59.043Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>2.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.269388</eo:Lat>
                                                <eo:Lon>0.535983</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.800459</eo:Lat>
                                                <eo:Lon>0.65509</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.715583</eo:Lat>
                                                <eo:Lon>1.201757</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.184483</eo:Lat>
                                                <eo:Lon>1.082649</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.269388</eo:Lat>
                                                <eo:Lon>0.535983</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_40</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
17T10:15:58.719Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
17T10:16:07.743Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>2.0</eo:Elevation>
                                    </eo:IncidenceAngle>
```

```
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>-0.242736</eo:Lat>
                                                    <eo:Lon>0.421106</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.288317</eo:Lat>
                                                    <eo:Lon>0.540256</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.203414</eo:Lat>
                                                    <eo:Lon>1.086921</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.327676</eo:Lat>
                                                    <eo:Lon>0.967816</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.242736</eo:Lat>
                                                    <eo:Lon>0.421106</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_41</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
22T10:19:34.719Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
22T10:19:43.743Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>1.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.783546</eo:Lat>
                                                    <eo:Lon>0.122866</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.314631</eo:Lat>
                                                    <eo:Lon>0.24198</eo:Lon>
```

```
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>1.229812</eo:Lat>
                                            <eo:Lon>0.787831</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.698744</eo:Lat>
                                            <eo:Lon>0.668677</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.783546</eo:Lat>
                                            <eo:Lon>0.122866</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_42</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
22T10:19:43.419Z</eo:StartTime>
                                <eo:StopTime>2009-08-
22T10:19:52.443Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>1.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.271403</eo:Lat>
                                            <eo:Lon>0.007999</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.802479</eo:Lat>
                                            <eo:Lon>0.127105</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.717677</eo:Lat>
                                            <eo:Lon>0.672916</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.186611</eo:Lat>
                                            <eo:Lon>0.553816</eo:Lon>
                                        </eo:Point>
```

```
                                        <eo:Point>
                                            <eo:Lat>0.271403</eo:Lat>
                                            <eo:Lon>0.007999</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_43</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
22T10:19:52.219Z</eo:StartTime>
                                <eo:StopTime>2009-08-
22T10:20:01.243Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>1.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>-0.24591</eo:Lat>
                                            <eo:Lon>-0.108021</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.285155</eo:Lat>
                                            <eo:Lon>0.011089</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.200364</eo:Lat>
                                            <eo:Lon>0.556906</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.330697</eo:Lat>
                                            <eo:Lon>0.437847</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.24591</eo:Lat>
                                            <eo:Lon>-0.108021</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_44</eo:ID>
```

```
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
22T10:19:33.419Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
22T10:19:42.443Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>5.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>0.781136</eo:Lat>
                                                    <eo:Lon>0.65041</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.312207</eo:Lat>
                                                    <eo:Lon>0.769571</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>1.226573</eo:Lat>
                                                    <eo:Lon>1.319897</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.695566</eo:Lat>
                                                    <eo:Lon>1.200704</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.781136</eo:Lat>
                                                    <eo:Lon>0.65041</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_45</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
22T10:19:42.119Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
22T10:19:51.143Z</eo:StopTime>
                                        <eo:IncidenceAngle>
```

```
                        <eo:Elevation>5.0</eo:Elevation>
                    </eo:IncidenceAngle>
                    <eo:Footprint>
                        <eo:Exterior elementCount="5">
                            <eo:Point>
                                <eo:Lat>0.268993</eo:Lat>
                                <eo:Lon>0.535568</eo:Lon>
                            </eo:Point>
                            <eo:Point>
                                <eo:Lat>0.800061</eo:Lat>
                                <eo:Lon>0.654676</eo:Lon>
                            </eo:Point>
                            <eo:Point>
                                <eo:Lat>0.714488</eo:Lat>
                                <eo:Lon>1.20497</eo:Lon>
                            </eo:Point>
                            <eo:Point>
                                <eo:Lat>0.183476</eo:Lat>
                                <eo:Lon>1.085876</eo:Lon>
                            </eo:Point>
                            <eo:Point>
                                <eo:Lat>0.268993</eo:Lat>
                                <eo:Lon>0.535568</eo:Lon>
                            </eo:Point>
                        </eo:Exterior>
                    </eo:Footprint>
                </eo:Segment>
                <eo:Segment>
                    <eo:ID>SCENE_46</eo:ID>
                    <eo:Platform>SPOT-5</eo:Platform>
                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                    <eo:StartTime>2009-08-
22T10:19:50.819Z</eo:StartTime>
                    <eo:StopTime>2009-08-
22T10:19:59.843Z</eo:StopTime>
                    <eo:IncidenceAngle>
                        <eo:Elevation>5.0</eo:Elevation>
                    </eo:IncidenceAngle>
                    <eo:Footprint>
                        <eo:Exterior elementCount="5">
                            <eo:Point>
                                <eo:Lat>-0.243141</eo:Lat>
                                <eo:Lon>0.420734</eo:Lon>
                            </eo:Point>
                            <eo:Point>
```

```
                                        <eo:Lat>0.287923</eo:Lat>
                                        <eo:Lon>0.539802</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.202403</eo:Lat>
                                        <eo:Lon>1.090108</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.328611</eo:Lat>
                                        <eo:Lon>0.9711</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>-0.243141</eo:Lat>
                                        <eo:Lon>0.420734</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_47</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
27T10:23:36.719Z</eo:StartTime>
                            <eo:StopTime>2009-08-
27T10:23:45.743Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>4.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.27017</eo:Lat>
                                        <eo:Lon>-0.522985</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.801217</eo:Lat>
                                        <eo:Lon>-0.403882</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.715802</eo:Lat>
                                        <eo:Lon>0.145465</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.184804</eo:Lat>
```

```
                                        <eo:Lon>0.026374</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.27017</eo:Lat>
                                        <eo:Lon>-0.522985</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_48</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
27T10:23:35.419Z</eo:StartTime>
                            <eo:StopTime>2009-08-
27T10:23:44.443Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>8.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>0.268134</eo:Lat>
                                        <eo:Lon>0.002025</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.799137</eo:Lat>
                                        <eo:Lon>0.12113</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.712143</eo:Lat>
                                        <eo:Lon>0.680118</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.181238</eo:Lat>
                                        <eo:Lon>0.561034</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.268134</eo:Lat>
                                        <eo:Lon>0.002025</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
```

```
                                    <eo:Segment>
                                        <eo:ID>SCENE_49</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
27T10:23:44.119Z</eo:StartTime>
                                        <eo:StopTime>2009-08-
27T10:23:53.143Z</eo:StopTime>
                                        <eo:IncidenceAngle>
                                            <eo:Elevation>8.0</eo:Elevation>
                                        </eo:IncidenceAngle>
                                        <eo:Footprint>
                                            <eo:Exterior elementCount="5">
                                                <eo:Point>
                                                    <eo:Lat>-0.243952</eo:Lat>
                                                    <eo:Lon>-0.112777</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.287052</eo:Lat>
                                                    <eo:Lon>0.00625</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>0.200151</eo:Lat>
                                                    <eo:Lon>0.565257</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.330762</eo:Lat>
                                                    <eo:Lon>0.446297</eo:Lon>
                                                </eo:Point>
                                                <eo:Point>
                                                    <eo:Lat>-0.243952</eo:Lat>
                                                    <eo:Lon>-0.112777</eo:Lon>
                                                </eo:Point>
                                            </eo:Exterior>
                                        </eo:Footprint>
                                    </eo:Segment>
                                    <eo:Segment>
                                        <eo:ID>SCENE_50</eo:ID>
                                        <eo:Platform>SPOT-5</eo:Platform>
                                        <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                        <eo:StartTime>2009-08-
28T10:04:07.019Z</eo:StartTime>
```

```
                                    <eo:StopTime>2009-08-
28T10:04:16.043Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>22.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.793401</eo:Lat>
                                                <eo:Lon>0.588871</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.323475</eo:Lat>
                                                <eo:Lon>0.707674</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>1.22157</eo:Lat>
                                                <eo:Lon>1.368237</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.691161</eo:Lat>
                                                <eo:Lon>1.24933</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.793401</eo:Lat>
                                                <eo:Lon>0.588871</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_51</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
28T10:04:15.819Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
28T10:04:24.843Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>22.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>0.277057</eo:Lat>
```

```
                                        <eo:Lon>0.472898</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.807076</eo:Lat>
                                        <eo:Lon>0.591985</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.704827</eo:Lat>
                                        <eo:Lon>1.252438</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.174464</eo:Lat>
                                        <eo:Lon>1.133302</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.277057</eo:Lat>
                                        <eo:Lon>0.472898</eo:Lon>
                                    </eo:Point>
                                </eo:Exterior>
                            </eo:Footprint>
                        </eo:Segment>
                        <eo:Segment>
                            <eo:ID>SCENE_52</eo:ID>
                            <eo:Platform>SPOT-5</eo:Platform>
                            <eo:Instrument>HRG1</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                            <eo:StartTime>2009-08-
28T10:04:24.519Z</eo:StartTime>
                            <eo:StopTime>2009-08-
28T10:04:33.543Z</eo:StopTime>
                            <eo:IncidenceAngle>
                                <eo:Elevation>22.0</eo:Elevation>
                            </eo:IncidenceAngle>
                            <eo:Footprint>
                                <eo:Exterior elementCount="5">
                                    <eo:Point>
                                        <eo:Lat>-0.23419</eo:Lat>
                                        <eo:Lon>0.358087</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.295772</eo:Lat>
                                        <eo:Lon>0.477469</eo:Lon>
                                    </eo:Point>
                                    <eo:Point>
                                        <eo:Lat>0.193204</eo:Lat>
                                        <eo:Lon>1.137852</eo:Lon>
```

```
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.33711</eo:Lat>
                                            <eo:Lon>1.018476</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>-0.23419</eo:Lat>
                                            <eo:Lon>0.358087</eo:Lon>
                                        </eo:Point>
                                    </eo:Exterior>
                                </eo:Footprint>
                            </eo:Segment>
                            <eo:Segment>
                                <eo:ID>SCENE_53</eo:ID>
                                <eo:Platform>SPOT-5</eo:Platform>
                                <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                <eo:StartTime>2009-08-
28T10:04:15.819Z</eo:StartTime>
                                <eo:StopTime>2009-08-
28T10:04:24.843Z</eo:StopTime>
                                <eo:IncidenceAngle>
                                    <eo:Elevation>22.0</eo:Elevation>
                                </eo:IncidenceAngle>
                                <eo:Footprint>
                                    <eo:Exterior elementCount="5">
                                        <eo:Point>
                                            <eo:Lat>0.277057</eo:Lat>
                                            <eo:Lon>0.472898</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.807076</eo:Lat>
                                            <eo:Lon>0.591985</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.704827</eo:Lat>
                                            <eo:Lon>1.252438</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.174464</eo:Lat>
                                            <eo:Lon>1.133302</eo:Lon>
                                        </eo:Point>
                                        <eo:Point>
                                            <eo:Lat>0.277057</eo:Lat>
                                            <eo:Lon>0.472898</eo:Lon>
                                        </eo:Point>
```

```
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                                <eo:Segment>
                                    <eo:ID>SCENE_54</eo:ID>
                                    <eo:Platform>SPOT-5</eo:Platform>
                                    <eo:Instrument>HRG2</eo:Instrument>

    <eo:InstrumentMode>PAN</eo:InstrumentMode>
                                    <eo:StartTime>2009-08-
28T10:04:24.519Z</eo:StartTime>
                                    <eo:StopTime>2009-08-
28T10:04:33.543Z</eo:StopTime>
                                    <eo:IncidenceAngle>
                                        <eo:Elevation>22.0</eo:Elevation>
                                    </eo:IncidenceAngle>
                                    <eo:Footprint>
                                        <eo:Exterior elementCount="5">
                                            <eo:Point>
                                                <eo:Lat>-0.23419</eo:Lat>
                                                <eo:Lon>0.358087</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.295772</eo:Lat>
                                                <eo:Lon>0.477469</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>0.193204</eo:Lat>
                                                <eo:Lon>1.137852</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>-0.33711</eo:Lat>
                                                <eo:Lon>1.018476</eo:Lon>
                                            </eo:Point>
                                            <eo:Point>
                                                <eo:Lat>-0.23419</eo:Lat>
                                                <eo:Lon>0.358087</eo:Lon>
                                            </eo:Point>
                                        </eo:Exterior>
                                    </eo:Footprint>
                                </eo:Segment>
                            </eo:EstimatedSegments>
                        </eo:FeasibilityStudy>
                    </sps:values>
                </sps:ParameterData>
            </sps:extendedData>
        </sps:FeasibilityReport>
```

