

## SPACEBEL / ESA-ESRIN

# Technical Note on the application of the EO Profile of GML to the VITO EO product collections



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## EXECUTIVE SUMMARY

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This technical note summarises the mapping of the various metadata models of the VITO EO Product collections onto the EO Profile of GML metadata model as defined within the Heterogeneous Missions Accessibility projects. In addition it contains the selection of the VITO EO Product collections of which (a representative subset) catalog will be exposed with HMA EO Product Catalog interfaces using the ERDAS EO Proxy framework.

In the past VITO has employed a variety of different metadata models for the different product collections that were developed to cover the needs of particular projects. In the future, VITO would like to harmonise the metadata descriptions and to align with International Standards. Hence the interest in applying the EO Profile of GML as the basis of a common metadata model.

This metadata model should not only allow to fulfil discovery purposes (through Catalogues) but should also contain sufficient information so that it can serve as well as the descriptive metadata file that is included in the individual EO Product delivery that allows the users to correctly interpret the products by specifying for instance band ranges and flag values. Obviously it would be best if both uses could be fulfilled by using a single metadata model.

As a broad conclusion of the metadata mapping exercise, we can state that

- The elements contained within the EO Profile of GML largely allow fulfilling the basic discovery use case. A number of smaller schema changes like generalising the compositeType element and a number of minor corrections to resolve inconsistencies between the specification text and the schema (e.g. allowing multiple processingInformation elements) would be required to make use of this standard for EO product discovery in the VITO context.
- For the metadata file that accompanies the EO Product delivery that should contain sufficient information for the correct interpretation of the product, a number of specific additional elements are required.
- Two possible approaches could be followed for incorporating these elements:
  - Derivation of a specific application schema that derives from the base Earth Observation Product schema (eop). This schema with namespace prefix VGT (VGT for Vegetation type of derived products) contains all of the additional elements required for the different product types. Advantage of working with a derived schema is the fact that additional elements can be presented in a structured way (additional elements can be grouped per VITO product group and grouped further thematically). Disadvantages are the fact that with the current approach of working with ebRIM extension packages where all elements of the EO Profile of GML information model are mapped on to ebRIM slots, that an additional CS-W ebRIM extension package would need to be created, in order to be able to fully query and present the added elements. Normal “EO extension package” enabled Catalog clients would in this case not be able to query on and present the additional elements. Also this would require the creation of a new ebRIM extension package specification which would only duplicate the information contained within the derived EO Profile of GML schema. The drawbacks of the current EO ebRIM extension package approach are recognised in the EOxebRIM1.0 Standards Working group where discussions are ongoing about the move to a “light extension package” with the possibility to acquire the full metadata in its original EO Profile of GML based encoding through the use of the GetRepositoryItem operation.
  - Using so-called vendorSpecific/SpecificInformation elements (localAttribute and localValue). This has the disadvantage that the additional elements are not presented in a structured way and the fact that the current way of defining these SpecificInformation elements is however not ideal for querying. The advantage is however that there is no need for development of an ebRIM Catalogue extension package and that hence the Normal “EO extension package” enabled Catalog clients can present all of the information.

During the progress meeting that was held at Spacebel on the 26<sup>th</sup> of November 2008 [AD9], the two approaches were discussed and it was decided to use the extended schema instead of working with

vendorSpecificInformation elements. In addition, it was discussed that the newly proposed elements that could be generally useful for all EO products would be taken up into a list of change requests to be discussed at the OGC standards working group dealing with the EO Profile of GML.

## SIGNATURES

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## DOCUMENT STATUS SHEET

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1	1	2009-02-07	Issue for CDR meeting – numerous changes and additions throughout the document

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# 1 INTRODUCTION

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## 1.1 PURPOSE

This document is the Technical Note on the application of the EO Profile of GML on the VITO EO Product Collections. It is format deliverable identified in WP2000 of the GIM-VITO-ERDAS proposal submitted for the Heterogeneous Missions Accessibility - Testbed (HMA-T) Phase 2 call in reply to the joint Spacebel/ESA ITT AO/HMA-T-2/780 – HMA Testbed Phase 2 [AD01].

## 1.2 SCOPE

The objectives of the HMA-Testbed project are

1. To permit the evolution and testing of the interoperability standards which have been initially defined within the Heterogeneous Missions Accessibility contract, in parallel with the EO Data Access Integration Layer EO-DAIL implementation and the implementation of the specified interfaces within the partners' ground segments.
2. To permit the conformance testing of the HMA adopted standards and to support industry and institutions in the testing of their own products or developments.
3. To support the take-up of HMA defined standards by European Institutional Users (e.g. INSPIRE Legally Mandated Organisations (LMOs) and geospatial software product developers).

The work performed by our Consortium headed by GIM and further consisting of VITO and ERDAS focuses on the EO Product metadata and HMA Product Catalogs.

- The EO Product Metadata standardised within the GML 3.1.1 Application schema for Earth Observation products specification (OGC06-080) is applied to a set of representative VITO EO Products. This study work will allow testing of this specification on a range of products and may lead to the creation of specific derived GML application schemas (as foreseen by this specification). It will also provide VITO with the required experience to allow future adoption of this specification as common EO Product Metadata format.
- Once this study is completed, one of the VITO systems will be selected for the implementation of an HMA Catalog. This Catalog prototype will be setup using ERDAS EbrIM software, it will be implemented by and hosted at GIM and filled with a representative set of metadata.

The subject technical note forms the summary of our findings with respect to the use of the EO Profile of GML for describing the products within the VITO Earth Observation collections.

## 1.3 STRUCTURE OF THE DOCUMENT

This technical note is organised in the following chapters:

Chapter 1 is the introductory chapter that you are currently reading and that lists scope and purpose.

Chapter 2 introduces the different product collections.

Chapter 3 details the metadata mapping.

Chapter 4 lists the comments on the OGC06-080r4 specification that were observed whilst doing this work

Chapter 5 defines the VITO EO Product collections that will be exposed as HMA catalogues.

## 1.4 APPLICABLE DOCUMENTS

AD01	Invitation to tender AO/HMA-T-2/780– HMA Testbed Phase 2, Hoeilaart, 31 January 2008,
AD02	Statement of Work SPB-HMA-T-SOW-002- Issue 1 - Rev. 0, 31 January 2008
AD03	Appendix 3 To Spacebel AO/HMA-T-2/780: Special Conditions of Tender
AD04	Appendix 2 to Spacebel AO/HMA-T-2/780: Draft Contract
AD05	ECSS Space Engineering Standards – Software ECSS E-40B (with tailoring)
AD06	Management, Administrative and Financial proposal - EO Profile of GML and HMA Product Catalog for VITO CVB, CP08028B/SS/ss/001/v01 (2008-04-11)
AD7	Technical proposal HMA-T Phase 2 EO Profile of GML and HMA Catalog for VITO CVB, CP08028B/SS/ss/002/v01 (2008-04-11)
AD8	GML 3.1.1 Application schema for Earth Observation products, OGC 06-080r4, Version 0.9.3, dated 2008/07/21
AD9	HMAT-MOM-2003-SPB, HMA-T PDR / Progress Meeting 26 November 2008 Minutes of Meeting

## 1.5 REFERENCE DOCUMENTS

RD01	OGC Catalogue Services Specification 2.0.2 (Corrigendum 2 Release), OGC 07-006r1
RD02	OGC Catalogue Services - ebRIM profile of CSW (ebRIM) 1.0, OGC 07-110
RD03	OGC 06-131r3 EO Products Extension Package for ebRIM Profile of CSW 2.0 0.1.8
RD04	Vegetation User Guide, <a href="http://www.spot-vegetation.com/vegetationprogramme/Pages/TheVegetationSystem/userguide/userguide.htm">http://www.spot-vegetation.com/vegetationprogramme/Pages/TheVegetationSystem/userguide/userguide.htm</a>
RD05	Vegetation Web Portal: <a href="http://www.vgt.vito.be/">http://www.vgt.vito.be/</a>
RD06	GeoSuccess Web Portal: <a href="http://geofront.vgt.vito.be/">http://geofront.vgt.vito.be/</a>
RD07	GMFS Web Portal <a href="http://www.gmfs.info/">http://www.gmfs.info/</a>
RD08	VGT4Africa Portal: <a href="http://www.vgt4africa.org/">http://www.vgt4africa.org/</a>
RD09	ISO 19115-2 Geographic information - Metadata - Part 2: Extensions for imagery and gridded data, 2008-07-21

## 1.6 ACRONYMS

BAE	Burnt Area Estimate
CSW	Catalogue Services for Web
CVB	VITO Centrum voor Beeldverwerking
DMP	Dry Matter Productivity
EO	Earth Observation
ESA	European Space Agency
ESRIN	European Space Research Institute
fAPAR	Fraction of Absorbed Photosynthetically Active Radiation
fCover	Fractional cover
GeoSuccess	Global Earth Observation in Support of Climate Change and Environmental Security Studies

GML	Geographic Mark-up Language
HDF	Hierarchical Data Format
HMA	Heterogeneous Missions Accessibility
HTTP	Hyper Text Transfer Protocol
ICD	Interface Control Document
ITT	Invitation to Tender
LAI	Leaf Area Index
MIR	Mid-Infrared
MVC	Maximum Value Composite
NDVI	Normalized Difference Vegetation Index
NIR	Near Infra red
NEP	Net Ecosystem Productivity
NPP	Net Primary Productivity
PAR	Photosynthetically Active Radiation
N/A	Not Applicable
OGC	Open Geospatial Consortium
SOW	Statement of Work
SWIR	Short wave Infrared
VGT-P	Vegetation Physical Values
VGT-S1	Vegetation Synthesis over 1 day
VGT-S10	Vegetation Synthesis over 10 days
VGT-D10	Vegetation bidirectional Synthesis over 10 days
VPI	Vegetation Productivity Indicator



## 2 VITO EO PRODUCT COLLECTIONS

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### 2.1 INTRODUCTION

The VITO CVB deals with a number of different EO product collections. Some of these products are “base” EO Products. Others are synthesis products that are created by combining the information contained within products that are acquired over a certain period. Yet others are derived products that are obtained by calculating derived values using the information contained within the EO Products and possibly auxiliary data. In addition VITO is operating airborne sensors.

These products are distributed using a variety of “Distribution and Production” systems that are described in Section 2.2.

The most important products are described in section 2.3.