```
            </sps:result>
        </sps:GetFeasibilityResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

D.2.5 Operation “submit”

D.2.5.1 Request sample with the HTTP POST binding

```
<?xml version='1.0' encoding='utf-8'?>

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">

 <soapenv:Body>

  <sps:Submit xmlns:sps="http://www.opengis.net/sps/2.0" service="SPS"
version="2.0.0">

   <sps:sensorID>urn:spot:sensors:SPOT5:HRG</sps:sensorID>

   <sps:taskingParameters>

    <sps:ParameterData>

     <sps:encoding>

      <swe:XMLEncoding xmlns:swe="http://www.opengis.net/swe/2.0"
namespace="urn:ogc:def:property:CEOS"/>

     </sps:encoding>

     <sps:values>

      <eo:CoverageProgrammingRequest xmlns:eo="urn:ogc:def:property:CEOS">

       <eo:QualityOfService>

        <eo:Priority>HIGH</eo:Priority>

       </eo:QualityOfService>

       <eo:RegionOfInterest>

        <eo:Polygon>

         <eo:Exterior elementCount="5">

          <eo:Point>
```

```
        <eo:Lat>0.0</eo:Lat>
        <eo:Lon>0.0</eo:Lon>
      </eo:Point>
      <eo:Point>
        <eo:Lat>0.0</eo:Lat>
        <eo:Lon>1.0</eo:Lon>
      </eo:Point>
      <eo:Point>
        <eo:Lat>1.0</eo:Lat>
        <eo:Lon>1.0</eo:Lon>
      </eo:Point>
      <eo:Point>
        <eo:Lat>1.0</eo:Lat>
        <eo:Lon>0.0</eo:Lon>
      </eo:Point>
      <eo:Point>
        <eo:Lat>0.0</eo:Lat>
        <eo:Lon>0.0</eo:Lon>
      </eo:Point>
    </eo:Exterior>
  </eo:Polygon>
</eo:RegionOfInterest>
<eo:TimeOfInterest>
  <eo:SurveyPeriod>
    <eo:min>2009-07-30T10:47:27.032Z</eo:min>
    <eo:max>2009-08-31T10:47:27.032Z</eo:max>
```

```
    </eo:SurveyPeriod>
  </eo:TimeOfInterest>
  <eo:AcquisitionType>
    <eo:MonoscopicAcquisition>
      <eo:CoverageType>MULTIPASS</eo:CoverageType>
      <eo:IncidenceAngle>
        <eo:Azimuth>
          <eo:min>-180.0</eo:min>
          <eo:max>180.0</eo:max>
        </eo:Azimuth>
        <eo:Elevation>
          <eo:min>0.0</eo:min>
          <eo:max>30.0</eo:max>
        </eo:Elevation>
      </eo:IncidenceAngle>
      <eo:AcquisitionParametersOPT>
        <eo:GroundResolution>
          <eo:min>2.5</eo:min>
          <eo:max>10.0</eo:max>
        </eo:GroundResolution>
        <eo:InstrumentMode>PANCHROMATIC</eo:InstrumentMode>
        <eo:FusionAccepted>FALSE</eo:FusionAccepted>
      </eo:AcquisitionParametersOPT>
    </eo:MonoscopicAcquisition>
  </eo:AcquisitionType>
  <eo:ValidationParametersOPT>
```

```
            <eo:MaxCloudCover>100.0</eo:MaxCloudCover>
            <eo:MaxSnowCover>100.0</eo:MaxSnowCover>
            <eo:HazeAccepted>TRUE</eo:HazeAccepted>
            <eo:SandWindAccepted>FALSE</eo:SandWindAccepted>
          </eo:ValidationParametersOPT>
        </eo:CoverageProgrammingRequest>
      </sps:values>
    </sps:ParameterData>
  </sps:taskingParameters>
  <sps:latestResponseTime>2009-01-30T11:47:29Z</sps:latestResponseTime>
 </sps:Submit>
</soapenv:Body>
</soapenv:Envelope>
```

D.2.5.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
    <soapenv:Body>
        <sps:SubmitResponse xmlns:sps="http://www.opengis.net/sps/2.0">
            <sps:result>
                <sps:StatusReport>
                    <sps:title>Tasking Report</sps:title>
                    <sps:sensorID>urn:spot:sensors:SPOT5:HRG</sps:sensorID>
                    <sps:taskID>http://ws.spotimage.com/sps/PR00001</sps:taskID>
                    <sps:updateTime>2009-04-21T15:15:15.265Z</sps:updateTime>
                    <sps:statusCode>PENDING</sps:statusCode>
                    <sps:estimatedToC>2009-04-
21T15:15:25.265Z</sps:estimatedToC>
                </sps:StatusReport>
            </sps:result>
        </sps:SubmitResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

D.2.6 Operation “GetStatus”

D.2.6.1 Request sample with the HTTP POST binding

```
<?xml version='1.0' encoding='utf-8'?>

  <soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">

    <soapenv:Body>

      <sps:GetStatus xmlns:sps="http://www.opengis.net/sps/2.0" service="SPS"
version="2.0.0">

        <sps:taskID>http://ws.spotimage.com/sps/PR00001</sps:taskID>

      </sps:GetStatus>

    </soapenv:Body>

</soapenv:Envelope>
```

D.2.6.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
    <soapenv:Body>
        <sps:GetStatusResponse xmlns:sps="http://www.opengis.net/sps/2.0">
            <sps:result>
                <sps:StatusReport>
                    <sps:title>Tasking Report</sps:title>
                    <sps:sensorID>urn:spot:sensors:SPOT5:HRG</sps:sensorID>
                    <sps:taskID>http://ws.spotimage.com/sps/PR00001</sps:taskID>
                    <sps:updateTime>2009-04-21T15:15:25.265Z</sps:updateTime>
                    <sps:statusCode>ACCEPTED</sps:statusCode>
                    <sps:estimatedToC>2009-04-
21T15:34:28.172Z</sps:estimatedToC>
                </sps:StatusReport>
            </sps:result>
        </sps:GetStatusResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

D.2.7 Operation “DescribeResultAccess”

D.2.7.1 Request sample with the HTTP POST binding

```
<?xml version='1.0' encoding='utf-8'?>

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">

  <soapenv:Body>

    <sps:DescribeResultAccess xmlns:sps="http://www.opengis.net/sps/2.0"
service="SPS" version="2.0.0">

      <sps:taskID>http://ws.spotimage.com/sps/PR00001</sps:taskID>

    </sps:DescribeResultAccess>

  </soapenv:Body>

</soapenv:Envelope>
```

D.2.7.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
    <soapenv:Body>
        <sps:DescribeResultAccessResponse
xmlns:sps="http://www.opengis.net/sps/2.0"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:ows="http://www.opengis.net/ows/1.1">
            <ows:ReferenceGroup>
                <ows:Title>Acquired Image #null</ows:Title>
                <ows:Reference
xlink:href="http://ws.spotimage.com/axis2/services/WcsLevel1A?service=WCS&amp;ve
rsion=1.0&amp;request=GetCoverage&amp;coverage=RSA_SCENE1&amp;crs=urn:ogc
:def:crs:OGC:0.0:ImageCRSPixelCenter:RSA_SCENE1&amp;bbox=3000,4000,4000,50
00&amp;width=1000&amp;height=1000&amp;format=image/tiff">
                    <ows:Format>image/tiff</ows:Format>
                </ows:Reference>
                <ows:Reference
xlink:href="http://ws.spotimage.com/axis2/services/WcsLevel1A?service=WCS&amp;ve
rsion=1.0&amp;request=GetCoverage&amp;coverage=RSA_SCENE1&amp;crs=urn:ogc
:def:crs:OGC:0.0:ImageCRSPixelCenter:RSA_SCENE1&amp;bbox=3000,4000,4000,50
00&amp;width=1000&amp;height=1000&amp;format=image/jp2">
                    <ows:Format>image/jp2</ows:Format>
                </ows:Reference>
            </ows:ReferenceGroup>
```

```
        </sps:DescribeResultAccessResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

D.3 SOS-T

This service was implemented by the group at 52°North, Germany, following the developing SOS 2.0.

D.3.1 Service endpoint

The service was deployed at http://v-swsl.uni-muenster.de:8080/52nSOS-OWS6/sos. The 52°North also proviced a demo page at http://v-swsl.uni-muenster.de:8080/52nSOS-OWS6. The revised WSDL is at http://csiss.gmu.edu/sensorweb/wsdls/ows6/sos/gmu4muensterSOS.wsdl.

D.3.2 Operation "RegisterSensor"

D.3.2.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<RegisterSensor service="SOS" version="1.0.0"
xmlns="http://www.opengis.net/sos/1.0" xmlns:swe="http://www.opengis.net/swe/1.0.1"
xmlns:ows="http://www.opengeospatial.net/ows"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml"
xmlns:ogc="http://www.opengis.net/ogc" xmlns:om="http://www.opengis.net/om/1.0"
xmlns:sml="http://www.opengis.net/sensorML/1.0.1"

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://www.opengis.net/sos/1.0

http://schemas.opengis.net/sos/1.0.0/sosRegisterSensor.xsd
http://www.opengis.net/om/1.0
http://schemas.opengis.net/om/1.0.0/extensions/observationSpecialization_override.xsd"
>

<SensorDescription>

        <sml:Component gml:id="HRG-HMB1">

      <!-- -->



      <gml:description>
```

For the HMB panchromatic band, a bar of 12000 CCD detectors is used to acquire the scanlines.

```
</gml:description>
<!-- -->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier name="Short Name">
      <sml:Term definition="urn:ogc:def:property:OGC:shortName">
        <sml:value>HMB</sml:value>

      </sml:Term>
    </sml:identifier>
    <sml:identifier name="Long Name">
      <sml:Term definition="urn:ogc:def:property:OGC:longName">
        <sml:value>Panchromatic HMB Detector</sml:value>
      </sml:Term>
    </sml:identifier>
    <sml:identifier name="Band ID">

      <sml:Term definition="urn:ogc:def:property:CEOS:eop:BandId">
        <sml:value>P</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
<!-- -->
```

```
      <sml:characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:GeometricCharacteristics">

        <swe:DataRecord>


          <gml:name>Geometric Characteristics</gml:name>

          <swe:field name="Across-Track Ground Resolution">

            <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:AcrossTrackGroundResolution">

              <swe:uom code="m"/>

              <swe:value>5</swe:value>

            </swe:Quantity>

          </swe:field>

          <swe:field name="Along-Track Ground Resolution">


            <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:AlongTrackGroundResolution">

              <swe:uom code="m"/>

              <swe:value>5</swe:value>

            </swe:Quantity>

          </swe:field>

          <swe:field name="Number of Samples">

            <swe:Count
definition="urn:ogc:def:property:CEOS:opt:NumberOfSamples">

              <swe:value>12000</swe:value>


            </swe:Count>

          </swe:field>
```

```
          </swe:DataRecord>
        </sml:characteristics>
        <!-- -->
        <sml:characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:MeasurementCharacteristics">
          <swe:DataRecord>
            <gml:name>Measurement Characteristics</gml:name>

            <swe:field name="Band Type">
              <swe:Category definition="urn:ogc:def:property:CEOS:eop:BandType">
                <swe:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:SpectralBands:v01"/>
                <swe:value>VIS</swe:value>
              </swe:Category>
            </swe:field>
            <swe:field name="Spectral Range">
              <swe:QuantityRange
definition="urn:ogc:def:property:CEOS:opt:SpectralRange">

                <swe:uom code="nm"/>
                <swe:value>490 690</swe:value>
              </swe:QuantityRange>
            </swe:field>
            <swe:field name="SNR Ratio">
              <swe:Quantity definition="urn:ogc:def:property:CEOS:eop:SNR">
                <swe:uom code="dB"/>
                <swe:value>170</swe:value>
```

```
            </swe:Quantity>
          </swe:field>
        </swe:DataRecord>
      </sml:characteristics>
      <!-- -->
    </sml:Component>
</SensorDescription>
<ObservationTemplate>
  <om:Observation>
    <om:samplingTime/>
    <om:procedure/>
    <om:observedProperty/>
    <om:featureOfInterest></om:featureOfInterest>
    <om:result uom=""></om:result>
  </om:Observation>
</ObservationTemplate>
</RegisterSensor>
```

D.3.2.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<RegisterSensorResponse xmlns="http://www.opengis.net/sos/1.0">
  <AssignedSensorId>HRG-HMB1</AssignedSensorId>
</RegisterSensorResponse>
```

D.3.2 Operation “RegisterSensor”

D.3.2.1 Request sample with the HTTP POST binding

D.3.2.2 Response sample

D.3.3 Operation “DescribeSensor”

D.3.3.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<DescribeSensor version="1.0.0" service="SOS"
xmlns="http://www.opengis.net/sos/1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengis.net/sos/1.0
http://schemas.opengis.net/sos/1.0.0/sosDescribeSensor.xsd"
outputFormat="text/xml;subtype=&quot;sensorML/1.0.1&quot;">

    <procedure>HRG-HMB</procedure>

</DescribeSensor>
```

D.3.3.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<SensorML xsi:schemaLocation="http://www.opengis.net/sensorML/1.0.1

                    http://schemas.opengis.net/sensorML/1.0.1/sensorML.xsd"
xmlns="http://www.opengis.net/sensorML/1.0.1"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:ns="http://www.opengis.net/swe/1.0.1"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <Component gml:id="HRG-HMB">

    <!---->

   <gml:description>For the HMB panchromatic band, a bar of 12000 CCD detectors is
used to acquire the scanlines.</gml:description>
```

```
<!---->
<identification>
 <IdentifierList>
  <identifier name="Short Name">
   <Term definition="urn:ogc:def:property:OGC:shortName">
    <value>HMB</value>
   </Term>
  </identifier>
  <identifier name="Long Name">
   <Term definition="urn:ogc:def:property:OGC:longName">
    <value>Panchromatic HMB Detector</value>
   </Term>
  </identifier>
  <identifier name="Band ID">
   <Term definition="urn:ogc:def:property:CEOS:eop:BandId">
    <value>P</value>
   </Term>
  </identifier>
 </IdentifierList>
</identification>
<!---->
<characteristics xlink:role="urn:ogc:def:role:CEOS:eop:GeometricCharacteristics">
 <ns:DataRecord>
  <gml:name>Geometric Characteristics</gml:name>
  <ns:field name="Across-Track Ground Resolution">
```

```
        <ns:Quantity
definition="urn:ogc:def:property:CEOS:eop:AcrossTrackGroundResolution">
          <ns:uom code="m"/>
          <ns:value>5</ns:value>
        </ns:Quantity>
      </ns:field>
      <ns:field name="Along-Track Ground Resolution">
        <ns:Quantity
definition="urn:ogc:def:property:CEOS:eop:AlongTrackGroundResolution">
          <ns:uom code="m"/>
          <ns:value>5</ns:value>
        </ns:Quantity>
      </ns:field>
      <ns:field name="Number of Samples">
        <ns:Count definition="urn:ogc:def:property:CEOS:opt:NumberOfSamples">
          <ns:value>12000</ns:value>
        </ns:Count>
      </ns:field>
    </ns:DataRecord>
  </characteristics>
  <!---->
  <characteristics
xlink:role="urn:ogc:def:role:CEOS:eop:MeasurementCharacteristics">
    <ns:DataRecord>
      <gml:name>Measurement Characteristics</gml:name>
      <ns:field name="Band Type">
        <ns:Category definition="urn:ogc:def:property:CEOS:eop:BandType">
```

```
          <ns:codeSpace
xlink:href="urn:ogc:def:dictionary:CEOS:eop:SpectralBands:v01"/>
          <ns:value>VIS</ns:value>
         </ns:Category>
        </ns:field>
        <ns:field name="Spectral Range">
         <ns:QuantityRange definition="urn:ogc:def:property:CEOS:opt:SpectralRange">
          <ns:uom code="nm"/>
          <ns:value>490 690</ns:value>
         </ns:QuantityRange>
        </ns:field>
        <ns:field name="SNR Ratio">
         <ns:Quantity definition="urn:ogc:def:property:CEOS:eop:SNR">
          <ns:uom code="dB"/>
          <ns:value>170</ns:value>
         </ns:Quantity>
        </ns:field>
      </ns:DataRecord>
    </characteristics>
    <!---->
  </Component>
</SensorML>
```

D.3.4 Operation “InsertObservation”

D.3.4.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<InsertObservation xmlns:xlink="http://www.w3.org/1999/xlink"
```

```
xmlns:gml="http://www.opengis.net/gml"
xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
xmlns:sa="http://www.opengis.net/sampling/1.0"
xmlns:ows="http://www.opengis.net/ows/1.1"
xmlns:om="http://www.opengis.net/om/1.0"
xmlns="http://www.opengis.net/sos/1.0"
xmlns:sost="http://www.52north.org/sos_t/v1-00"
xmlns:ceos="http://www.ceos.org/sa/1.0"
xmlns:swe="http://www.opengis.net/swe/1.0.1"
xmlns:ogc="http://www.opengis.net/ogc"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" service="SOS"
version="1.0.0">
<AssignedSensorId>
    HRG-HMB
</AssignedSensorId>
<om:Observation>
    <om:samplingTime>
        <gml:TimePeriod>
            <gml:beginPosition>
                2008-11-12T08:55:53.116Z
            </gml:beginPosition>
            <gml:endPosition>
                2008-11-12T08:55:53.116Z
            </gml:endPosition>
        </gml:TimePeriod>
    </om:samplingTime>
```

```
<om:procedure
    xlink:href="urn:ogc:object:sensor:SPOT5:HRG:SWIR:v01" />
<om:observedProperty
    xlink:href="urn:ogc:def:property:OGC:radiance" />
<om:featureOfInterest>
    <ceos:GeoreferenceableSwath>
        <sa:sampledFeature
            xlink:href="urn:ogc:object:feature:earthSurface" />
        <sa:shape>
            <gml:Polygon
                srsName="urn:ogc:def:crs:EPSG:32611">
                <gml:exterior>
                    <gml:LinearRing>
                        <gml:pos>-2145012.64 3297514.72</gml:pos>
                        <gml:pos>-2139307.14 3389543.03</gml:pos>
                        <gml:pos>-2197619.57 3389013.82</gml:pos>
                        <gml:pos>-2203828.78 3296292.64</gml:pos>
                    </gml:LinearRing>
                </gml:exterior>
            </gml:Polygon>
        </sa:shape>
        <ceos:groundToImageModel>
            <sml:ProcessModel gml:id="RPC_PROCESS">
                <sml:inputs>
                    <sml:InputList>
                        <sml:input name="target_location">
```

```
                                    <swe:Vector
referenceFrame="urn:ogc:def:crs:EPSG:6.17:4979">
                                        <swe:coordinate name="x">
                                            <swe:Quantity
definition="urn:ogc:def:property:OGC:angle" axisID="Long">
                                                <gml:name>
                                                    longitude
                                                </gml:name>
                                                <swe:uom code="deg" />
                                            </swe:Quantity>
                                        </swe:coordinate>
                                        <swe:coordinate name="y">
                                            <swe:Quantity
definition="urn:ogc:def:property:OGC:angle" axisID="Lat">
                                                <gml:name>
                                                    latitude
                                                </gml:name>
                                                <swe:uom code="deg" />
                                            </swe:Quantity>
                                        </swe:coordinate>
                                        <swe:coordinate name="z">
                                            <swe:Quantity
definition="urn:ogc:def:property:OGC:distance" axisID="h">
```

```
                                        <gml:name>
                                            altitude
                                        </gml:name>
                                        <swe:uom code="m" />
                                    </swe:Quantity>
                                </swe:coordinate>
                            </swe:Vector>
                        </sml:input>
                    </sml:InputList>
                </sml:inputs>
                <sml:outputs>
                    <sml:OutputList>
                        <sml:output name="image_location">
                            <swe:Vector
definition="urn:ogc:def:data:OGC:locationVector"
referenceFrame="urn:ogc:def:crs:OGC:ImageCRSpixelCenter:RSA_SCENE1">
                                <swe:coordinate name="x">
                                    <swe:Quantity
definition="urn:ogc:def:property:OGC:distance" axisID="X">
                                        <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                    </swe:Quantity>
                                </swe:coordinate>
```

```
                                        <swe:coordinate name="y">
                                            <swe:Quantity

definition="urn:ogc:def:property:OGC:distance" axisID="Y">
                                                <swe:uom

xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                            </swe:Quantity>
                                        </swe:coordinate>
                                    </swe:Vector>
                                </sml:output>
                            </sml:OutputList>
                        </sml:outputs>
                        <!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~-->
                        <!--RPC Parameters-->
                        <!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~-->
                        <sml:parameters>
                            <sml:ParameterList>
                                <sml:parameter
                                    name="rpc_parameter_series">
                                    <swe:DataArray>
                                        <swe:elementCount>
                                            <swe:Count>
                                                <swe:value>1</swe:value>
                                            </swe:Count>
                                        </swe:elementCount>
                                        <swe:elementType
```

```
                                        name="rpc_parameter_set">
                                        <swe:DataRecord
definition="urn:ogc:def:data:CSM:rpcParameters">
                                            <!-- -->
                                            <swe:field
                                                name="image_region">
                                                <swe:DataRecord>
                                                    <swe:field
                                                        name="zone_minX">
                                                        <swe:Quantity>
                                                            <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                                        </swe:Quantity>
                                                    </swe:field>
                                                    <swe:field
                                                        name="zone_minY">
                                                        <swe:Quantity>
                                                            <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                                        </swe:Quantity>
                                                    </swe:field>
                                                    <swe:field
                                                        name="zone_maxX">
                                                        <swe:Quantity>
```

```
                                        <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field
                                    name="zone_maxY">
                                    <swe:Quantity>
                                        <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                    </swe:Quantity>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:field>
                        <!-- -->
                        <swe:field
                            name="image_adjustment">
                            <swe:DataRecord>
                                <swe:field
                                    name="image_x_offset">
                                    <swe:Quantity>
                                        <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                    </swe:Quantity>
                                </swe:field>
```

```
                                        <swe:field
                                            name="image_x_scale">
                                            <swe:Quantity>
                                                <swe:uom
xlink:href="urn:ogc:def:unit:OGC:none" />
                                            </swe:Quantity>
                                        </swe:field>
                                        <swe:field
                                            name="image_y_offset">
                                            <swe:Quantity>
                                                <swe:uom
xlink:href="urn:ogc:def:unit:OGC:pixel" />
                                            </swe:Quantity>
                                        </swe:field>
                                        <swe:field
                                            name="image_y_scale">
                                            <swe:Quantity>
                                                <swe:uom
xlink:href="urn:ogc:def:unit:OGC:none" />
                                            </swe:Quantity>
                                        </swe:field>
                                    </swe:DataRecord>
                                </swe:field>
                                <!-- -->
```

```
                                        <swe:field
                                            name="target_adjustment">
                                            <swe:DataRecord>
                                                <swe:field
                                                    name="target_x_offset">
                                                    <swe:Quantity>
                                                        <swe:uom
                                                            code="deg" />
                                                    </swe:Quantity>
                                                </swe:field>
                                                <swe:field
                                                    name="target_x_scale">
                                                    <swe:Quantity>
                                                        <swe:uom
xlink:href="urn:ogc:def:unit:OGC:none" />
                                                    </swe:Quantity>
                                                </swe:field>
                                                <swe:field
                                                    name="target_y_offset">
                                                    <swe:Quantity>
                                                        <swe:uom
                                                            code="deg" />
                                                    </swe:Quantity>
                                                </swe:field>
                                                <swe:field
```