### 2.2 OVERVIEW OF CVB PRODUCTION AND DISTRIBUTION SYSTEMS

#### 2.2.1 CTIV commercial services (VGT)

This image processing and archiving centre processes all data received from the “VEGETATION” instruments (VGT 1 and VGT2) on board the SPOT4 and SPOT5 satellites. The Vegetation instruments have got 4 spectral bands B0 (Blue 0.43 - 0.47  $\mu\text{m}$ ), B2 (Red 0.61 - 0.68  $\mu\text{m}$ ), B3 (NIR - 0.78 - 0.89  $\mu\text{m}$ ) and MIR (SWIR - 1.58 - 1.75  $\mu\text{m}$ ) developed specifically for monitoring vegetation conditions.

The processing at VITO's CTIV includes the application of corrections for radiometric, atmospheric and geometric effects and composition of global syntheses (daily and over 10 days). In addition the VITO VGT System performs functions as cataloguing, archive management (on disk, on tape), order management, product preparation and delivery on various supports. The products are delivered in the Hierarchical Data Format (HDF) format with accompanying metadata stored in so called logical Volume files (delimited text files). The VGT product Catalogue and ordering system is available at <http://www.vgt.vito.be/> and offers access to the VGT P, VGT S1, VGT S10 and VGT D10 products.

#### 2.2.2 Free VGT

Via the free VGT Website (<http://free.vgt.vito.be/>), a registered user can get access to almost the entire SPOT VEGETATION ten-daily synthesis archive. The products that are offered are extracts from the ten-day global syntheses that are minimally three month old. Products are available in full resolution (1km), in the plate carrée projection and available on 10 predefined regions of interest. The products are delivered via http. Both S10 and D10 extracts are available.

#### 2.2.3 GeoSuccess

The objective of the Geosuccess system is to demonstrate a variety of operational products based on remote sensing data, which give timely information on the evolution of the vegetation cover and its related parameters. Some of these products are calculated in near real time, at the global or regional scale. The products are derived on the basis of the VGT-S10 synthesis products that were described above. The Geosuccess products and services are offered to the users through the webportal <http://www.geosuccess.org>. This website offers a combined Catalogue and ordering system. The products when delivered to the enduser are accompanied by an XML based metadata file that contains identification and evaluation metadata. The contents of this file are based on a proprietary metadata model. The products that are offered via this distribution channel are Net Primary Productivity (NPP), Net Ecosystem Productivity (NEP), Dry Matter Productivity (DMP), Small Water bodies and Apparent Green Cover percentage. Product formats are HDF GeoSuccess, GeoTIFF and Envi.

## 2.2.4 Global Monitoring for Food Security

GMFS (Global Monitoring for Food Security) is a GMES Service Element (GSE) project, part of the ESA contribution to the EU / ESA GMES (Global Monitoring for Environment and Security) Programme. GMFS aims to establish an operational service for crop monitoring in support of Food Security Monitoring to serve policy makers and operational users. The GMFS EO Product Collection Catalogue is implemented using GeoNetwork Open Source with metadata being modelled according to ISO19115. The products can be downloaded over FTP. Frequently produced EO derived products include Vegetation Productivity Indicator, Dry Matter Productivity and Fraction of Absorbed Photo synthetically Active Radiation. Files are offered in ENVI file format.

## 2.2.5 VGT4Africa

VGT4Africa has as objective the distribution of VEGETATION data in Africa through EUMETCast. It is a Specific Support Action (SSA) funded in the EC 6th Framework program (FP6). It aims at setting up an operational and timely distribution system of VEGETATION data from the SPOT satellites and high level derived products to all African countries. The most important products are listed below. Products are delivered in the form of zip archives containing 1 or more pixel data files (in HDF format), an ASCII Copyright information, a Quick Look image (TIFF) and a Product Description file (XML, ISO 19115/19139 format). Products that are offered are VITO's Normalised Difference Water Index (NDWI), Vegetation Productivity Indicator (VPI – developed in GMFS) and S10 NDVI. In addition the system distributes products contributed by JRC (Burnt area, Phenology, Small Water bodies and DMP) and MEDIAS France (Albedo, LAI and fCover)

## 2.3 OVERVIEW OF VITO EO PRODUCTS

The VITO products delivered via the various distribution system described above can be subdivided in the following categories:

Category	Products	Distribution system
Base products	VGT-P	CTIV Commercial Services
Synthesis products	VGT-S1, VGT S-10, VGT D-10 VGTS-10 NDVI	CTIV Commercial Services VGT4Africa
Derived Products	Net Primary Productivity (NPP) Net Ecosystem Productivity (NEP) Dry Matter Productivity (DMP) Small Water Bodies Vegetation Productivity Indicator (VPI) Fraction Absorbed Photosynthetically Active Radiation Normalised Difference Water Index (NDWI) Fractional cover LeafArea Index Albedo Phenology Small Water bodies Burnt Area COPS B AOD and AOD*Maps	Geosuccess Geosuccess Geosuccess/GMFS/VGT4Africa Geosuccess/VGT4Africa GMFS, VGT4Africa GMFS VGT4Africa VGT4Africa VGT4Africa VGT4Africa VGT4Africa VGT4Africa VGT4Africa COPS-B
Airborne	APEX	

## 2.3.1 Base Products

### 2.3.1.1 VGT-P

VGT-P (P= physical values) products are adapted for scientific applications requiring physical measurements. The data is corrected for system errors (error registration of the different channels, calibration of all the detectors along the line-array detectors for each spectral band) and resampled to predefined geographic projections chosen by the user. The pixel brightness count is the ground area's apparent reflectance as seen at the top of atmosphere (TOA). Auxiliary data supplied with the products allow users to process the original reflectance values using their own algorithms. Each pixel in the image represents a ground area of approximately 1km x 1 km. The image products cover all or a part of a VEGETATION segment (data strip over land).

## 2.3.2 Synthesis Products

### 2.3.2.1 VGT-S1

VGT-S1 daily synthesis products are MVC or Maximum Value Composite Syntheses. The pixels selected for the syntheses are based on the selection of the maximum NDVI value from all segments received during one day, to ensure coverage of all landmasses worldwide with a minimum effect of cloud cover. The pixel brightness count is the ground area's reflectance (corrected for atmospheric effects). Pixels in the sea area are set to 0. A map of computed normalised difference vegetation index values (NDVI image plane) is also supplied with the product. Each pixel of a VGT-S product represents a ground area of approximately 1 km x 1 km. The global coverage of a synthesis extends from 75°N to 56°S. A VGT-S1 product can be ordered in a map projection specified by the user, covering the whole world or a selected part (region of interest) defined by the user. These products provide data from all spectral bands, the NDVI and auxiliary data on image acquisition parameters. This product is offered from the VGT Portal.

### 2.3.2.2 VGT-S10

VGT-S10 products (ten day synthesis) are compiled by merging segments (data strips) acquired in a period consisting of ten consecutive days. All the segments of this period are compared pixel by pixel to pick out the 'best' ground reflectance values. These products provide data from all spectral bands, the NDVI and auxiliary data on image acquisition parameters. A MVC synthesis can be delivered with several spatial resolutions (1\*1 km<sup>2</sup> or 4\*4 km<sup>2</sup> or 8\*8 km<sup>2</sup>).

Products are offered from the VGT and free VGT web portals. In addition VGT4Africa delivers the S10 NDVI product which is a subset of the full 10daily Synthesis Product. It only contains the Normalized Difference Vegetation Index or NDVI band. This is a dimensionless index that is indicative for vegetation density and is calculated by comparing the visible and near-infrared sunlight reflected by the surface (reflectance).

### 2.3.2.3 VGT D10

VGT D-10 products are BDC syntheses or BiDirectional Composite syntheses. These syntheses are based on a bidirectional reflectance distribution function. The pixel brightness count is the ground area's reflectance. Pixels in the sea area are set to 0. A VGT-D product covers the whole world or a selected part (region of interest) and can be ordered in a map projection specified by the user. The global coverage of a synthesis extends from 75°N to 56°S. A map of computed normalised difference vegetation index values (NDVI image plane) is also supplied with the product. A BDC synthesis can be delivered with several spatial resolutions (1\*1 km<sup>2</sup> or 4\*4 km<sup>2</sup> or 8\*8 km<sup>2</sup>). This product is offered from the VGT and Free VGT portals.

## 2.3.3 Derived Products

### 2.3.3.1 Net Primary Productivity (NPP)

Net Primary Productivity (NPP) products represent repeatable estimates of the carbon uptake of terrestrial vegetation by photosynthesis subtracted with the autotrophic respiration. These carbon fluxes are

quantified using a remote sensed-based carbon balance product efficiency model wherein the evolution of the radiation absorption efficiency in the PAR (Photosynthetically Active Radiation) band of vegetation is directly inferred from SPOT VGT S10 images, using the Normalized Difference Vegetation Index (NDVI). The products are hence 10 daily products (as the S10 images that they are derived from). They become available with a delay of 3 months.

### **2.3.3.2 Net Ecosystem Productivity (NEP)**

The net ecosystem productivity (NEP) takes into account the soil respiratory flux originating from heterotrophic decomposition of soil organic matter. These carbon fluxes are quantified using the same C-Fix model as described above with the VGT S10 images serving as input. Like for NPP, the products are 10 daily products.

### **2.3.3.3 Dry Matter Productivity (DMP)**

Dry Matter Productivity or DMP products are 10-daily images representing estimates of dry matter, oriented towards agricultural crop monitoring and yield estimation. These DMP-images are very similar to the NPP products, they are also based on the combination of remote sensing imagery (NDVI) converted to fAPAR) with meteorological data in order to obtain estimates of the productivity of the terrestrial vegetation. Different DMP Products are distributed via the GeoSuccess, GMFS and VGT4Africa (MARS-FOOD) systems.

### **2.3.3.4 Small Water bodies**

Small Water Bodies describes the state of small ponds in dry regions. The Global Vegetation Monitoring Unit of JRC has developed a method to map and monitor small water bodies in arid regions using VGT S10 images. Although this instrument provides images of the Earth with a 1-km resolution, it was demonstrated that it is sufficient to accurately map and monitor the presence of water in natural and artificial ponds and swamps of about 1 km<sup>2</sup> in size. The products are available for arid and semi-arid regions in northern Africa with a frequency of 10 days.

### **2.3.3.5 Vegetation Productivity Indicator (VPI)**

The Vegetation Productivity Indicator is used to assess the overall vegetation condition and is a categorical type of difference vegetation index, referenced against the NDVI percentiles of the historical year. The VPI method is a statistical distribution of the NDVI for each 10-day period of the year by applying techniques commonly used in hydrology for the prediction of extreme events. The VPI can be calculated based on DMP (Dry Matter Productivity) or NDVI values. The VPI can be stratified to remove effects of the main vegetation types in order to assess vegetation status. This stratification can be done based on main vegetation types based on best available landcover. The VPI is produced based on SPOT-VGT NDVI and DMP values.