```
                                        name="target_y_scale">
                                        <swe:Quantity>
                                            <swe:uom
xlink:href="urn:ogc:def:unit:OGC:none" />
                                        </swe:Quantity>
                                    </swe:field>
                                    <swe:field
                                        name="target_z_offset">
                                        <swe:Quantity>
                                            <swe:uom
                                                code="m" />
                                        </swe:Quantity>
                                    </swe:field>
                                    <swe:field
                                        name="target_z_scale">
                                        <swe:Quantity>
                                            <swe:uom
xlink:href="urn:ogc:def:unit:OGC:none" />
                                        </swe:Quantity>
                                    </swe:field>
                                </swe:DataRecord>
                            </swe:field>
                            <!-- -->
                            <swe:field
```

```
name="x_numerator_coefficients">
                                                    <swe:DataRecord
                                                        gml:id="PolyCoeff"
definition="urn:ogc:def:data:CSM:rpcCoefficients">
                                                        <swe:field
                                                            name="constant">
                                                            <swe:Quantity />
                                                        </swe:field>
                                                        <swe:field
                                                            name="x">
                                                            <swe:Quantity />
                                                        </swe:field>
                                                        <swe:field
                                                            name="y">
                                                            <swe:Quantity />
                                                        </swe:field>
                                                        <swe:field
                                                            name="z">
                                                            <swe:Quantity />
                                                        </swe:field>
                                                        <swe:field
                                                            name="xx">
                                                            <swe:Quantity />
                                                        </swe:field>
                                                        <swe:field
```

```
        name="xy">
        <swe:Quantity />
    </swe:field>
    <swe:field
        name="xz">
        <swe:Quantity />
    </swe:field>
    <swe:field
        name="yy">
        <swe:Quantity />
    </swe:field>
    <swe:field
        name="yz">
        <swe:Quantity />
    </swe:field>
    <swe:field
        name="zz">
        <swe:Quantity />
    </swe:field>
    <swe:field
        name="xxx">
        <swe:Quantity />
    </swe:field>
    <swe:field
        name="xxy">
        <swe:Quantity />
```

```
</swe:field>
<swe:field
    name="xxz">
    <swe:Quantity />
</swe:field>
<swe:field
    name="xyy">
    <swe:Quantity />
</swe:field>
<swe:field
    name="xyz">
    <swe:Quantity />
</swe:field>
<swe:field
    name="xzz">
    <swe:Quantity />
</swe:field>
<swe:field
    name="yyy">
    <swe:Quantity />
</swe:field>
<swe:field
    name="yyz">
    <swe:Quantity />
</swe:field>
<swe:field
```

```
                                        name="yzz">
                                        <swe:Quantity />
                                    </swe:field>
                                    <swe:field
                                        name="zzz">
                                        <swe:Quantity />
                                    </swe:field>
                                </swe:DataRecord>
                            </swe:field>
                            <!-- other three coefficient record
descriptions same as above -->
                            <swe:field
    name="x_denominator_coefficients" xlink:href="#PolyCoeff" />
                            <swe:field
                                name="y_numerator_coefficients"
xlink:href="#PolyCoeff" />
                            <swe:field
    name="y_denominator_coefficients" xlink:href="#PolyCoeff" />
                            <!-- -->
                            <swe:field
                                name="error_parameters">
                                <swe:DataRecord>
                                    <swe:field
                                        name="error_bias">
                                        <swe:Quantity>
```

```
                        <swe:uom
    xlink:href="urn:ogc:def:unit:OGC:pixel" />
                    </swe:Quantity>
                </swe:field>
                <swe:field
                    name="error_random">
                    <swe:Quantity>
                        <swe:uom
    xlink:href="urn:ogc:def:unit:OGC:pixel" />
                    </swe:Quantity>
                </swe:field>
            </swe:DataRecord>
        </swe:field>
    </swe:DataRecord>
</swe:elementType>
<swe:encoding>
    <swe:TextBlock
        decimalSeparator="."
tokenSeparator="," blockSeparator="@@" />
</swe:encoding>
<swe:values>

    0,0,5999,5999,0.0,6000.0,0.0,6000.0,27.078285,0.87313599999999988,-
23.839041,0.66755900000000007,0.0,1.0,

    0.03926941641308965,1.1083689351027264,-
0.18874262804145372,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,
```



```
    0.9605186585045906,0.04828014980697991,-
0.013154113856949848,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,

                                        1.2531982228233605,-
0.29230125400900814,-
1.213778850973431,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,

                                        0.9998332996143047,-
5.076461877886081E-
4,0.004783811811464411,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0
,

                                        0.0,0.0

                                    </swe:values>

                                </swe:DataArray>

                            </sml:parameter>

                        </sml:ParameterList>

                    </sml:parameters>

                    <sml:method

                        xlink:href="urn:ogc:def:process:CSM:RPC:1.0" />

                </sml:ProcessModel>

            </ceos:groundToImageModel>

        </ceos:GeoreferenceableSwath>

    </om:featureOfInterest>

    <om:result xsi:type="swe:DataArrayPropertyType">

        <swe:DataArray>

            <swe:elementCount>

                <swe:Count>

                    <swe:value>6000</swe:value>

                </swe:Count>

            </swe:elementCount>
```



```
                <swe:elementType name="row">
                    <swe:DataArray>
                        <swe:elementCount>
                            <swe:Count>
                                <swe:value>6000</swe:value>
                            </swe:Count>
                        </swe:elementCount>
                        <swe:elementType name="sample">
                            <swe:DataRecord>
                                <swe:field name="xs1">
                                    <swe:Quantity
definition="urn:ogc:def:property:OGC:radiance">
                                        <gml:name>XS1 Band</gml:name>
                                        <swe:uom code="W.m-2.sr-1.um-1" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="xs2">
                                    <swe:Quantity
definition="urn:ogc:def:property:OGC:radiance">
                                        <gml:name>XS2 Band</gml:name>
                                        <swe:uom code="W.m-2.sr-1.um-1" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="xs3">
                                    <swe:Quantity
```

```
definition="urn:ogc:def:property:OGC:radiance">
                                        <gml:name>XS3 Band</gml:name>
                                        <swe:uom code="W.m-2.sr-1.um-1" />
                                    </swe:Quantity>
                                </swe:field>
                                <swe:field name="swir">
                                    <swe:Quantity

definition="urn:ogc:def:property:OGC:radiance">
                                        <gml:name>SWIR Band</gml:name>
                                        <swe:uom code="W.m-2.sr-1.um-1" />
                                    </swe:Quantity>
                                </swe:field>
                            </swe:DataRecord>
                        </swe:elementType>
                    </swe:DataArray>
                </swe:elementType>
                <swe:encoding>
                    <swe:StandardFormat mimeType="image/jp2" />
                </swe:encoding>
                <swe:values

xlink:href="http://ws.spotimage.com/ows/SPOT5UnrectifiedImagery.jp2" />
            </swe:DataArray>
        </om:result>
    </om:Observation>
```

```
</InsertObservation>
```

D.3.4.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<InsertObservationResponse xsi:schemaLocation="http://www.52north.org/vod/v1

                    http://localhost:8080/52nVOD/xsd/52nVOD.xsd"
xmlns="http://www.opengis.net/sos/1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <AssignedObservationId>HRG-
HMB:1226480213116:1226480213116</AssignedObservationId>

</InsertObservationResponse>
```

D.3.5 Operation “GetObservation”

D.3.5.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<sos:GetObservation

  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

  xsi:schemaLocation="http://www.opengis.net/sos/1.0
http://schemas.opengis.net/sos/1.0.0/sosAll.xsd"

  xmlns:sos="http://www.opengis.net/sos/1.0"

  xmlns:om="http://www.opengis.net/om/1.0"

  xmlns:ogc="http://www.opengis.net/ogc"

  xmlns:sa="http://www.opengis.net/sampling/1.0"

  xmlns:xlink="http://www.w3.org/1999/xlink"

  xmlns:ceos="http://www.ceos.org/sa/1.0"

  xmlns:gml="http://www.opengis.net/gml"