### **2.3.3.6 Fraction of Absorbed Photosynthetically Active Radiation (fAPAR)**

The Fraction of Absorbed Photosynthetically Active Radiation represents the fraction of the solar energy which is absorbed by vegetation and therefore plays the role of a battery during the plant photosynthetic process, they are dimensionless and scaled between 0 and 1. This product is based on ENVISAT MERIS Imagery.

### **2.3.3.7 Normalised Difference Water Index (NDWI)**

The normalised difference water index, NDWI, allows assessing water content in a normalised way. This index increases with vegetation water content or from dry soil to free water. It is a dimensionless index that indicates the presence or absence of water on the surface and is calculated by comparing the shortwave and near-infrared sunlight reflected by the surface (reflectance).

### **2.3.3.8 Fractional cover (fCover)**

The cover fraction fCover is the fraction of green vegetation covering a unit area of horizontal soil. It corresponds to the gap fraction in the nadir direction. It is generally close to fAPAR with the advantage of

being defined independently of illuminations condition making it an intrinsic canopy attribute. For these reasons, fCover is a very good candidate for substitution of classical vegetation indices.

### **2.3.3.9 Leaf Area Index (LAI)**

LAI has been defined as the one sided area of green per unit leaf horizontal soil. It represents the size of the interface between the plant and the atmosphere for energy and mass exchanges. It is thus of prime interest for energy balance, photosynthesis, transpiration and litter production.

### **2.3.3.10 Albedo**

The Albedo product is a measure of the amount of solar energy reflected by a surface and provides information on the radiative balance, thus on temperature and water balance. The albedo is one of the most interesting variable required as a primary input for global circulation models used to forecast short term weather and long term climatic change.

### **2.3.3.11 Phenology**

This product was developed in the framework of the GEOLAND project. The phenology product informs the user about the vegetation development stages as they can be observed from Earth Observation data. These phenological stages are namely the date at which the vegetation starts growing, the date of the maximal growth and a date representing its senescence (an indication of the end of vegetation development). This information is made available at 1km resolution, for the whole African continent, and is updated every 10-days.

### **2.3.3.12 Burnt Area**

The burned area product includes the burned area itself and information about the temporal pattern of the fire activity, i. e. the start and end dates of the fire season. The burned area product is a digital map at full resolution of the extent of surfaces burned during a period of time, in our case the dekad. Start and end of season products provide dates about occurrence of burned surfaces at a reduced resolution, typically half-degree by half-degree. The products are derived from VGT Synthesis data. The product is based on a series of regional algorithms which have been optimised for specific ecosystems and which have been validated.

### **2.3.3.13 COPS-B AOD and AOD\* Maps**

Within the ESA COPS-B Project, VITO produced a set of derived EO Atmosphere Products: Aerosol Optical Depth Maps and Modified Aerosol Optical Depth Maps.

- Starting from the ENVISAT MERIS Level 2 Reduced Resolution products, for each day in the specified period of interest, a selection step is executed selecting all MERIS data products that intersect with a specified region of interest (ROI). For each intersecting MERIS product, the AOD (Aerosol Optical Depth) band is extracted from the MERIS products. This band contains the AOD at 443 nm for land pixels and the AOD at 865 nm for water pixels. The AOD from the MERIS products is then converted to an AOD at 550nm. The AOD data at 550nm (raw non-projected data at 1.2km resolution) is then projected to a 1km Plate Carrée grid.
- Apart from the raw AOD products, a modified AOD product (AOD\*) is also produced, taking into account the effect of the vertical distribution of the aerosols in the atmosphere. Therefore the AOD values are combined with the BLH (Boundary Layer Height) data from ECMWF auxiliary files.

From this base AOD\* data climatologies are derived that combine data over a specific time period.

There is no Product Catalogue for these products, but it is beneficial to apply the EO Profile of GML to these products as typical examples of derived EO Atmosphere products.

## **2.4 AIRBORN SENSORS**

### **2.4.1 APEX**

APEX (<http://apex.vgt.vito.be/>) is an airborne (dispersive push broom) imaging spectrometer developed by a Swiss-Belgian consortium on behalf of ESA. It is intended as a simulator and a calibration and validation device for future spaceborne hyperspectral imagers. Furthermore, APEX is an advanced scientific instrument for the European remote sensing community, recording hyperspectral data in approximately 300 bands in the wavelength range between 400 nm and 2500 nm and at a spatial ground resolution of 2 m to 5 m

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## 3 MAPPING OF VITO PRODUCT METADATA TO EO PROFILE OF GML

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### 3.1 INTRODUCTION

In this section we describe the mapping of the existing metadata descriptions onto the EO Profile of GML for one representative product per product category.

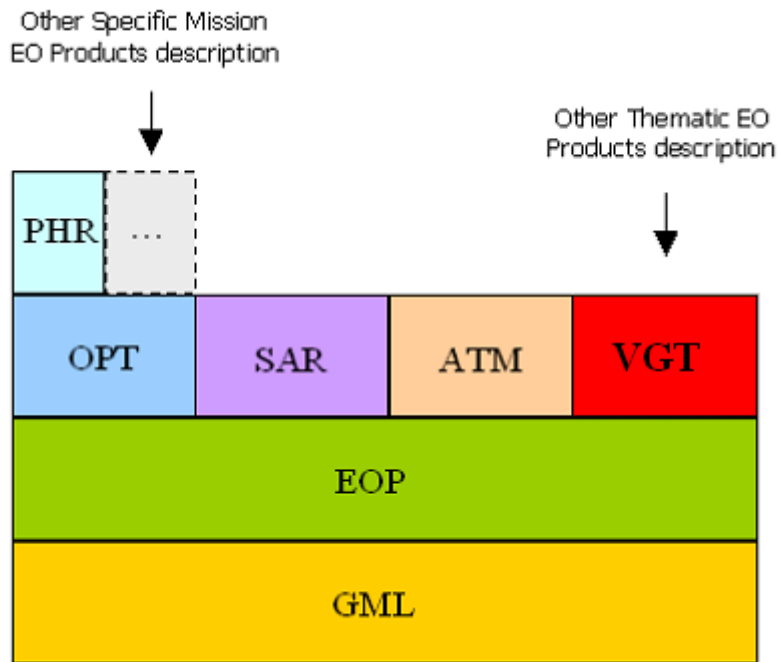
The mapping tables are given in this chapter and the corresponding EO Profile of GML instances are included in Annex 1.

The conclusion of the mapping exercise is that with a number of minor modifications and a number of additional elements, the EO Profile of GML becomes suitable for describing all of the VITO EO Products and this both for discovery from Catalogues as for descriptive metadata files that contain the required information to interpret the products.

The required modifications to the basic EO Profile of GML Specification are listed in section 4 and the list of additional elements is given per type of product in the mapping tables below.

For these additional elements, there are two options:

- Either a derived schema is developed on top of the base Earth Observation Product (eop) schema (graphically represented in Figure 1).
  - Advantages:
    - Both for Catalogue and “accompanying product file” use: Allows modelling the additional information elements in a structured way with nested elements that are grouped per type of product and per “type of additional information”.
    - For Catalogue use: Allows to use the new elements as queryables. To note however that the elements under consideration in this document are not required for querying).
  - Disadvantages:
    - For Catalogue use: limit the interoperability since the client must know the specific schema to understand/display the returned objects.
    - For Catalogue use and supposing the current approach of mapping all of the extended schema elements to ebRIM slots: requires non negligible developments including the creation of the new specific Schema extending the EO schema, create and manage the new namespace, create and manage the new objects, extend the model to map the new parameters to the GML generation and extend the factory to generate the new objects.
- Or one uses the so-called vendorSpecific/SpecificInformation elements (localAttribute and localValue).
  - Advantages:
    - For Catalogue Use: Interoperability can be understood by any client understanding the base EO extension package
    - For Catalogue Use: Easy to implement
  - Disadvantages:
    - Both for Catalogue and “accompanying product file” use: information cannot be structured
    - The link between the name and the value is in the order of the elements, this is difficult to query and to understand. Alternative way of working could be to use a kind of key-value pair structure.



**Figure 1 Schema Hierarchy**

It must be noted that there are currently discussions ongoing in the EOxebRIM1.0 standards working group that would facilitate working with derived schemas by development of a “light extension package” with the possibility to acquire the full metadata in its original EO Profile of GML based encoding through the use of the GetRepositoryItem operation.

A derived “thematic” schema with namespace prefix vgt for “vegetation derivedproducts” has been developed and is included as Annex 2 with a schema view presented in Figure 2.