  service="SOS"
```

```
 version="1.0.0">
 <sos:offering>Georeferenceable Imagery</sos:offering>
 <sos:eventTime>
  <ogc:TM_During>
   <ogc:PropertyName>om:samplingTime</ogc:PropertyName>
   <gml:TimePeriod>
    <gml:beginPosition>2008-11-12T08:55:53.116Z</gml:beginPosition>
    <gml:endPosition>2008-11-12T08:55:53.116Z</gml:endPosition>
   </gml:TimePeriod>
  </ogc:TM_During>
 </sos:eventTime>
 <sos:procedure>
  urn:ogc:object:sensor:SPOT5:HRG:SWIR:v01
 </sos:procedure>
 <sos:observedProperty>
  urn:ogc:def:property:OGC:radiance
 </sos:observedProperty>
 <sos:responseFormat>image/jpp-stream</sos:responseFormat>
</sos:GetObservation>
```

D.3.5.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<Observation xsi:schemaLocation="http://www.opengis.net/om/1.0
                    http://schemas.opengis.net/om/1.0.0/om.xsd"
xmlns="http://www.opengis.net/om/1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xlin="http://www.w3.org/1999/xlink">
```

```
  <samplingTime>

    <gml:TimePeriod xsi:type="gml:TimePeriodType"
xmlns:gml="http://www.opengis.net/gml">

      <gml:beginPosition>2008-11-12T09:55:53.116+01:00</gml:beginPosition>

      <gml:endPosition>2008-11-12T09:55:53.116+01:00</gml:endPosition>

    </gml:TimePeriod>

  </samplingTime>

  <procedure xlin:href="HRG-HMB"/>

  <observedProperty xlin:href="urn:ogc:def:property:OGC:radiance"/>

  <featureOfInterest>

    <ceos:GeoreferenceableSwath xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:gml="http://www.opengis.net/gml"
xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
xmlns:sa="http://www.opengis.net/sampling/1.0"
xmlns:ows="http://www.opengis.net/ows/1.1"
xmlns:om="http://www.opengis.net/om/1.0" xmlns="http://www.opengis.net/sos/1.0"
xmlns:sost="http://www.52north.org/sos_t/v1-00"
xmlns:ceos="http://www.ceos.org/sa/1.0"
xmlns:swe="http://www.opengis.net/swe/1.0.1"
xmlns:ogc="http://www.opengis.net/ogc">

      <sa:sampledFeature xlink:href="urn:ogc:object:feature:earthSurface"/>

      <sa:shape>

        <gml:Polygon srsName="urn:ogc:def:crs:EPSG:32611">

          <gml:exterior>

            <gml:LinearRing>

              <gml:pos>-2145012.64 3297514.72</gml:pos>

              <gml:pos>-2139307.14 3389543.03</gml:pos>

              <gml:pos>-2197619.57 3389013.82</gml:pos>

              <gml:pos>-2203828.78 3296292.64</gml:pos>

            </gml:LinearRing>
```

```
        </gml:exterior>
      </gml:Polygon>
    </sa:shape>
    <ceos:groundToImageModel>
      <sml:ProcessModel>
        <!---->
        <gml:description>Rigorous Sensor Model for SPOT-5 HRG Pushbroom
instrument</gml:description>
        <sml:inputs>
          <sml:InputList>
            <sml:input name="PixelGridCoordinates">
              <swe:Vector referenceFrame="urn:ogc:def:crs:CSM:pixelGridCRS">
                <swe:coordinate name="row">
                  <swe:Quantity>
                    <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
                  </swe:Quantity>
                </swe:coordinate>
                <swe:coordinate name="col">
                  <swe:Quantity>
                    <swe:uom xlink:href="urn:ogc:def:unit:CSM:pixel"/>
                  </swe:Quantity>
                </swe:coordinate>
              </swe:Vector>
            </sml:input>
            <sml:input name="SegmentStartTime">
              <swe:Time referenceFrame="urn:ogc:def:crs:OGC:TAI">
```

```
            <swe:uom code="s"/>
           </swe:Time>
          </sml:input>
         </sml:InputList>
        </sml:inputs>
        <sml:outputs>
         <sml:OutputList>
          <sml:output name="ViewVector">
           <swe:Vector referenceFrame="urn:ogc:def:crs:EPSG:4979">
            <swe:coordinate name="x">
             <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="X">
              <swe:uom code="m"/>
             </swe:Quantity>
            </swe:coordinate>
            <swe:coordinate name="y">
             <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="Y">
              <swe:uom code="m"/>
             </swe:Quantity>
            </swe:coordinate>
            <swe:coordinate name="z">
             <swe:Quantity definition="urn:ogc:def:property:CSM:DISTANCE"
axisID="Z">
              <swe:uom code="m"/>
             </swe:Quantity>
            </swe:coordinate>
```

```
        </swe:Vector>
      </sml:output>
    </sml:OutputList>
  </sml:outputs>
  <sml:parameters>
    <sml:ParameterList>
      <sml:parameter name="PixelGridCharacteristics">
        <swe:DataRecord>
          <swe:field name="NumberOfRows">
            <swe:Count definition="urn:ogc:def:property:CSM:NROWS">
              <swe:value>1</swe:value>
            </swe:Count>
          </swe:field>
          <swe:field name="NumberOfColumns">
            <swe:Count definition="urn:ogc:def:property:CSM:NCOLS">
              <swe:value>12000</swe:value>
            </swe:Count>
          </swe:field>
          <swe:field name="RowSpacing">
            <swe:Quantity definition="urn:ogc:def:property:CSM:ROW_SPACING">
              <swe:uom code="m"/>
              <swe:value>6.5e-6</swe:value>
            </swe:Quantity>
          </swe:field>
          <swe:field name="ColumnSpacing">
            <swe:Quantity definition="urn:ogc:def:property:CSM:COL_SPACING">
```

```
                <swe:uom code="m"/>
                <swe:value>6.5e-6</swe:value>
               </swe:Quantity>
              </swe:field>
              <swe:field name="RowAxisOffset">
               <swe:Quantity
definition="urn:ogc:def:property:CSM:ROW_AXIS_OFFSET">
                <swe:uom code="m"/>
                <swe:value>-3.25e-6</swe:value>
               </swe:Quantity>
              </swe:field>
              <swe:field name="ColumnAxisOffset">
               <swe:Quantity
definition="urn:ogc:def:property:CSM:COL_AXIS_OFFSET">
                <swe:uom code="m"/>
                <swe:value>-3.9e-2</swe:value>
               </swe:Quantity>
              </swe:field>
             </swe:DataRecord>
            </sml:parameter>
            <sml:parameter name="IdealOpticalCharacteristics">
             <swe:DataRecord>
              <swe:field name="CalibratedFocalLength">
               <swe:Quantity gml:id="FOCAL_LENGTH"
definition="urn:ogc:def:property:CSM:FOCAL_LENGTH_CAL">
                <swe:uom code="m"/>
                <swe:value>1.082</swe:value>
```

```
            </swe:Quantity>
          </swe:field>
        </swe:DataRecord>
      </sml:parameter>
      <sml:parameter name="PushbroomTimingCharacteristics">
        <swe:DataRecord>
          <swe:field name="FrameSamplingPeriod">
            <swe:Quantity
definition="urn:ogc:def:property:CSM:FRAME_SAMPLING_PERIOD">
              <swe:uom code="s"/>
              <swe:value>7.52e-4</swe:value>
            </swe:Quantity>
          </swe:field>
        </swe:DataRecord>
      </sml:parameter>
      <sml:parameter name="PlatformLocation">
        <swe:DataArray
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_TABLE">
          <swe:elementCount>
            <swe:Count>
              <swe:value>6</swe:value>
            </swe:Count>
          </swe:elementCount>
          <swe:elementType name="Location">
            <swe:Vector
definition="urn:ogc:def:property:CSM:PLATFORM_LOCATION_VECTOR"
referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">
```

```
                <swe:coordinate name="time">

                  <swe:Time definition="urn:ogc:def:property:CSM:TIME"
referenceFrame="urn:ogc:def:crs:OGC:TAI">

                    <swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>

                  </swe:Time>

                </swe:coordinate>

                <swe:coordinate name="x">

                  <swe:Quantity gml:id="LOC_X"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="X">

                    <swe:uom code="m"/>

                  </swe:Quantity>

                </swe:coordinate>

                <swe:coordinate name="y">

                  <swe:Quantity gml:id="LOC_Y"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Y">

                    <swe:uom code="m"/>

                  </swe:Quantity>

                </swe:coordinate>

                <swe:coordinate name="z">

                  <swe:Quantity gml:id="LOC_Z"
definition="urn:ogc:def:property:CSM:DISTANCE" axisID="Z">

                    <swe:uom code="m"/>

                  </swe:Quantity>

                </swe:coordinate>

                <swe:coordinate name="vx">

                  <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="X">

                    <swe:uom code="m/s"/>
```

```
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="vy">
                <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="Y">
                  <swe:uom code="m/s"/>
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="vz">
                <swe:Quantity definition="urn:ogc:def:property:CSM:SPEED"
axisID="Z">
                  <swe:uom code="m/s"/>
                </swe:Quantity>
              </swe:coordinate>
            </swe:Vector>
          </swe:elementType>
          <swe:encoding>
            <swe:TextBlock tokenSeparator=" " blockSeparator=" "
decimalSeparator="."/>
          </swe:encoding>
          <swe:values>2009-01-01T10:30:00Z 5.8439678946e+06 2.3337696760e+06
-3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03

              2009-01-01T10:30:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03

              2009-01-01T10:31:00Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03

              2009-01-01T10:31:30Z 5.8439678946e+06 2.3337696760e+06 -
3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03
```

2009-01-01T10:32:00Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03

2009-01-01T10:32:30Z 5.8439678946e+06 2.3337696760e+06 -3.5191143007e+06 -2.6635608480e+03 -2.9517514710e+03 -6.3906206560e+03</swe:values>

</swe:DataArray>

</sml:parameter>

<sml:parameter name="PlatformAttitude">

<swe:DataArray definition="urn:ogc:def:property:CSM:PLATFORM_ATTITUDE_TABLE">

<swe:elementCount>

<swe:Count>

<swe:value>10</swe:value>

</swe:Count>

</swe:elementCount>

<swe:elementType name="Attitude">

<swe:Vector definition="urn:ogc:def:property:CSM:PLATFORM_ORIENTATION_VECTOR" referenceFrame="urn:ogc:def:crs:CSM:ECEF:WGS84">

<swe:coordinate name="time">

<swe:Time definition="urn:ogc:def:property:CSM:TIME" referenceFrame="urn:ogc:def:crs:OGC:TAI">

<swe:uom xlink:href="urn:ogc:def:unit:ISO:8601"/>

</swe:Time>

</swe:coordinate>

<swe:coordinate name="yaw">

<swe:Quantity gml:id="YAW" definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Z">

<swe:uom code="rad"/>

```
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="pitch">
                <swe:Quantity gml:id="PITCH"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="X">
                  <swe:uom code="rad"/>
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="roll">
                <swe:Quantity gml:id="ROLL"
definition="urn:ogc:def:property:CSM:EULER_ANGLE" axisID="Y">
                  <swe:uom code="rad"/>
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="yaw_speed">
                <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Z">
                  <swe:uom code="rad/s"/>
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="pitch_speed">
                <swe:Quantity
definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="X">
                  <swe:uom code="rad/s"/>
                </swe:Quantity>
              </swe:coordinate>
              <swe:coordinate name="roll_speed">
```

<swe:Quantity definition="urn:ogc:def:property:CSM:EULER_ANGULAR_SPEED" axisID="Y">

<swe:uom code="rad/s"/>

</swe:Quantity>

</swe:coordinate>

</swe:Vector>

</swe:elementType>

<swe:encoding>

<swe:TextBlock tokenSeparator=" " blockSeparator=" " decimalSeparator="."/>

</swe:encoding>

<swe:values>2009-01-01T10:30:00Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:30:10Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:30:20Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:30:30Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:30:40Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:30:50Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:31:00Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:31:10Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:31:20Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07

2009-01-01T10:31:30Z 8.1161153986e-04 -6.5864093377e-04 3.5913343051e-04 2.9999940914e-07 -3.9999979396e-07 5.0000017878e-07</swe:values>

```
          </swe:DataArray>
        </sml:parameter>
        <sml:parameter name="UncertaintyInformation">
          <swe:DataRecord>
            <swe:field name="AdjustableParameters">
              <swe:DataRecord>
                <swe:field name="PlatformLocationX" xlink:href="#LOC_X"/>
                <swe:field name="PlatformLocationY" xlink:href="#LOC_Y"/>
                <swe:field name="PlatformLocationZ" xlink:href="#LOC_Z"/>
                <swe:field name="PlatformAttitudeX" xlink:href="#YAW"/>
                <swe:field name="PlatformAttitudeY" xlink:href="#PITCH"/>
                <swe:field name="PlatformAttitudeZ" xlink:href="#ROLL"/>
                <swe:field name="FocalLength" xlink:href="#FOCAL_LENGTH"/>
              </swe:DataRecord>
            </swe:field>
            <swe:field name="CovarianceMatrix">
              <swe:DataArray
definition="urn:ogc:def:property:CSM:COVARIANCE_MATRIX">
                <swe:elementCount>
                  <swe:Count>
                    <swe:value>7</swe:value>
                  </swe:Count>
                </swe:elementCount>
                <swe:elementType name="Row">
                  <swe:DataArray>
                    <swe:elementCount>
```

```
                    <swe:Count>
                      <swe:value>7</swe:value>
                    </swe:Count>
                  </swe:elementCount>
                  <swe:elementType name="Value">
                    <swe:Quantity/>
                  </swe:elementType>
                </swe:DataArray>
              </swe:elementType>
              <swe:encoding>
                <swe:TextBlock tokenSeparator=" " blockSeparator=" "
decimalSeparator="."/>
              </swe:encoding>
              <swe:values>1 0 0 0 0 0 0
                    0 1 0 0 0 0 0
                    0 0 1 0 0 0 0
                    0 0 0 1 0 0 0
                    0 0 0 0 1 0 0
                    0 0 0 0 0 1 0
                    0 0 0 0 0 0 1</swe:values>
            </swe:DataArray>
          </swe:field>
        </swe:DataRecord>
      </sml:parameter>
    </sml:ParameterList>
  </sml:parameters>
```

```
        <sml:method
xlink:href="urn:ogc:def:process:CSM:ImageToGroundPushbroomSensorModel"/>

       </sml:ProcessModel>

     </ceos:groundToImageModel>

   </ceos:GeoreferenceableSwath>

  </featureOfInterest>

  <result xsi:type="swe:DataArrayPropertyType"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml"
xmlns:sml="http://www.opengis.net/sensorML/1.0.1"
xmlns:sa="http://www.opengis.net/sampling/1.0"
xmlns:ows="http://www.opengis.net/ows/1.1"
xmlns:om="http://www.opengis.net/om/1.0"
xmlns:sost="http://www.52north.org/sos_t/v1-00"
xmlns:ceos="http://www.ceos.org/sa/1.0"
xmlns:swe="http://www.opengis.net/swe/1.0.1"
xmlns:ogc="http://www.opengis.net/ogc">

   <swe:DataArray>

     <swe:elementCount>

       <swe:Count>

         <swe:value>6000</swe:value>

       </swe:Count>

     </swe:elementCount>

     <swe:elementType name="row">

       <swe:DataArray>

         <swe:elementCount>

           <swe:Count>

             <swe:value>6000</swe:value>

           </swe:Count>

         </swe:elementCount>

         <swe:elementType name="sample">
```

```
<swe:DataRecord>
  <swe:field name="xs1">
    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
      <gml:name>XS1 Band</gml:name>
      <swe:uom code="W.m-2.sr-1.um-1"/>
    </swe:Quantity>
  </swe:field>
  <swe:field name="xs2">
    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
      <gml:name>XS2 Band</gml:name>
      <swe:uom code="W.m-2.sr-1.um-1"/>
    </swe:Quantity>
  </swe:field>
  <swe:field name="xs3">
    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
      <gml:name>XS3 Band</gml:name>
      <swe:uom code="W.m-2.sr-1.um-1"/>
    </swe:Quantity>
  </swe:field>
  <swe:field name="swir">
    <swe:Quantity definition="urn:ogc:def:property:OGC:radiance">
      <gml:name>SWIR Band</gml:name>
      <swe:uom code="W.m-2.sr-1.um-1"/>
    </swe:Quantity>
  </swe:field>
</swe:DataRecord>
```

```
        </swe:elementType>
       </swe:DataArray>
     </swe:elementType>
     <swe:encoding>
       <swe:StandardFormat mimeType="image/jp2"/>
     </swe:encoding>
     <swe:values xlink:href="jpip://v-swsl.uni-muenster.de:8090/org_HRG-
HMB_1226480153116_1226480153116.jp2"/>
   </swe:DataArray>
 </result>
</Observation>
```