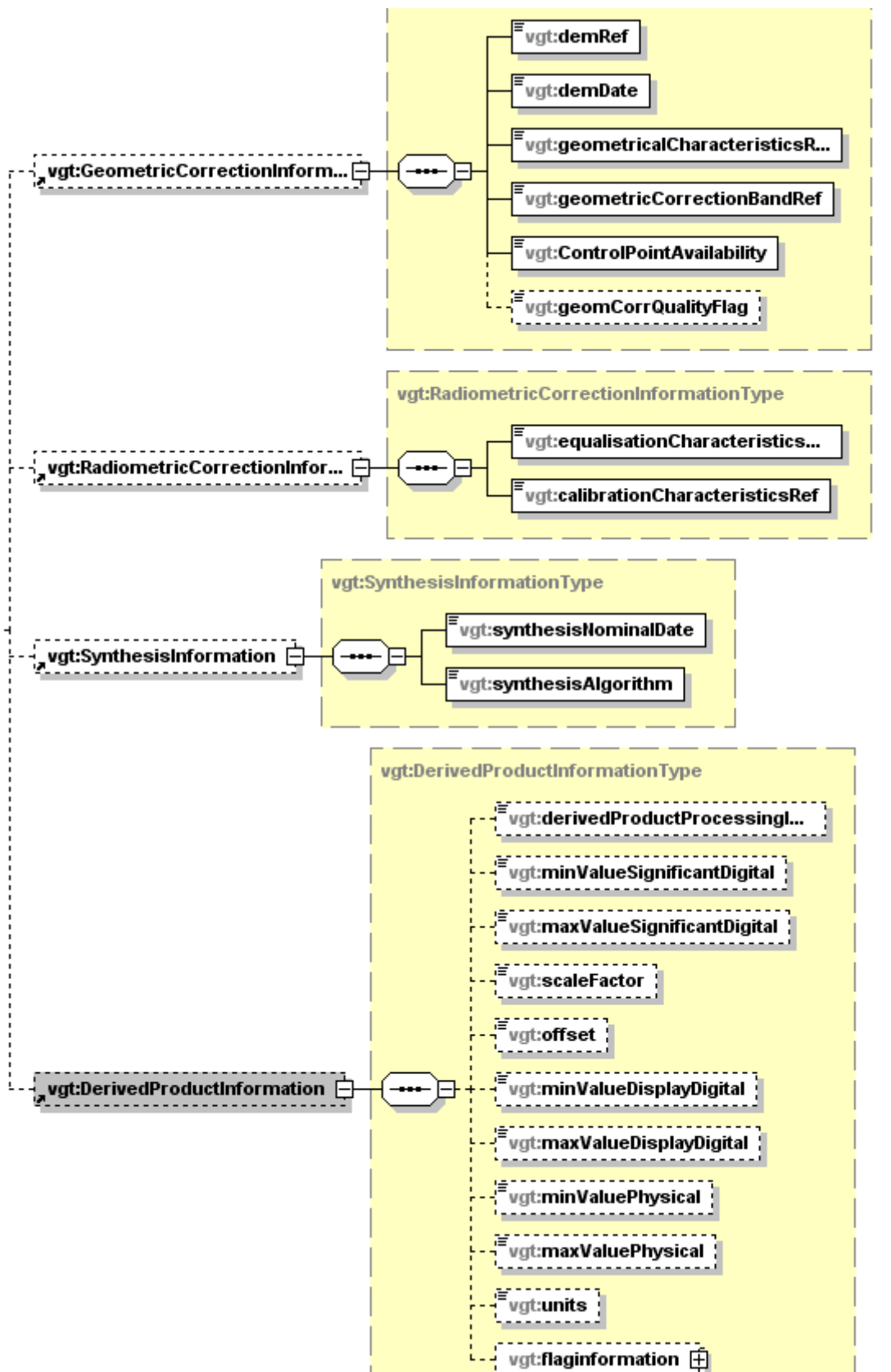


Figure 2 CVB Schema View

### 3.2 BASE PRODUCTS

The only product that falls in this category is the VGT-P or Physical Values product. The metadata that was used in the metadata mapping exercise was based on the two following information sources:

- The existing VGT Catalog portal that shows all current Catalog queryables and returnables that is shown in Figure 3.
- The VGT “Logical Volume Files” that are shipped with the products and that detail the metadata elements that are required for correct use of the product.

**Segment details**

**Query criteria:**

47.78761

R.O.I.: -27.7533 79.29515 First year: 2008 Last year: 2008

6.371681

Instrument: VGT2

**ID:** V220081105218

**Instrument:** VGT2

**Track:** 116

**Reference timestamp:** Nov 5, 2008 4:37:56 AM

**Start timestamp:** Nov 5, 2008 4:29:21 AM

**End timestamp:** Nov 5, 2008 4:46:31 AM

**Top-left corner:** (81.046;66.6281)

**Top-right corner:** (124.6838;59.3868)

**Bottom-left corner:** (73.4984;7.0984)

**Bottom-right corner:** (93.5106;2.6631)

**On-board gain B0:** 3

**On-board gain B2:** 2

**On-board gain B3:** 3

**On-board gain MIR:** 2

**Area:** 2,836,711 Km<sup>2</sup>

**Maximum uncompressed size:** 56.811 MB

**Maximum compressed size:** 14.202 MB

**Special:**

**Figure 3 CTIV Catalogue "Present Information"**

The mapping of the metadata is shown in the following table. It must hereby be noticed that not all elements presented here should be taken up into a discovery Catalogue, some of them are only required for the metadata that accompanies a product delivery.

- The elements highlighted in pink are the ones that can be expressed using the base eop information model provided that this model evolves as per our proposed change requests.
- The elements highlighted in yellow are the VITO VGT specific elements which have been defined in a specific VGT Schema.

Field Name	Field Description	VITO metadata element name	Example Values
EO Profile of GML (OGC06-80r4)	EO Profile of GML (OGC06-80r4)	LogVol: Logical Volume Files CVBCat: CVB Catalogue	

gml:validTime/gml:TimePeriod/gml:beginPosition	Acquisition start date time:dateTime in ISO 8601 format (CCYY- MM- DDThh:mm[:ss[.cc]]Z)	LogVol: SEGM_FIRST_DATE LogVol: SEGM_FIRST_TIME CVBCat: Start TimeStamp CVBCat: End TimeStamp	2007-05- 10T5:57:20Z
gml:validTime/gml:TimePeriod/gml:endPosition	Acquisition end date time:dateTime in ISO 8601 format (CCYY- MM- DDThh:mm[:ss[.cc]]Z)	LogVol:SEGM_LAST_DATE LogVol:SEGM_LAST_TIME	2007-05- 10T061319Z
Identifier	Identifier for metadata item, includes ground segment namespace to guarantee uniqueness within EOP	LogVol:PRODUCT_ID CVBCat: ID	vito:vgt:p:V2KRNP ____20070510F1 58
ParentIdentifier	Collection Identifier		vito:vgt:p
AcquisitionType	Used to distinguish at a high level the appropriateness of the acquisition for "general" use, whether the product is a nominal acquisition, special calibration product or other.Values: - NOMINAL - CALIBRATION - OTHER	Not included in existing metadata but mandatory for EO Profile of GML	NOMINAL
ProductType	Describes product type in case that mixed types are available within a single collection, this is ground segment specific definition	TBD: Is this element mandatory or not? Schema implies it is. Document text states cardinality of 0..1. We propose to make this optional in which case this element will not be filled for the VITO products	vito:vgt:p1
Status	Refers to product status.Values : - ARCHIVED - ACQUIRED - CANCELLED - FAILED - PLANNED - POTENTIAL - REJECTED		ARCHIVED
downlinkedTo/DownlinkInformation/ /acquisitionStation	Acquisition / receiving station code. Possible values are mission specific and should be retrieved using codespace.		KIRUNA
archivedIn/ArchivingInformation/arc hivingCenter	Archiving center code. Possible values are mission specific and should be retrieved using codeSpace.	CVB Archiving Facility	CAF
archivedIn/ArchivingInformation/arc hivingDate	Archiving date time.	LogVol: PRODUCTION_DATE	2007-05- 11T00:00:00.0
processing/ProcessingInformation/ processingCenter	Processing center code. Possible values are mission specific and should be retrieved using codeSpace.		CVB
processing/ProcessingInformation/ processingDate	Processing date time	LogVol: PRODUCTION_DATE	20070511T00:00: 00

processing/ProcessingInformation/method	Method used to compute datalayer. (e.g. Kalman filtering, ROSE)	2 Processing steps should be described but issue with the cardinality of the elements.	CLOUDCOVER SNOWCOVER
processing/ProcessingInformation/processorName	Processor software name (e.g. FastROSE)	logVol: CLOUD_COVER_REF logVol: SNOW_COVER_REF	CTIV_CLOUDCOVER CTIV_SNOWICECOVER
processing/ProcessingInformation/processorVersion	Processor software version (e.g. 1.0)	logVol: CLOUD_COVER_REF logVol: SNOW_COVER_REF	V2.0 V2.0
processing/ProcessingInformation/processingLevel	Processing level applied to the product		LEVEL 1
processing/ProcessingInformation/nativeProductFormat	Native product format		HDF
platform/Platform/shortName	Platform short name (e.g. PHR)		SPOT
platform/Platform/serialIdentifier	Platform serial identifier (e.g. for PHR : 1A)		5
instrument/Instrument/shortName	Instrument (Sensor) name	Logvol:ProductID CVBCat: Instrument	VGT2
sensor/Sensor/sensorType	Sensor type. This field should contain an enumeration : - OPTICAL - RADAR - ALTIMETRIC - ATMOSPHERIC		OPTICAL
sensor/Sensor/resolution	Sensor resolution.	Uom =m	1000
sensor/Sensor/swathIdentifier	Swath identifier (e.g. Envisat ASAR has 7 distinct swaths (I1,I2,I3...I7) that correspond to precise incidence angles for the sensor). Value list can be retrieved with codeSpace.	Logvol:GROUND_TRACK_NUMBER CVBCat: Track	GTN_95
acquisitionParameters/Acquisition/orbitNumber	Acquisition orbit number	Logvol:ORBIT_NUMBER	338

MultiExtentOf	Acquisition footprint coordinates, described by a closed polygon (last point=first point), using CRS:WGS84, Latitude,Longitude pairs (per-WGS84 definition of point ordering, not necessarily per all WFS implementations). Multi polygons are allowed.	Logvol:GEO_UPPER_LEFT_LAT Logvol:GEO_UPPER_LEFT_LONG Logvol:GEO_UPPER_RIGHT_LAT Logvol:GEO_UPPER_RIGHT_LON Logvol:GEO_LOWER_RIGHT_LAT Logvol:GEO_LOWER_RIGHT_LON Logvol:GEO_LOWER_LEFT_LAT Logvol:GEO_LOWER_LEFT_LON CVBCat:ROI	<gml:multiExtentOf><gml:MultiSurface><gml:srsName="EPSG:4326"><gml:surfaceMembers><gml:Polygon><gml:srsName="EPSG:4326"><gml:exterior><gml:LinearRing><gml:posList>72.410714 54.901786 72.410714 112.803571 12.491071 112.803571 12.491071 54.901786 72.410714 54.901786</gml:posList></gml:LinearRing></gml:exterior></gml:Polygon></gml:surfaceMembers></gml:MultiSurface></gml:multiExtentOf>
CenterOf	Acquisition center coordinates	Logvol:CARTO_CENTRE_X Logvol:CARTO_CENTRE_Y	<gml:centerOf><gml:Point><gml:pos>42.450893 83.852679</gml:pos></gml:Point></gml:centerOf>
browse/BrowseInformation/type	Browse type.Possible values are : - THUMBNAIL - QUICKLOOK - ALBUM.		QUICKLOOK
browse/BrowseInformation/fileName	Path to the browse image (could be any kind of URL : direct link to the image or WMS/WCS interface), it is assumed that if a client is prepared to "manage" a browse delivered by e.g. WMS they would parse the URL to identify that it contains the OGC standard SERVICE=WMS	CVBCat	<a href="http://suvweb.vgt.vito.be/suv/vusbe_t_o_suvweb/thumbnails/200808/THUMB_V220080806104_SEGM.jpg">http://suvweb.vgt.vito.be/suv/vusbe_t_o_suvweb/thumbnails/200808/THUMB_V220080806104_SEGM.jpg</a>
product/ProductInformation/size	Product size (bytes) allowing the user to realise how long a download is likely to take	CVBCat	56811000
mask/MaskInformation/type	Mask type. Possible values are : SNOW, CLOUD and QUALITY		CLOUD SNOW
mask/MaskInformation/format	Mask format. Possible values are : RASTER or VECTOR		RASTER

mask/MaskInformation/referenceSystemIdentifier	Indicates if mask is geo-referenced, and thus can be assumed to be displayed directly on a map (in which case should point to a code space for the CRS), when not supplied it is assumed that the mask is provided in "raw" satellite frame of reference		EPSG:4326
mask/MaskInformation/Filename	Path to the mask (could be any kind of URL : direct link to the image or WMS/WCS interface in case of RASTER mask; direct link to the file or WFS interface in case of VECTOR file), it is assumed that if a client is prepared to "manage" a mask delivered by e.g. WMS they would parse the URL to identify that it contains the OGC standard SERVICE=WMS	PRODUCTID (mask is included in the file)	V2KRNP____20070510F158
vgt:EarthObservationMetadata/GeometricCorrectionInformation/DemReference	Reference of the DEM used for geometric corrections	DEM_REF	dtm_vgt_system_proj
vgt:EarthObservationMetadata/GeometricCorrectionInformation/DemDate	DEM used for geometric corrections - Date of validity	DEM_DATE	1997-12-05
vgt:EarthObservationMetadata/GeometricCorrectionInformation/GeometricalCharacteristics	Reference to the instrument geometrical characteristics	GEOM_CHAR_REF	V2_G_000_2002_07_24_01.PCI
vgt:EarthObservationMetadata/GeometricCorrectionInformation/DemDate/GeometricCorrectionBandReference	Reference band used for geometric modeling	GEOM_BAND_REF	B3
vgt:EarthObservationMetadata/GeometricCorrectionInformation/ControlPointAvailability (*)	Use of Ground control point to locate segment	USE_GCP	Y
vgt:EarthObservationMetadata/GeometricCorrectionInformation/GeomCorrQualityFlag	Geometrical quality indicator	GEOM_QUALITY_FLAG	GOOD
vgt:EarthObservationMetadata/RadiometricCorrectionInformation/Radiometric	Reference to instrument equalization characteristics	RADIOM_EQUAL_REF	V2_E_126_2007_04_28_02.PCI
vgt:EarthObservationMetadata/RadiometricCorrectionInformation/GeomCorrQualityFlag	Reference to instrument absolute calibration characteristics	RADIOM_ABS_CAL_REF	V2_A_000_2007_05_01_05.PCI

(\*) The name of this element is derived from the ISO19115 Part 2 standard.

The conclusion is that

- For product discovery these products can be well described with metadata corresponding to the “opt” schema except for the following 2 issues:
  - We would like to describe multiple processing steps with the version of the algorithms are used etc. This appears not to be possible. The <eop:processing> element can occur only once within the

<eop:EarthObservationMetaData> element and within the <eop:processing> the <eop:ProcessingInformation> element can appear only once. Within <eop:ProcessingInformation> finally all elements have a maximum cardinality of 1. This appears to contradict the Specification text that in table 4 Specifies a cardinality of 0..n

- productType is mandatory according to the eop schema definition. The table inside the specification document however states that it has a cardinality of 0..1?
- In order to obtain a metadata file that can be delivered together with the product to provide the information that is currently included in the logical volume files, some fields must be added related to the geometric and radiometric correction. This was done in a separate schema with namespace prefix vgt (VITO's Centrum voor Beeldverwerking) that extends the eop:EarthObservationMetaData to add 5 elements related to <GeometricCorrectionInformation> and 2 elements related to <RadiometricCorrectionInformation>. This schema is attached in Annex 1. If these elements would prove also to be useful for other products, these could potentially be moved to the base eop schemas under ProcessingInformation.

### 3.3 SYNTHESIS PRODUCTS

This category contains the 1 and 10 daily maximum value and bidirectional composites S1, S10 and D10.

The metadata that was used in the metadata mapping exercise was – as for VGT-P - based on two elements:

- The VGT Catalog that shows the metadata elements useful for discovery
- The VGT “Logical Volume Files” that are shipped with the products and that detail the metadata elements that are required for correct use of the product.

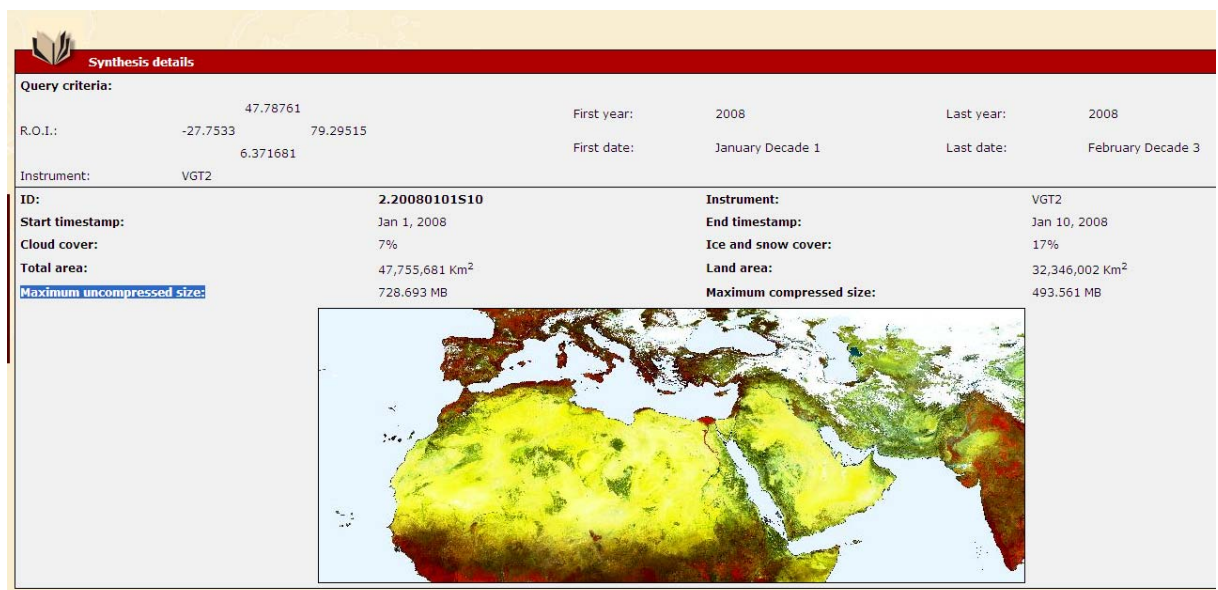


Figure 4 VGT Catalog "Present Information " for S10

The mapping of the metadata is shown in the following table for the S10 example (S1 and D10 are very similar):

- The elements highlighted in pink are the ones that can be expressed using the base eop information model provided that this model evolves as per our proposed change requests.
- The elements highlighted in yellow are the VITO VGT specific elements which have been defined in a specific VGT Schema.

Field Name	Field Description	VITO metadata element name	Example Values
EO Profile of GML (OGC06-80r4)	EO Profile of GML (OGC06-80r4)	LogVol: Logical Volume Files CVBCat: CVB Catalogue	
gml:validTime/gml:TimePeriod/gml:beginPosition	Acquisition start date timedateTime in ISO 8601 format (CCYY-MM-DDThh:mm:ss[.cc]Z)	LogVol: SYNTHESIS_FIRST_DATE CVBCat:StartTimestamp	2007-05-10 21:41:30Z
gml:validTime/gml:TimePeriod/gml:endPosition	Acquisition end date timedateTime in ISO 8601 format (CCYY-MM-DDThh:mm:ss[.cc]Z)	LogVol SYNTHESIS_LAST_DATE CVBCat:EndTimestamp	2007-05-20 22:59:36Z
Identifier	Identifier for metadata item, includes ground segment namespace to guarantee uniqueness within EOP	LogVol PRODUCT_ID CVBCat:ID	vito:vgt:s10:V2KRNS10__20070511E
ParentIdentifier	Collection Identifier		vito:vgt:s10
AcquisitionType	Used to distinguish at a high level the appropriateness of the acquisition for "general" use, whether the product is a nominal acquisition, special calibration product or other. Values: - NOMINAL - CALIBRATION - OTHER		NOMINAL
ProductType	Describes product type in case that mixed types are available within a single collection, this is ground segment specific definition		vito:vgt:s10
Status	Refers to product status. Values : - ARCHIVED - ACQUIRED - CANCELLED - FAILED - PLANNED - POTENTIAL - REJECTED		ARCHIVED
downlinkedTo/DownlinkInformation/acquisitionStation	Acquisition / receiving station code. Possible values are mission specific and should be retrieved using codespace.		KIRUNA
archivedIn/ArchivingInformation/archivingCenter	Archiving center code. Possible values are mission specific and should be retrieved using codeSpace.	CVB Archiving Facility	CAF
archivedIn/ArchivingInformation/archivingDate	Archiving date time.	LogVol: PRODUCTION_DATE	20070611T00:00:00Z
processing/ProcessingInformation/processingCenter	Processing center code. Possible values are mission specific and should be retrieved using codeSpace.		CVB