D.3.6 Operation "GetObservationById"

D.3.6.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>
<GetObservationById xmlns="http://www.opengis.net/sos/1.0">
     <ObservationId>HRG-HMB:1226480153116:1226480153116</ObservationId>
     <responseFormat>image/jpp-stream</responseFormat>
</GetObservationById>
```

D.3.6.2 Response sample

Omitted. It is the same as the response in Section D.3.5.2.

D.4 WNS

This service was implemented by the group at 52°North, Germany, following the best practice paper of WNS.

D.4.1 Service endpoint

The service was deployed at http://mars.uni-muenster.de:8080/52nWNS/wns. The revised WSDL is at http://csiss.gmu.edu/sensorweb/wsdls/ows6/wns/gmu4muensterWNS.wsdl. Example pages are the following.

http://mars.uni-muenster.de:8080/52nWNS/DoNotification.htm

http://mars.uni-muenster.de:8080/52nWNS/GetCapabilities.htm

http://mars.uni-muenster.de:8080/52nWNS/GetMessage.htm

http://mars.uni-muenster.de:8080/52nWNS/RegisterMulti.htm

http://mars.uni-muenster.de:8080/52nWNS/RegisterSingle.htm

http://mars.uni-muenster.de:8080/52nWNS/Unregister.htm

http://mars.uni-muenster.de:8080/52nWNS/UpdateMulti.htm

http://mars.uni-muenster.de:8080/52nWNS/UpdateSingle.htm

D.4.2 Operation "RegisterSingle"

D.4.2.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>
<Register xmlns="http://www.opengis.net/wns"
                                xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
                                xsi:schemaLocation="http://www.opengis.net/wns
../wns.xsd"
                                service="WNS" version="1.0.0">
  <SingleUser>
    <Name>Eugene Yu</Name>
    <CommunicationProtocol>
      <Email>gyu@gmu.edu</Email>
```

```
    </CommunicationProtocol>
  </SingleUser>
</Register>
```

D.4.2.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<RegisterResponse xsi:schemaLocation="http://www.opengis.net/wns
http://schemas.opengis.net/wns/0.1.1/wnsAll.xsd" xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <UserID>82</UserID>
</RegisterResponse>
```

D.4.3 Operation “RegisterMultiple”

D.4.3.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>
<Register xmlns="http://www.opengis.net/wns"
                                xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
                                xsi:schemaLocation="http://www.opengis.net/wns
../wns.xsd"
                                service="WNS" version="1.0.0">
   <MultiUser>
      <UserID>88</UserID>
      <UserID>82</UserID>
   </MultiUser>
</Register>
```

D.4.3.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<RegisterResponse xsi:schemaLocation="http://www.opengis.net/wns
http://schemas.opengis.net/wns/0.1.1/wnsAll.xsd" xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <UserID>89</UserID>

</RegisterResponse>
```

D.4.4 Operation "Unregister"

D.4.4.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<Unregister xmlns="http://www.opengis.net/wns"

                                xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"

                                xsi:schemaLocation="http://www.opengis.net/wns
../wns.xsd"

                                service="WNS" version="1.0.0">

   <ID>90</ID>

</Unregister>
```

D.4.4.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<UnregisterResponse xsi:schemaLocation="http://www.opengis.net/wns
http://schemas.opengis.net/wns/0.1.1/wnsAll.xsd" xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <status>success</status>

</UnregisterResponse>
```

D.4.5 Operation “UpdateSingleUserRegistration”

D.4.5.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<UpdateSingleUserRegistration xmlns="http://www.opengis.net/wns"

                              xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"

                              xsi:schemaLocation="http://www.opengis.net/wns
../wns.xsd"

                              service="WNS" version="1.0.0">

  <UserID>83</UserID>

  <updateName>Genong Eugene Yu</updateName>

  <addCommunicationProtocol>

    <Email>genong.eugene.yu@gmail.com</Email>

  </addCommunicationProtocol>

  <removeCommunicationProtocol>

    <Email>gmu.edu</Email>

  </removeCommunicationProtocol>

</UpdateSingleUserRegistration>
```

D.4.5.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<UpdateSingleUserRegistrationResponse
xsi:schemaLocation="http://www.opengis.net/wns
http://schemas.opengis.net/wns/0.1.1/wnsAll.xsd" xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

 <status>success</status>

</UpdateSingleUserRegistrationResponse>
```

D.4.6 Operation “UpdateMultiUserRegistration”

D.4.6.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<UpdateMultiUserRegistration xmlns="http://www.opengis.net/wns"

                             xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"

                             xsi:schemaLocation="http://www.opengis.net/wns
../wns.xsd"

                             service="WNS" version="1.0.0">

  <MultiUserID>89</MultiUserID>

  <addUser>

    <ID>83</ID>

  </addUser>

<removeUser>

    <ID>82</ID>

  </removeUser>

</UpdateMultiUserRegistration>
```

D.4.6.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<UpdateMultiUserRegistrationResponse
xsi:schemaLocation="http://www.opengis.net/wns
http://schemas.opengis.net/wns/0.1.1/wnsAll.xsd" xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <status>success</status>

</UpdateMultiUserRegistrationResponse>
```

D.4.7 Operation “DoNotification”

D.4.7.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<DoNotification xmlns="http://www.opengis.net/wns"
                                xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
                                xsi:schemaLocation="http://www.opengis.net/wns
../wns.xsd"
                                service="WNS" version="1.0.0">
  <UserID>89</UserID>
  <MaxTTLOfMessage>P7D</MaxTTLOfMessage>
  <ShortMessage>Task 1161690976970_684004688690043 is
commencing.</ShortMessage>
  <Message>
    <NotificationMessage>
      <ServiceDescription>
        <ServiceType>SPS</ServiceType>
        <ServiceTypeVersion>0.0.30</ServiceTypeVersion>
        <ServiceURL>http://mars.uni-muenster.de:8080/52nSPSv1/SPS</ServiceURL>
      </ServiceDescription>
      <Payload>
        <sps:SPSMessage SPSCorrID="1161690976970_684004688690043"
                                xmlns:sps="http://www.opengis.net/sps">
          <sps:StatusInformation>
            <sps:status>New data available</sps:status>
          </sps:StatusInformation>
        </sps:SPSMessage>
      </Payload>
    </NotificationMessage>
  </Message>
```

```
</DoNotification>
```

D.4.7.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<DoNotificationResponse xsi:schemaLocation="http://www.opengis.net/wns
http://schemas.opengis.net/wns/0.1.1/wnsAll.xsd" xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <status>success</status>

</DoNotificationResponse>
```

D.4.7.3 Actual message received by email

```
<NotificationMessage xmlns="http://www.opengis.net/wns"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

 <ServiceDescription>

   <ServiceType>SPS</ServiceType>

   <ServiceTypeVersion>0.0.30</ServiceTypeVersion>

   <ServiceURL>http://mars.uni-muenster.de:8080/52nSPSv1/SPS</ServiceURL>

 </ServiceDescription>

 <Payload>

   <sps:SPSMessage SPSCorrID="1161690976970_684004688690043"
xmlns:sps="http://www.opengis.net/sps">

     <sps:StatusInformation>

       <sps:status>New data available</sps:status>

     </sps:StatusInformation>

   </sps:SPSMessage>

 </Payload>

</NotificationMessage>
```

D.5 WPS

This service was implemented by the group at SpotImage, France, following the developing WPS 2.0. This is an ortho-rectification processing service.

D.5.1 Service endpoint

The service was deployed at http://ws.spotimage.com:80/axis2/services/WPS. The group at SpotImage also proviced demo pages at http://ws.spotimage.com/client_ows/. The revised WSDL is at http://csiss.gmu.edu/sensorweb/wsdls/ows6/wps/gmu4spotimageWPS.wsdl.

D.5.2 Operation "DescribeProcess"

D.5.2.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<!-- Request for submiting a task using parameters described in
spsDescripeTaskingResponseEO.xml -->

<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <soapenv:Header xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing">

    <wsa:MessageID>65700</wsa:MessageID>

    <wsa:To>http://ws.spotimage.com/axis2/services/WPS</wsa:To>

    <wsa:Action>DescribeProcess</wsa:Action>

  </soapenv:Header>

  <soapenv:Body>

    <DescribeProcess xmlns="http://www.opengis.net/wps/2.0"
xmlns:swe="http://www.opengis.net/swe/2.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengis.net/wps/2.0 ../wpsDescribeProcess.xsd"
service="WPS" version="2.0.0">

      <processID>urn:ogc:id:ESA:process:orthorectification</processID>

    </DescribeProcess>

  </soapenv:Body>
```

```
</soapenv:Envelope>
```

D.5.2.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>

<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">

    <soapenv:Body>

        <wps:DescribeProcessResponse xmlns:wps="http://www.opengis.net/wps/2.0"
xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:swe="http://www.opengis.net/swe/2.0">

            <wps:inputParameters name="OrthorectificationRequest">

                <swe:DataRecord>

                    <swe:field name="UnrectifiedImageryMimeType">

                        <swe:Category
definition="urn:ogc:def:property:CEOS:eop:UnrectifiedImageryMimeType">

                            <gml:name>Unrectified Imagery Mime Type</gml:name>

                            <swe:constraint>

                                <swe:AllowedTokens>

                                    <swe:enumeration>image/tiff
image/jp2</swe:enumeration>

                                </swe:AllowedTokens>

                            </swe:constraint>

                            <swe:value>image/tiff</swe:value>

                        </swe:Category>

                    </swe:field>

                    <swe:field name="UnrectifiedImageryLocation">

                        <swe:Text
definition="urn:ogc:def:property:CEOS:eop:UnrectifiedImageryLocation">

                            <gml:name>Unrectified Imagery Location</gml:name>
```

```
                        <swe:value>ftp://myserver/path/to/imagery.tif</swe:value>
                    </swe:Text>
                </swe:field>
                <swe:field name="GeopositioningMetadataMimeType">
                    <swe:Category
definition="urn:ogc:def:property:CEOS:eop:GeopositioningMetadataMimeType">
                        <gml:name>Geopositioning Metadata Mime
Type</gml:name>
                        <swe:constraint>
                            <swe:AllowedTokens>
                                <swe:enumeration>text/xml+dimap
text/xml+sensorML</swe:enumeration>
                            </swe:AllowedTokens>
                        </swe:constraint>
                        <swe:value>text/xml+dimap</swe:value>
                    </swe:Category>
                </swe:field>
                <swe:field name="GeopositioningMetadataLocation">
                    <swe:Text
definition="urn:ogc:def:property:CEOS:eop:GeopositioningMetadataLocation">
                        <gml:name>Geopositioning Metadata
Location</gml:name>

    <swe:value>ftp://myserver/path/to/metadata.xml</swe:value>
                    </swe:Text>
                </swe:field>
            </swe:DataRecord>
        </wps:inputParameters>
```

```
            <wps:outputParameters name="OrthorectificationResult">
                <swe:DataRecord>
                    <swe:field name="OrthorectifiedImageryLocation">
                        <swe:Text
definition="urn:ogc:def:property:CEOS:eop:OrthorectifiedImageryLocation">
                            <gml:name>Orthorectified Imagery Location</gml:name>
                            <swe:value>ftp://myserver/path/to/imagery.jp2</swe:value>
                        </swe:Text>
                    </swe:field>
                    <swe:field name="CoverageMetadataLocation">
                        <swe:Text
definition="urn:ogc:def:property:CEOS:eop:CoverageMetadataLocation">
                            <gml:name>Coverage Metadata Location</gml:name>

    <swe:value>ftp://myserver/path/to/coverage.xml</swe:value>
                        </swe:Text>
                    </swe:field>
                </swe:DataRecord>
            </wps:outputParameters>
            <wps:statusReportExtendedData name="OrthorectificationStatus">
                <swe:DataRecord>
                    <swe:field name="PercentCompletion">
                        <swe:Quantity
definition="urn:ogc:def:property:CEOS:eop:PercentCompletion">
                            <gml:name>Percent Completion</gml:name>
                            <swe:uom code="%"/>
                        </swe:Quantity>
```