processing/ProcessingInformation/processingDate	Processing date time	LogVol:PRODUCTION_DATE	20070611T00:00:00Z
processing/ProcessingInformation/compositeType	Composite type of product, if available		P10D
processing/ProcessingInformation/method	Method used to compute datalayer. (e.g. Kalman filtering, ROSE)		CLOUDCOVER SNOWCOVER ATMOSPHERIC CORRECTION
processing/ProcessingInformation/methodVersion	Method version (e.g. 1.0)		
processing/ProcessingInformation/processorName	Processor software name (e.g. FastROSE)	LogVol: CLOUD_COVER_REF LogVol: SNOW_COVER_REF LogVol: ATMOS_CORR_REF	CTIV_CLOUD_COVER CTIV_SNOW_ICE_COVE R CTIV_SMAC
processing/ProcessingInformation/processorVersion	Processor software version (e.g. 1.0)	LogVol: CLOUD_COVER_REF LogVol: SNOW_COVER_REF LogVol: ATMOS_CORR_REF	V2.0 V2.0 V4.0
platform/Platform/shortName	Platform short name (e.g. PHR)		SPOT
platform/Platform/serialIdentifier	Platform serial identifier (e.g. for PHR : 1A)		5
instrument/Instrument/shortName	Instrument (Sensor) name		VGT2
sensor/Sensor/sensorType	Sensor type. This field should contain an enumeration : - OPTICAL - RADAR - ALTIMETRIC - ATMOSPHERIC		OPTICAL
sensor/Sensor/resolution	Sensor resolution.		1000
MultiExtentOf	Acquisition footprint coordinates, described by a closed polygon (last point=first point), using CRS:WGS84, Latitude,Longitude pairs (per-WGS84 definition of point ordering, not necessarily per all WFS implementations). Multi polygons are allowed.	LogVol:GEO_UPPER_LEFT_LAT LogVol:GEO_UPPER_LEFT_LONG LogVol:GEO_UPPER_RIGHT_LAT LogVol:GEO_UPPER_RIGHT_LON LogVol:GEO_LOWER_RIGHT_LAT LogVol:GEO_LOWER_RIGHT_LON GEO_LOWER_LEFT_LAT LogVol:GEO_LOWER_LEFT_LON	<gml:multiExtentOf><gml:MultiSurface srsName="EPSG:4326"><gml:surfaceMembers><gml:Polygon srsName="EPSG:4326"><gml:exterior><gml:LinearRing> <gml:posList>38 -26 38 60 -35 60 -35 -26 38 -26</gml:posList></gml:LinearRing></gml:exterior></gml:Polygon></gml:surfaceMembers></gml:MultiSurface></gml:multiExtentOf>
centerOf	Acquisition center coordinates	LogVol:CARTO_CENTERX LogVol:CARTO_CENTER_Y	<gml:centerOf> <gml:Point> <gml:pos>1.5 17.0</gml:pos> </gml:Point> </gml:centerOf>
browse/BrowseInformation/type	Browse type. Possible values are : - THUMBNAIL - QUICKLOOK - ALBUM.		QUICKLOOK
browse/BrowseInformation/filename	Path to the browse image (could be any kind of URL : direct link to the image or WMS/WCS interface), it is assumed that if a client is prepared to "manage" a browse delivered by e.g. WMS they would parse the URL to identify that it contains the OGC standard SERVICE=WMS	CVBCat:quicklook	<a href="http://suvweb.vgt.vito.be/suv/vusbe_to_suvweb/previews/20081120/PREV_2_20080101S10_COMP_47_112511.jpg">http://suvweb.vgt.vito.be/suv/vusbe_to_suvweb/previews/20081120/PREV_2_20080101S10_COMP_47_112511.jpg</a>

product/ProductInformation/referenceSystemIdentifier	Indicates if product is geo-referenced, (in which case should point to a code space for the CRS), when not supplied it is assumed that the browse is provided in "raw" satellite frame of reference		EPSG:4326
product/ProductInformation/size	Product size (bytes) allowing the user to realise how long a download is likely to take	CVBCat: Maximum uncompressed size	6985569
mask/MaskInformation/type	Mask type. Possible values are : SNOW, CLOUD and QUALITY		CLOUD SNOW
mask/MaskInformation/format	Mask format. Possible values are : RASTER or VECTOR		RASTER RASTER
mask/MaskInformation/referenceSystemIdentifier	Indicates if maske is geo-referenced, and thus can be assumed to be displayed directly on a map (in which case should point to a code space for the CRS), when not supplied it is assumed that the mask is provided in "raw" satellite frame of reference		EPSG:4326
mask/MaskInformation/fileName	Path to the mask (could be any kind of URL : direct link to the image or WMS/WCS interface in case of RASTER mask; direct link to the file or WFS interface in case of VECTOR file), it is assumed that if a client is prepared to "manage" a mask delivered by e.g. WMS they would parse the URL to identify that it contains the OGC standard SERVICE=WMS		vito:vgt:s10:V2KRNS10__20070511E
opt:EarthObservationResult/opt:cloudCoverPercentage	Cloud cover percentage (i.e. uom='%')	CVBCat: Cloud Cover	7
opt:EarthObservationResult/opt:cloudCoverPercentageQuotationMode	Indicator to know how the cloud cover percentage has been calculatedValue : AUTOMATIC, MANUAL		AUTOMATIC
opt:EarthObservationResult/opt:snowCoverPercentage	Snow cover percentage (i.e. uom='%')	CVBCat: SnowIceCover	3
opt:EarthObservationResult/opt:snowCoverPercentageQuotationMode	Indicator to know how the snow cover percentage has been calculatedValue : AUTOMATIC, MANUAL		AUTOMATIC
vgt:EarthObservationMetadata/GeometricCorrectionInformation/DemReference	Reference of the DEM used for geometric corrections	LogVol:DEM_REF	dtm_vgt_system_proj

vgt:EarthObservationMetadata/GeometricCorrectionInformation/DemDate	DEM used for geometric corrections - Date of validity	LogVol:DEM_DATE	19971205
vgt:EarthObservationMetadata/GeometricCorrectionInformation/GeometricalCharacteristics	Reference to the instrument geometrical characteristics	LogVol:GEOM_CHAR_REF	V2_G_000_2002_07_24_01.PCI
vgt:EarthObservationMetadata/GeometricCorrectionInformation/DemDate/GeometricCorrectionBandReference	Reference band used for geometric modeling	LogVol:GEOM_BAND_REF	B3
vgt:EarthObservationMetadata/GeometricCorrectionInformation/ControlPointAvailability	Use of Ground control point to locate segment	LogVol:USE_GCP	Y
vgt:EarthObservationMetadata/RadiometricCorrectionInformation/Radiation	Reference to instrument equalization characteristics	LogVol:RADIOM_EQUAL_REF	V2_E_126_2007_04_28_02.PCI
vgt:EarthObservationMetadata/RadiometricCorrectionInformation/GeomCorrQualityFlag	Reference to instrument absolute calibration characteristics	LogVol:RADIOM_ABS_CAL_REF	V2_A_000_2007_05_01_05.PCI
vgt:EarthObservationMetadata/SynthesisInformation/SynthesisNominalDate	Nominal date assigned to synthesis	LogVol:SYNTHESIS_NOM_DATE	20070511
vgt:EarthObservationMetadata/SynthesisInformation/SynthesisAlgorithm	Synthesis Algorithm	SYNTHESIS_REF	CTIV_SYNTHESIS_V1.0

The conclusion for the synthesis products is that

- For product discovery these products can be well described with metadata corresponding to the “opt” schema except for the following issue (in addition to the ones already mentioned for VGT-P):
  - The VGT-S10 and VGT-D10 composites are synthesis products that are obtained by merging data acquired over 10 days. In order to describe these types of products, the value “10 - daily” should be added to the enumeration of the processing/ProcessingInformation/compositeType element. A better solution however is to change the type of the compositeType element from a string to an xs:duration which allows to encode time period values as per the ISO8601 standard. E.g. P10D: 10-daily, P1M: Monthly, ...
- In order to obtain a metadata file that can be delivered together with the product to provide the information that is currently included in the logical Volume files, two fields additional to the radiometric and geometric correction information fields described for VGT-P are required. These elements are the nominal date of the synthesis and the reference to the synthesis algorithm.

A VGT-S10 metadata instance can be found under Annex 1.

### 3.4 DERIVED PRODUCTS

All value-added products that are derived on the basis of the VGT products in projects like GeoSuccess, GMFS and VGT4Africa fall in this category. The mapping of the metadata was performed on the basis of the VGT4Africa products which are the more recent developments. Metadata requirements for the other products are similar.

Input for the metadata mapping are the metadata files that are currently shipped together with the products. For VGT4Africa, these consist of ISO19115/ISO19139 encoded files. An example of such a metadata file is included in Annex 3.

The mapping of the metadata is shown in the following tables for the Dry Matter Productivity Product, the and:

Field Name	Field Description	Example Values
EO Profile of GML (OGC06-80r4)	EO Profile of GML (OGC06-80r4)	
gml:validTime/gml:TimePeriod/gml:beginPosition	Acquisition start date time/dateTime in ISO 8601 format (CCYY-MM-DDThh:mm[:ss[.cc]]Z)	2008-09-01T00:00:00

gml:validTime/gml:TimePeriod/gml:endPosition	Acquisition end date time dateTime in ISO 8601 format (CCYY-MM-DDThh:mm[:ss].[cc]]Z)	2008-09-10T23:59:59
Identifier	Identifier for metadata item, includes ground segment namespace to guarantee uniqueness within EOP	vito:vgt4A:dmp:20080901_DMP
parentIdentifier	Collection Identifier	vito:vgt4A:dmp
acquisitionType	Used to distinguish at a high level the appropriateness of the acquisition for "general" use, whether the product is a nominal acquisition, special calibration product or other. Values: - NOMINAL - CALIBRATION - OTHER	NOMINAL
productType	Describes product type in case that mixed types are available within a single collection, this is ground segment specific definition	vito:vgt4A:dmp
Status	Refers to product status. Values : - ARCHIVED - ACQUIRED - CANCELLED - FAILED - PLANNED - POTENTIAL - REJECTED	ARCHIVED
archivedIn/ArchivingInformation/archivingCenter	Archiving center code. Possible values are mission specific and should be retrieved using codeSpace.	CAF
archivedIn/ArchivingInformation/archivingDate	Archiving date time.	2008-09-14T00:00:00.0
processing/ProcessingInformation/processingCenter	Processing center code. Possible values are mission specific and should be retrieved using codeSpace.	CVB
processing/ProcessingInformation/processingDate	Processing date time	2008-09-14T00:00:00.0
processing/ProcessingInformation/compositeType	Composite type of product, if available	10-daily
processing/ProcessingInformation/method	Method used to compute datalayer. (e.g. Kalman filtering, ROSE)	DMP Calculation
processing/ProcessingInformation/processorName	Processor software name	PI_backU.exe
processing/ProcessingInformation/processorVersion	Processor software version (e.g. 1.0)	V710)
platform/Platform/shortName	Platform short name (e.g. PHR)	SPOT
platform/Platform/serialIdentifier	Platform serial identifier (e.g. for PHR : 1A)	5
Instrument/Instrument/shortName	Instrument (Sensor) name	VGT2
sensor/Sensor/sensorType	Sensor type. This field should contain an enumeration : - OPTICAL - RADAR - ALTIMETRIC - ATMOSPHERIC	OPTICAL
sensor/Sensor/resolution	Sensor resolution.	0.00892857142857 (uom =deg)
multiExtentOf	Acquisition footprint coordinates, described by a closed polygon (last point=first point), using CRS:WGS84, Latitude,Longitude pairs (per-WGS84 definition of point ordering, not necessarily per all WFS implementations). Multi polygons are allowed.	<gml:multiExtentOf><gml:MultiSurface srsName="EPSG:4326"><gml:surfaceMembers><gml:Polygon srsName="EPSG:4326"><gml:exterior><gml:LinearRing><gml:posList>38 -26 38 60 -35 60 -35 -26 38 -26</gml:posList></gml:LinearRing></gml:exterior></gml:Polygon></gml:surfaceMembers></gml:MultiSurface></gml:multiExtentOf>
Browse/BrowseInformation/type	Browse type. Possible values are : - THUMBNAIL - QUICKLOOK - ALBUM.	QUICKLOOK
Browse/BrowseInformation/fileName	Path to the browse image (could be any kind of URL : direct link to the image or WMS/WCS interface), it is assumed that if a client is prepared to "manage" a browse delivered by e.g. WMS they would parse the URL to identify that it contains the OGC standard SERVICE=WMS	20080901_QL.TIF

Product/ProductInformation/filename	Path to the actual product data if available online (could be any kind of URL : direct link to the image or WMS/WCS interface), it is assumed that if a client is prepared to "manage" a product delivered by e.g. WCS they would parse the URL to identify that it contains the OGC standard SERVICE=WCS	20080901_DMP.HDF
vgt:EarthObservationMetadata/DerivedProductInformation/DerivedProductProcessingInformation	Specific Processing Information	VGT-NDVI=m:\dgl\rois\gp\act\10\vt0825i.img, Pmax=m:\dgl\rois\gp\met\10\wt0825p.img, IPol=0
vgt:EarthObservationMetadata/DerivedProductInformation/minValueSignificantDigital	Min Significant Value –digital	0
vgt:EarthObservationMetadata/DerivedProductInformation/maxValueSignificantDigital	Max Significant Value –digital	32767
vgt:EarthObservationMetadata/DerivedProductInformation/scaleFactor	Scalefactor between digital and physical values	0.01
vgt:EarthObservationMetadata/DerivedProductInformation/offset	Offset	0
vgt:EarthObservationMetadata/DerivedProductInformation/minValueDisplayDigital	Min Significant Value –digital for display	0
vgt:EarthObservationMetadata/DerivedProductInformation/maxValueDisplayDigital	Max Significant Value –digital for display	32767
vgt:EarthObservationMetadata/DerivedProductInformation/minValuePhysical	Min Physical Value	0
vgt:EarthObservationMetadata/DerivedProductInformation/maxValuePhysical	Max Physical Value	327.67
vgt:EarthObservationMetadata/DerivedProductInformation/units	Units of measure for physical values	kgDM/ha/day
vgt:EarthObservationMetadata/DerivedProductInformation/flagInformation/flagCode	Code for specific Flag	Snow
vgt:EarthObservationMetadata/DerivedProductInformation/flagInformation/flagDescription	Description for specific Flag	Snow
vgt:EarthObservationMetadata/DerivedProductInformation/flagInformation/flagValue	Digital Flag value	-3

The conclusion is that:

- For product discovery these products can be well described with metadata corresponding to the "eop" schema
- In order to obtain a metadata file that can be delivered together with the product to provide the information that is currently included in the ISO19115/ISO19139 based XML metadata files, a set of elements need to be added that describe the band information contained within the files. This includes elements like min and max values, scale factors and offsets. Elements like these are defined in ISO19115/ISO19139 (gmd) but including these schemas is not straightforward due to dependencies of gmd on gml (3.2) which conflict with the eop dependencies on GML. Including these schemas is also not desirable from the point of view to not create additional dependencies

### 3.5 AIRBORNE PRODUCTS

The mapping of the Airborne product metadata to the EO Profile of GML will be subject of a separate technical note that will be issued once sufficient information is available.

## 4 SUMMARY OF EO PROFILE OF GML COMMENTS

In the process of our work we identified the following issues with respect to the GML 3.1.1 Application schema for Earth Observation products, OGC 06-080r4. These issues are listed in the following table and have also been raised in the OGC Standards working group.

	OGC Issue tracker no	Comment	Proposed Resolution
1	170	<p>ProductType element of EarthObservationMetadata is as per the OGC06-080r4 text an element with cardinality of 0..1 intended to describe the product type "in case that mixed types are available within a single collection, this is ground segment specific definition."</p> <p>According to the schema eop.xsd this element is however mandatory.</p>	<p>As not all collections have mixed types, we propose to make this optional in the schema</p> <p>Schema change:</p> <pre>&lt;xs:element ref="eop:productType" minOccurs="0" /&gt;</pre>
2	171	<p>There appears to be an inconsistency between the text of the document and the xsd with respect to the cardinality of the processingInformation child elements. The text suggests that elements like processing/ProcessingInformation/method should have a cardinality of 0..n . The schema implies a cardinality of 0..1 for these elements and for the parents ProcessingInformation and processing so that one can only describe one processing step which is too limitative.</p>	<p>One could solve this by adjusting the cardinality at any of the three levels: processing, ProcessingInformation or ProcessingInformation children. I would propose to change the cardinality of the "middle" ProcessingInformation element to 1..n as this would allow to group the information that belongs to one processing step together within one ProcessingInformation element.</p> <p>Schema change: <pre>&lt;xs:element name="processing" type="eop:ProcessingInformationPropertyType" minOccurs="0" maxOccurs="unbounded"/&gt;</pre></p>
3	172	<p>The processing/ProcessingInformation/compositeType element expects values that come from the enumeration that contains values Weekly, Daily, Monthly.</p> <p>This does not allow describing all possible composites as for instance SPOT VGT 10-daily</p>	<p>To have a more generic approach we would propose to use the ISO8601 format for time intervals as is for instance used in the OGC WMS Specification to express the time interval</p>

		synthesis products or the MODIS NDVI 16 day composites	<p>between available maps.</p> <p>This gives:</p> <p>Weekly P7D</p> <p>Daily: P1D</p> <p>Monthly: P1M</p> <p>10 Daily: P10D</p> <p>16 Daily: P16D</p> <p>Xsd Type: duration Perhaps to be further restricted by a pattern that would limit the period to be expressed in Days, Months, Years</p> <pre>&lt;xs:element name="compositeType" minOccurs="0" type="xs:duration"/&gt;</pre>
4	Comment 166 on EO ebRIM extension package	The current way of defining the VendorSpecific localAttribute and localValue makes them difficult to query as the index of the parameter needs to be known	Merge both fields in one slot in the form of attribute:value

The corrected eop schema that takes into account the proposed modifications 1, 2 en 3 of the above table is included as Annex 4.

## 5 SELECTION OF VITO SYSTEM FOR IMPLEMENTATION OF AN HMA CATALOGUE SYSTEM

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Based on the study of the applicability of the EO Profile of GML on the VITO EO Products we propose building the reference implementation using the ERDAS Apollo RedSpider Catalog Product. This Catalogue will be predominantly filled with the VGT4Africa metadata. This metadata that is currently encoded in ISO19115 format, will be transformed using an XSLT stylesheet transformation into the EO Profile of GML format.

This EO Profile of GML will then be subsequently harvested into the Catalogue by development of a specific Harvester. In addition a number of VGT S10 and P products will be included in the Catalogue with metadata that is manually produced from the base physical volume files.

This approach will offer a reference implementation that demonstrates the extensibility of the HMA adopted approach when additional metadata fields need to be taken into account.

This catalog service is then to be conformance tested against the CITE engine (note that the availability of derived schema may cause our catalog instance not be able to pass the conformance tests).

It is to be noted that HMA identity management will not be demonstrated for this prototype Catalog.

After successful conformance testing, this Catalog instance will then be integrated in the HMA Prototype Portal.



## ANNEX 1 EO PROFILE OF GML SAMPLES

### Example 1: VGT P

```

<?xml version="1.0" encoding="utf-8"?>
<?xml-stylesheet type="text/xsl" href="schematron_result_for_cvb.xsl"?>
<vgt:EarthObservation version="1.2.1" gml:id="vito_vgt_p1_V2KRNp____20070510F158"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:vgt="http://www.vito.be/vgt"
xmlns:eop="http://earth.esa.int/eop" xsi:schemaLocation="http://www.vito.be/vgt xsd-v1.2.1-
GIM/eop/1.2.1/vgt.xsd http://earth.esa.int/eop xsd-v1.2.1-GIM/eop/1.2.1/eop.xsd">
  <gml:metaDataProperty>
    <vgt:EarthObservationMetaData>
      <eop:identifier>vito:vgt:p:V2KRNp____20070510F158</eop:identifier>
      <eop:parentIdentifier>vito:vgt.p</eop:parentIdentifier>
      <eop:acquisitionType>NOMINAL</eop:acquisitionType>
      <eop:status>ARCHIVED</eop:status>
      <eop:downloadedTo>
        <eop:DownlinkInformation>
          <eop:acquisitionStation
codeSpace="urn:eop:PHR:stationCode">KIRUNA</eop:acquisitionStation>
          </eop:DownlinkInformation>
        </eop:downloadedTo>
      <eop:archivedIn>
        <eop:ArchivingInformation>
          <eop:archivingCenter
codeSpace="urn:eop:PHR:stationCode">VITO:CVB</eop:archivingCenter>
          <eop:archivingDate>2007-05-
11T00:00:00.0</eop:archivingDate>
          </eop:ArchivingInformation>
        </eop:archivedIn>
      <eop:composedOf/>
      <eop:processing>
        <eop:ProcessingInformation>
          <eop:processingCenter>VITO:CVB</eop:processingCenter>
          <eop:nativeProductFormat>HDF</eop:nativeProductFormat>
          </eop:ProcessingInformation>
        <eop:ProcessingInformation>
          <eop:method>CLOUDCOVER</eop:method>

          <eop:processorName>CTIV_CLOUD_COVER</eop:processorName>
          <eop:processorVersion>V2.0</eop:processorVersion>
          </eop:ProcessingInformation>

          <eop:ProcessingInformation>
            <eop:method>SNOWICECOVER</eop:method>

          <eop:processorName>CTIV_SNOW_ICE_COVER</eop:processorName>
          <eop:processorVersion>V2.0</eop:processorVersion>
          </eop:ProcessingInformation>
        </eop:processing>
      <vgt:GeometricCorrectionInformation>
        <vgt:demRef>dtm_vgt_system_proj</vgt:demRef>
        <vgt:demDate>1997-12-05</vgt:demDate>
    </vgt:EarthObservationMetaData>
  </gml:metaDataProperty>
</vgt:EarthObservation>