```
                    </swe:field>
                </swe:DataRecord>
            </wps:statusReportExtendedData>
        </wps:DescribeProcessResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

D.5.3 Operation “Execute”

D.5.3.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<!-- Request for submiting a task using parameters described in
spsDescripeTaskingResponseEO.xml -->

<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <soapenv:Header xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing">

    <wsa:MessageID>656</wsa:MessageID>

    <wsa:To>http://http://ws.spotimage.com/axis2/services/WPS</wsa:To>

    <wsa:Action>Execute</wsa:Action>

  </soapenv:Header>

  <soapenv:Body>

    <Execute xmlns="http://www.opengis.net/wps/2.0"
xmlns:swe="http://www.opengis.net/swe/2.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengis.net/wps/2.0 ../wpsExecute.xsd"
service="WPS" version="2.0.0">

      <processID>urn:ogc:id:ESA:process:orthorectification</processID>

      <inputParameters>

        <ParameterData>

          <swe:encoding>
```

```
          <swe:XMLEncoding namespace="http://www.opengis.net/swe/2.0"/>
        </swe:encoding>
        <swe:values>
          <OrthorectificationRequest>
            <UnrectifiedImageryMimeType>image/tiff</UnrectifiedImageryMimeType>

<UnrectifiedImageryLocation>ftp://my_ftp_server/data1/IMAGERY.TIF</UnrectifiedImageryLocation>

<GeopositioningMetadataMimeType>text/xml+dimap</GeopositioningMetadataMimeType>

<GeopositioningMetadataLocation>ftp://my_ftp_server/data1/METADATA.DIM</GeopositioningMetadataLocation>
          </OrthorectificationRequest>
        </swe:values>
      </ParameterData>
    </inputParameters>
  </Execute>
 </soapenv:Body>
</soapenv:Envelope>
```

D.5.3.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
    <soapenv:Body>
        <wps:ExecuteResponse xmlns:wps="http://www.opengis.net/wps/2.0">
            <wps:result>
```

```
                <wps:StatusReport>
                    <wps:title>Execute response</wps:title>

    <wps:processID>urn:ogc:id:ESA:process:orthorectification</wps:processID>
                    <wps:taskID>090330002934</wps:taskID>
                    <wps:statusCode>COMPLETED</wps:statusCode>
                </wps:StatusReport>
            </wps:result>
        </wps:ExecuteResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

D.5.4 Operation "DescribeResultAccess"

D.5.4.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<!-- Request for submiting a task using parameters described in
spsDescripeTaskingResponseEO.xml -->

<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

 <soapenv:Header xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing">

  <wsa:MessageID>aa6543</wsa:MessageID>

  <wsa:To>http://http://ws.spotimage.com/axis2/services/WPS</wsa:To>

  <wsa:Action>DescribeResultAccess</wsa:Action>

 </soapenv:Header>

 <soapenv:Body>

  <wps:DescribeResultAccess service="WPS" version="2.0"
xsi:schemaLocation="http://www.opengis.net/wps/2.0 wpsDescribeResultAccess.xsd"
xmlns:wps="http://www.opengis.net/wps/2.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

```
    <wps:id>
      <wps:taskID>090319104930+0100</wps:taskID>
    </wps:id>
  </wps:DescribeResultAccess>
 </soapenv:Body>
</soapenv:Envelope>
```

D.5.4.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
    <soapenv:Body>
        <wps:DescribeResultAccessResponse
xmlns:wps="http://www.opengis.net/wps/2.0"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:ows="http://www.opengis.net/ows/1.1">
            <ows:ReferenceGroup>
                <ows:Title>Orthorectification result</ows:Title>
                <ows:Identifier>oLS31-</ows:Identifier>
                <ows:Reference
xlink:href="http://ws.spotimage.com/wcs/coverage/Kenya2?request=GetCoverage&amp;
service=WCS&amp;version=1.0&amp;bbox=678489.9999999735,18949.99999999974,7
55154.9999996678,92059.99999999993&amp;crs=EPSG:32636&amp;format=GeoTIFF
&amp;coverage=TIF&amp;width=1000&amp;height=1000&amp;band=band1,band2,ba
nd3">
                    <ows:Format>image/tiff</ows:Format>
                </ows:Reference>
                <ows:Reference
xlink:href="http://ws.spotimage.com/wcs/coverage/Kenya2?request=GetCoverage&amp;
service=WCS&amp;version=1.0&amp;bbox=678489.9999999735,18949.99999999974,7
55154.9999996678,92059.99999999993&amp;crs=EPSG:32636&amp;format=JPEG200
```

0&coverage=TIF&width=1000&height=1000&band=band1,band2,band3">


```
                        <ows:Format>image/jp2</ows:Format>
                    </ows:Reference>
                </ows:ReferenceGroup>
            </wps:DescribeResultAccessResponse>
        </soapenv:Body>
</soapenv:Envelope>
```


D.6 WCS-T

This service was implemented by the group at Center for Spatial Information Science and Systems (CSISS), Georege Mason University, USA, following the WCS 1.1.0 and the discussion paper for transaction add-on to WCS 1.1.x.

D.6.1 Service endpoint

The service was deployed at http://ws.csiss.gmu.edu/cgi-bin/wcs-t. The GMU/CSISS group proviced a demo page for the transaction operation at http://ws.csiss.gmu.edu/wcst_add.htm. The revised WSDL is at http://csiss.gmu.edu/sensorweb/wsdls/ows6/wcst/ows-6_wcs_110_transaction.wsdl.

D.6.2 Operation "Transaction"

D.6.2.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<Transaction xmlns="http://www.opengis.net/wcs/1.1"

    xmlns:xlink="http://www.w3.org/1999/xlink"

    xmlns:ows="http://www.opengis.net/ows"

    xmlns:owcs="http://www.opengis.net/wcs/1.1/ows"

    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

    xsi:schemaLocation="http://www.opengis.net/wcs/1.1
http://csiss.gmu.edu/sensorweb/schemas/ows6/wcst/wcs/1.1.0/wcsTransaction.xsd
```

```
http://www.opengis.net/wcs/1.1/ows
http://csiss.gmu.edu/sensorweb/schemas/ows6/wcst/wcs/1.1.0/owsCoverages.xsd"
    service="WCS" version="1.1.0">
    <InputCoverages>
        <owcs:Coverage>
            <ows:Title>Add</ows:Title>
            <owcs:Reference
xlink:href="http://geobrain.laits.gmu.edu/geoportal_data_cache/data/WcsLevel2A.jp2"
                xlink:role="urn:ogc:def:role:WCS:1.1:coverage"/>
        </owcs:Coverage>
    </InputCoverages>
</Transaction>
```

D.6.2.2 Response sample

```
<?xml version="1.0" encoding="UTF-8"?>
<CoverageDescriptions xmlns="http://www.opengis.net/wcs/1.1"
xmlns:ows="http://www.opengis.net/ows"
xmlns:owcs="http://www.opengis.net/wcs/1.1/ows"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:gml="http://www.opengis.net/gml"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://schemas.opengis.net/wcs/1.1 ../wcsDescribeCoverage.xsd
http://schemas.opengis.net/wcs/1.1/ows ../owsDataIdentification.xsd">
<CoverageDescription>
    <ows:Title>GEOJP2:"/var/tmp/WcsLevel2A.jp2":RGB</ows:Title>
    <ows:Abstract>[3x1498x1793] RGB GEOJP2 (Byte)</ows:Abstract>
    <ows:Keywords>
```

```
    <ows:Keyword>images/GEOJP2</ows:Keyword>
    </ows:Keywords>
    <Identifier>GEOJP2:"/var/tmp/WcsLevel2A.jp2":RGB</Identifier>
        <Domain>
            <SpatialDomain>
                <ows:BoundingBox crs="urn:ogc:def:crs:OGC:0.0:imageCRS"
dimensions="2">
                    <ows:LowerCorner>0 0</ows:LowerCorner>
                    <ows:UpperCorner>1792 1497</ows:UpperCorner>
                </ows:BoundingBox>
                <ows:BoundingBox crs="urn:ogc:def:crs:EPSG:6.3:32646"
dimensions="2">
                    <ows:LowerCorner>716239 566441</ows:LowerCorner>
                    <ows:UpperCorner>805889 641361</ows:UpperCorner>
                </ows:BoundingBox>
                <ows:BoundingBox crs="urn:ogc:def:crs:EPSG:6.3:4326"
dimensions="2">
                    <ows:LowerCorner>94.9504 5.11868</ows:LowerCorner>
                    <ows:UpperCorner>95.7619 5.79925</ows:UpperCorner>
                </ows:BoundingBox>
                <GridCRS>
                    <GridBaseCRS>urn:ogc:def:crs:EPSG:6.3:32646</GridBaseCRS>

    <GridType>urn:ogc:def:method:WCS:1.1:2dSimpleGrid</GridType>
                    <GridOrigin>716239 641361</GridOrigin>
                    <GridOffsets>50 50.0134</GridOffsets>
                    <GridCS>urn:ogc:def:cs:OGC:0.0:Grid2dSquareCS</GridCS>
```

```
            </GridCRS>
        </SpatialDomain>
    </Domain>
    <Range>
        <Field>
            <ows:Title>RGB</ows:Title>
            <ows:Abstract>Band</ows:Abstract>
            <Identifier>RGB</Identifier>
            <NullValue>0</NullValue>
            <owcs:InterpolationMethods>

<owcs:DefaultMethod>NEAREST_NEIGHBOR</owcs:DefaultMethod>
                <owcs:OtherMethod>LINEAR</owcs:OtherMethod>
                <owcs:OtherMethod>BILINEAR</owcs:OtherMethod>
                <owcs:OtherMethod>BICUBIC</owcs:OtherMethod>
            </owcs:InterpolationMethods>
            <Axis identifier="Band">
                <AvailableKeys>
                    <Key>1</Key>
                    <Key>2</Key>
                    <Key>3</Key>
                </AvailableKeys>
            </Axis>
        </Field>
    </Range>
    <SupportedCRS>urn:ogc:def:crs:OGC:0.0:imageCRS</SupportedCRS>
```

<SupportedCRS>urn:ogc:def:crs:EPSG:6.3:32646</SupportedCRS>

<SupportedCRS>urn:ogc:def:crs:EPSG:6.3:4326</SupportedCRS>

<SupportedFormat>image/Geotiff</SupportedFormat>

<SupportedFormat>image/jpeg2000</SupportedFormat>

<SupportedFormat>image/jpeg</SupportedFormat>

</CoverageDescription>

</CoverageDescriptions>

D.6.2 Operation "GetCoverage" – for retrieving the JPIP reference

D.6.2.1 KVP request sample with the HTTP GET binding

http://ws.csiss.gmu.edu/cgi-bin/wcs-t?service=WCS&request=getCoverage&version=1.1&identifier=GEOJP2:%22/usr/local/apache2/geoportal_data_cache/WcsLevel2A.jp2%22:RGB&format=image/jpeg2000&store=true

D.6.2.2 Response sample

<?xml version="1.0" encoding="UTF-8"?>

<Coverages xmlns="http://www.opengis.net/wcs/1.1"

xmlns:ows="http://www.opengis.net/ows"

xmlns:owcs="http://www.opengis.net/wcs/1.1/ows"

xmlns:xlink="http://www.w3.org/1999/xlink"

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://schemas.opengis.net/ows/1.1.0 ../owsCoverages.xsd">

<Coverage>

<Abstract>Coverage created from GetCoverage operation request to a WCS</Abstract>

<Reference xlink:href="jpip://ws.csiss.gmu.edu:6666/F03D8EE8-1E4B-40FC-B07A-A08C3678A5D6.jp2"

xlink:role="urn:ogc:def:role:WCS:1.1:coverage"/>

```
    <Reference xlink:href="http://ws.csiss.gmu.edu/temp/F03D8EE8-1E4B-40FC-B07A-
A08C3678A5D6.jp2"

    xlink:role="urn:ogc:def:role:WCS:1.1:coverage"/>

  </Coverage>

</Coverages>
```

D.7 CSW

Two services were available for the demonstration. One was implemented and provided by Galdos Inc, Canada. Another was implemented and provided by the Center for Spatial Information Science and Systems (CSISS), George Mason University, USA. The GMU one was used in the final workflow since it was tested in OWS-5. The specification was CSW 2.0.2 with ebRIM profile.

D.7.1 Service endpoint

The service for publication was deployed at http://laits.gmu.edu:8099/csw/Publication. The service for discovery was deployed at http://laits.gmu.edu:8099/LAITSCSWVM2/discovery. The revised WSDL for publication is at http://csiss.gmu.edu/sensorweb/wsdls/ows5/csw/CSW_Publication_laits_cswdbvm.wsdl.

D.7.2 Operation "Publication"

D.7.2.1 Request sample with the HTTP POST binding

```
<?xml version="1.0" encoding="UTF-8"?>

<Transaction xmlns="http://www.opengis.net/cat/csw"
xmlns:tns="http://csiss.gmu.edu/cswPublication"
xmlns:bpws="http://schemas.xmlsoap.org/ws/2003/03/business-process/"
xmlns:xp20="http://www.oracle.com/XSL/Transform/java/oracle.tip.pc.services.function
s.Xpath20" xmlns:ns4="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
xmlns:sas="http://www.opengis.net/sas/0.0"
xmlns:ldap="http://schemas.oracle.com/xpath/extension/ldap"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:ns5="http://www.opengis.net/ogc"
xmlns:client="http://csiss.gmu.edu/cswPublication"
xmlns:ora="http://schemas.oracle.com/xpath/extension"
xmlns:ns6="http://www.opengis.net/wcs/wsdl"
xmlns:default_ns="http://schemas.xmlsoap.org/ws/2003/03/business-process/"
xmlns:gml="http://www.opengis.net/gml"
xmlns:targetNamespace="http://csiss.gmu.edu/cswPublication"
```

```
xmlns:ns1="http://laits.gmu.edu/csw" xmlns:ows11="http://www.opengis.net/ows/1.1"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
xmlns:ns3="http://www.w3.org/2003/XInclude"
xmlns:wcs111="http://www.opengis.net/wcs/1.1.1"
xmlns:ns2="http://geobrain.laits.gmu.edu:8099/axis/UUIDGen.jws"
xmlns:bpelx="http://schemas.oracle.com/bpel/extension"
xmlns:csw="http://www.opengis.net/cat/csw"
xmlns:orcl="http://www.oracle.com/XSL/Transform/java/oracle.tip.pc.services.functions.
ExtFunc" version="2.0.0" service="http://www.opengis.net/cat/csw"
briefResponse="true">

    <Insert handle="cswHandle">

        <WCSCoverage xmlns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
home="http://csiss.gmu.edu/sensorweb/" expiration="2009-03-16T04:59:21Z"
id="urn:uuid:398e4b22-f667-4258-814d-9c12735c4976" isOpaque="false"
majorVersion="1" mimeType="application/octet-stream"
objectType="urn:uuid:7DBF8BAD-6B69-48EB-9723-E16721809B15"
minorVersion="0" stability="Dynamic" status="Submitted" userVersion="1.0">

            <Name>

                <LocalizedString charset="UTF-8" value="coverage_name"
xml:lang="en-US"/>

            </Name>

            <Description>

                <LocalizedString charset="UTF-8" xml:lang="en-US"
value="coverage_description"/>

            </Description>

            <granule>@granule_id@</granule>

            <version>1.1.1</version>

            <name>RSA_SCENE1</name>

            <label>JPIP coverage based on 05MAY14083758-M1BS-
005693793010_01_P001.jp2 with remote RPCs</label>

            <gridEnvelopLow>0 0</gridEnvelopLow>

            <gridEnvelopeHigh>7168 67584</gridEnvelopeHigh>

            <yAxisName>y</yAxisName>
```

```
            <xAxisName>x</xAxisName>
            <originPoint>26.6 -25.5</originPoint>
            <requestCRSs>EPSG:4326</requestCRSs>
            <responseCRSs>EPSG:4326</responseCRSs>

    <nativeCRSs>urn:ogc:def:crs:OGC:ImageCRSpixelCenter:RSA_SCENE1</nativeC
RSs>
            <supportedFormats>JPeg2000</supportedFormats>
            <nativeFormat>JPeg2000</nativeFormat>
            <BBOX>

    <referenceSystemNameCode>EPSG:4326</referenceSystemNameCode>
                <eastBoundingCoordinate>-23</eastBoundingCoordinate>
                <westBoundingCoordinate>-25.5</westBoundingCoordinate>
                <northBoundingCoordinate>28</northBoundingCoordinate>
                <southBoundingCoordinate>26.6</southBoundingCoordinate>
            </BBOX>
        </WCSCoverage>
        <Association xmlns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
id="urn:uuid:a090d86a-921b-4c20-b9a0-106b00a986eb"
home="http://csiss.gmu.edu/sensorweb/" objectType="urn:uuid:69399ff8-ca2c-4637-
baf0-a157b2466b90" status="Approved" associationType="urn:uuid:4D142107-992B-
4A8F-BE9E-D5703E86F70C" sourceObject="urn:uuid:287c5c70-d246-102a-85f2-
5356c0a80203" targetObject="urn:uuid:398e4b22-f667-4258-814d-9c12735c4976"
isConfirmedBySourceOwner="1" isConfirmedByTargetOwner="1"/>
    </Insert>
</Transaction>
```

D.7.2.2 Response sample

<csw:TransactionResponse xmlns:csw="http://www.opengis.org/cat/csw"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
xmlns:tns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" version="2.0.0">

<csw:TransactionSummary requestId="">

<csw:objectsInserted>2</csw:objectsInserted>

</csw:TransactionSummary>

<csw:InsertResult handle="">

<WCSCoverage xmlns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
expiration="2009-03-16T04:59:21Z" home="http://csiss.gmu.edu/sensorweb/"
id="urn:uuid:398e4b22-f667-4258-814d-9c12735c4976" isOpaque="false"
majorVersion="1" mimeType="application/octet-stream" minorVersion="0"
objectType="urn:uuid:7DBF8BAD-6B69-48EB-9723-E16721809B15"
stability="Dynamic" status="Submitted" userVersion="1.0">

<Name>

<LocalizedString charset="UTF-8" value="coverage_name" xml:lang="en-US"/>

</Name>

<Description>

<LocalizedString charset="UTF-8" value="coverage_description" xml:lang="en-US"/>

</Description>

<granule>@granule_id@</granule>

<version>1.1.1</version>

<name>RSA_SCENE1</name>

<label>JPIP coverage based on 05MAY14083758-M1BS-005693793010_01_P001.jp2
with remote RPCs</label>

<gridEnvelopLow>0 0</gridEnvelopLow>

<gridEnvelopeHigh>7168 67584</gridEnvelopeHigh>

<yAxisName>y</yAxisName>

<xAxisName>x</xAxisName>

<originPoint>26.6 -25.5</originPoint>

<requestCRSs>EPSG:4326</requestCRSs>

<responseCRSs>EPSG:4326</responseCRSs>

<nativeCRSs>urn:ogc:def:crs:OGC:ImageCRSpixelCenter:RSA_SCENE1</nativeCRSs
>

<supportedFormats>JPeg2000</supportedFormats>

<nativeFormat>JPeg2000</nativeFormat>

<BBOX>

<referenceSystemNameCode>EPSG:4326</referenceSystemNameCode>

<eastBoundingCoordinate>-23</eastBoundingCoordinate>

<westBoundingCoordinate>-25.5</westBoundingCoordinate>

<northBoundingCoordinate>28</northBoundingCoordinate>

<southBoundingCoordinate>26.6</southBoundingCoordinate>

</BBOX>

</WCSCoverage>

<Association xmlns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
associationType="urn:uuid:4D142107-992B-4A8F-BE9E-D5703E86F70C"
home="http://csiss.gmu.edu/sensorweb/" id="urn:uuid:a090d86a-921b-4c20-b9a0-
106b00a986eb" isConfirmedBySourceOwner="1" isConfirmedByTargetOwner="1"
objectType="urn:uuid:69399ff8-ca2c-4637-baf0-a157b2466b90"
sourceObject="urn:uuid:287c5c70-d246-102a-85f2-5356c0a80203" status="Approved"
targetObject="urn:uuid:398e4b22-f667-4258-814d-9c12735c4976"/>

</csw:InsertResult>

</csw:TransactionResponse>

BPWSProcessRT=0. EventBPWSEventType: Invoke;

Infor (XPathUtils - ignoring namespace) - document strXML =
<csw:TransactionResponse xmlns:csw="http://www.opengis.org/cat/csw"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
xmlns:tns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" version="2.0.0">

<csw:TransactionSummary requestId="">

<csw:objectsInserted>2</csw:objectsInserted>

</csw:TransactionSummary>

<csw:InsertResult handle="">

<WCSCoverage xmlns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
expiration="2009-03-16T04:59:21Z" home="http://csiss.gmu.edu/sensorweb/"
id="urn:uuid:398e4b22-f667-4258-814d-9c12735c4976" isOpaque="false"
majorVersion="1" mimeType="application/octet-stream" minorVersion="0"
objectType="urn:uuid:7DBF8BAD-6B69-48EB-9723-E16721809B15"
stability="Dynamic" status="Submitted" userVersion="1.0">

<Name>

<LocalizedString charset="UTF-8" value="coverage_name" xml:lang="en-US"/>

</Name>

<Description>

<LocalizedString charset="UTF-8" value="coverage_description" xml:lang="en-US"/>

</Description>

<granule>@granule_id@</granule>

<version>1.1.1</version>

<name>RSA_SCENE1</name>

<label>JPIP coverage based on 05MAY14083758-M1BS-005693793010_01_P001.jp2
with remote RPCs</label>

<gridEnvelopLow>0 0</gridEnvelopLow>

<gridEnvelopeHigh>7168 67584</gridEnvelopeHigh>

<yAxisName>y</yAxisName>

<xAxisName>x</xAxisName>

<originPoint>26.6 -25.5</originPoint>

<requestCRSs>EPSG:4326</requestCRSs>

<responseCRSs>EPSG:4326</responseCRSs>

<nativeCRSs>urn:ogc:def:crs:OGC:ImageCRSpixelCenter:RSA_SCENE1</nativeCRSs
>

<supportedFormats>JPeg2000</supportedFormats>

<nativeFormat>JPeg2000</nativeFormat>

<BBOX>

<referenceSystemNameCode>EPSG:4326</referenceSystemNameCode>

<eastBoundingCoordinate>-23</eastBoundingCoordinate>

<westBoundingCoordinate>-25.5</westBoundingCoordinate>

<northBoundingCoordinate>28</northBoundingCoordinate>

<southBoundingCoordinate>26.6</southBoundingCoordinate>

</BBOX>

</WCSCoverage>

<Association xmlns="urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.5"
associationType="urn:uuid:4D142107-992B-4A8F-BE9E-D5703E86F70C"
home="http://csiss.gmu.edu/sensorweb/" id="urn:uuid:a090d86a-921b-4c20-b9a0-
106b00a986eb" isConfirmedBySourceOwner="1" isConfirmedByTargetOwner="1"
objectType="urn:uuid:69399ff8-ca2c-4637-baf0-a157b2466b90"
sourceObject="urn:uuid:287c5c70-d246-102a-85f2-5356c0a80203" status="Approved"
targetObject="urn:uuid:398e4b22-f667-4258-814d-9c12735c4976"/>

</csw:InsertResult>

</csw:TransactionResponse>

D.7.3 Operation “Discovery”

D.7.3.1 Access user interface

Data can be quried and download at http://laits.gmu.edu:8099/cswquery-vdp/.

Bibliography

[1] Mike Botts, "OWS 5 Engineering Report: Supporting Georeferenceable Imagery," 2008; http://portal.opengeospatial.org/files/index.php?artifact_id=29466&version=2.

[2] NSF, "Geographic information — Reference Model – Imagery," 2004; http://csiss.gmu.edu/dad/19101-2WD2.pdf.

[3] NSF, "Geographic information — Imagery sensor models for geopositioning," 2008.

[4] Genong Yu, Liping Di, J.F. Moses, Peichuan Li, and Peisheng Zhao, Geospatial Workflow in a Sensor Web Environment: Transactions, Events, and Asynchrony, In: IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2008), 7-11 July 2008, Boston, MA, USA, vol. 5: 132-135, 2008.