```

```

csRef> <vgt:geometricalCharacteristicsRef>V2_G_000_2002_07_24_01.PCI</vgt:geometricalCharacteristi
csRef>

<vgt:geometricCorrectionBandRef>B3</vgt:geometricCorrectionBandRef>
  <vgt:ControlPointAvailability>true</vgt:ControlPointAvailability>
  <vgt:geomCorrQualityFlag>Good</vgt:geomCorrQualityFlag>
</vgt:GeometricCorrectionInformation>
<vgt:RadiometricCorrectionInformation>

csRef> <vgt:equalisationCharacteristicsRef>V2_E_126_2007_04_28_02.PCI</vgt:equalisationCharacteristi
csRef>

Ref> <vgt:calibrationCharacteristicsRef>V2_A_000_2007_05_01_05.PCI</vgt:calibrationCharacteristics
Ref>
  </vgt:RadiometricCorrectionInformation>
  </vgt:EarthObservationMetaData>
</gml:metaDataProperty>
<gml:validTime>
  <gml:TimePeriod>
    <gml:beginPosition>2007-05-10T5:57:20Z</gml:beginPosition>
    <gml:endPosition>2007-05-10T06:13:19Z</gml:endPosition>
  </gml:TimePeriod>
</gml:validTime>
<gml:using>
  <eop:EarthObservationEquipment>
    <eop:platform>
      <eop:Platform>
        <eop:shortName>SPOT</eop:shortName>
        <eop:serialIdentifier>5</eop:serialIdentifier>
      </eop:Platform>
    </eop:platform>
    <eop:instrument>
      <eop:Instrument>
        <eop:shortName>VGT2</eop:shortName>
      </eop:Instrument>
    </eop:instrument>
    <eop:sensor>
      <eop:Sensor>
        <eop:sensorType>OPTICAL</eop:sensorType>
        <eop:resolution uom="m">1000</eop:resolution>
        <eop:swathIdentifier>
codeSpace="urn:eop:VITO:swathIdentifier">GTN_95</eop:swathIdentifier>
      </eop:Sensor>
    </eop:sensor>
    <eop:acquisitionParameters>
      <eop:Acquisition>
        <eop:orbitNumber>338</eop:orbitNumber>
      </eop:Acquisition>
    </eop:acquisitionParameters>
  </eop:EarthObservationEquipment>
</gml:using>
<gml:target>
  <eop:Footprint>
    <gml:multiExtentOf>
      <gml:MultiSurface srsName="EPSG:4326">
        <gml:surfaceMembers>
          <gml:Polygon>
            <gml:exterior>

```

```

        <gml:LinearRing>
            <gml:posList>2.1025
43.516667 2.861667 43.381667 2.65 42.862778 1.896944 42.996389 2.1025 43.516667</gml:posList>
            </gml:LinearRing>
        </gml:exterior>
    </gml:Polygon>
</gml:surfaceMembers>
</gml:MultiSurface>
</gml:multiExtentOf>
<gml:centerOf>
    <gml:Point>
        <gml:pos>42.450893 83.852679</gml:pos>
    </gml:Point>
</gml:centerOf>
</eop:Footprint>
</gml:target>
<gml:resultOf>
    <eop:EarthObservationResult>
        <eop:browse>
            <eop:BrowseInformation>
                <eop:type>QUICKLOOK</eop:type>
                <eop:referenceSystemIdentifier codeSpace=""/>

                <eop:fileName>http://suvweb.vgt.vito.be/suv/vusbe_to_suvweb/thumbnails/200808/THUMB_V2
20080806104_SEGM.jpg</eop:fileName>
            </eop:BrowseInformation>
        </eop:browse>
        <eop:product>
            <eop:ProductInformation>
                <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
                <eop:fileName/>
                <eop:size uom="Bytes">56811000</eop:size>
            </eop:ProductInformation>
        </eop:product>
        <eop:mask>
            <eop:MaskInformation>
                <eop:type>SNOW</eop:type>
                <eop:format>RASTER</eop:format>
                <eop:fileName>V2KRNP____20070510F158</eop:fileName>
            </eop:MaskInformation>
            <eop:MaskInformation>
                <eop:type>CLOUD</eop:type>
                <eop:format>RASTER</eop:format>
                <eop:fileName>V2KRNP____20070510F158</eop:fileName>
            </eop:MaskInformation>
        </eop:mask>
    </eop:EarthObservationResult>
</gml:resultOf>
</vgt:EarthObservation>

```

**Example 2: VGT S10**

```

<?xml version="1.0" encoding="utf-8"?>
<vgt:EarthObservation version="1.2.1" gml:id="vito_vgt_p1_V2KRNP____20070510F158"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:vgt="http://www.vito.be/vgt"
xmlns:eop="http://earth.esa.int/eop" xsi:schemaLocation="http://www.vito.be/vgt xsd-v1.2.1-
GIM/eop/1.2.1/vgt.xsd http://earth.esa.int/eop xsd-v1.2.1-GIM/eop/1.2.1/eop.xsd">
  <gml:metaDataProperty>
    <vgt:EarthObservationMetaData>
      <eop:identifier>vito:vgt:s10:V2KRNS10__20070511E</eop:identifier>
      <eop:parentIdentifier>vito:vgt:s10</eop:parentIdentifier>
      <eop:acquisitionType>NOMINAL</eop:acquisitionType>
      <eop:productType>vito:vgt:s10</eop:productType>
      <eop:status>ARCHIVED</eop:status>
      <eop:downloadedTo>
        <eop:DownlinkInformation>
          <eop:acquisitionStation
codeSpace="urn:eop:PHR:stationCode">KIRUNA</eop:acquisitionStation>
          </eop:DownlinkInformation>
        </eop:downloadedTo>
      <eop:archivedIn>
        <eop:ArchivingInformation>
          <eop:archivingCenter
codeSpace="urn:eop:PHR:stationCode">VITO:CVB</eop:archivingCenter>
          <eop:archivingDate>2007-06-
11T00:00:00.0</eop:archivingDate>
          </eop:ArchivingInformation>
        </eop:archivedIn>
      <eop:composedOf/>
      <eop:processing>
        <eop:ProcessingInformation>
          <eop:processingCenter>VITO:vgt</eop:processingCenter>
          <eop:compositeType>P10D</eop:compositeType>
          <eop:nativeProductFormat>HDF</eop:nativeProductFormat>
        </eop:ProcessingInformation>
        <eop:ProcessingInformation>
          <eop:method>CLOUDCOVER</eop:method>
        </eop:ProcessingInformation>
        <eop:processorName>CTIV_CLOUD_COVER</eop:processorName>
          <eop:processorVersion>V2.0</eop:processorVersion>
          <eop:nativeProductFormat>HDF</eop:nativeProductFormat>
        </eop:ProcessingInformation>
        <eop:ProcessingInformation>
          <eop:method>SNOWICECOVER</eop:method>
        </eop:ProcessingInformation>
        <eop:processorName>CTIV_SNOW_ICE_COVER</eop:processorName>
          <eop:processorVersion>V2.0</eop:processorVersion>
        </eop:ProcessingInformation>
        <eop:ProcessingInformation>
          <eop:method>ATMOSPHERICCORRECTION</eop:method>
          <eop:processorName>CTIV_SMAC</eop:processorName>
          <eop:processorVersion>V4.0</eop:processorVersion>
        </eop:ProcessingInformation>
      </eop:processing>
      <vgt:GeometricCorrectionInformation>
        <vgt:demRef>dtm_vgt_system_proj</vgt:demRef>
        <vgt:demDate>1997-12-05</vgt:demDate>
      </vgt:GeometricCorrectionInformation>
    </vgt:EarthObservationMetaData>
  </gml:metaDataProperty>
</vgt:EarthObservation>

```

```

csRef> <vgt:geometricalCharacteristicsRef>V2_G_000_2002_07_24_01.PCI</vgt:geometricalCharacteristi
csRef>

<vgt:geometricCorrectionBandRef>B3</vgt:geometricCorrectionBandRef>
  <vgt:ControlPointAvailability>>true</vgt:ControlPointAvailability>
  <vgt:geomCorrQualityFlag>Good</vgt:geomCorrQualityFlag>
</vgt:GeometricCorrectionInformation>
<vgt:RadiometricCorrectionInformation>

csRef> <vgt:equalisationCharacteristicsRef>V2_E_126_2007_04_28_02.PCI</vgt:equalisationCharacteristi
csRef>

Ref> <vgt:calibrationCharacteristicsRef>V2_A_000_2007_05_01_05.PCI</vgt:calibrationCharacteristics
Ref>
  </vgt:RadiometricCorrectionInformation>
  <vgt:SynthesisInformation>
    <vgt:synthesisNominalDate>2007-05-11</vgt:synthesisNominalDate>
    <vgt:synthesisAlgorithm>CTIV_SYNTHESIS_V1.0</vgt:synthesisAlgorithm>
  </vgt:SynthesisInformation>

  </vgt:EarthObservationMetaData>
</gml:metaDataProperty>
<gml:validTime>
  <gml:TimePeriod>
    <gml:beginPosition>2007-05-10T5:57:20Z</gml:beginPosition>
    <gml:endPosition>2007-05-10T06:13:19Z</gml:endPosition>
  </gml:TimePeriod>
</gml:validTime>
<gml:using>
  <eop:EarthObservationEquipment>
    <eop:platform>
      <eop:Platform>
        <eop:shortName>SPOT</eop:shortName>
        <eop:serialIdentifier>5</eop:serialIdentifier>
      </eop:Platform>
    </eop:platform>
    <eop:instrument>
      <eop:Instrument>
        <eop:shortName>VGT2</eop:shortName>
      </eop:Instrument>
    </eop:instrument>
    <eop:sensor>
      <eop:Sensor>
        <eop:sensorType>OPTICAL</eop:sensorType>
        <eop:resolution uom="m">1000</eop:resolution>
        <eop:swathIdentifier
codeSpace="urn:eop:VITO:swathIdentifier">GTN_95</eop:swathIdentifier>
      </eop:Sensor>
    </eop:sensor>
    <eop:acquisitionParameters>
      <eop:Acquisition>
        <eop:orbitNumber>338</eop:orbitNumber>
      </eop:Acquisition>
    </eop:acquisitionParameters>
  </eop:EarthObservationEquipment>
</gml:using>
<gml:target>
  <eop:Footprint>

```

```

        <gml:multiExtentOf>
          <gml:MultiSurface srsName="EPSG:4326">
            <gml:surfaceMembers>
              <gml:Polygon srsName="EPSG:4326">
                <gml:exterior>
                  <gml:LinearRing>
                    <gml:posList>38 -26 38 60 -35
60 -35 -26 38 -26</gml:posList>
                  </gml:LinearRing>
                </gml:exterior>
              </gml:Polygon>
            </gml:surfaceMembers>
          </gml:MultiSurface>
        </gml:multiExtentOf>
        <gml:centerOf>
          <gml:Point>
            <gml:pos>1.5 17.0</gml:pos>
          </gml:Point>
        </gml:centerOf>
      </eop:Footprint>
    </gml:target>
  <gml:resultOf>
    <eop:EarthObservationResult>
      <eop:browse>
        <eop:BrowseInformation>
          <eop:type>QUICKLOOK</eop:type>
          <eop:referenceSystemIdentifier codeSpace=""/>

          <eop:fileName>http://suvweb.vgt.vito.be/suv/vusbe_to_suvweb/thumbnails/200808/THUMB_V2
20080806104_SEGM.jpg</eop:fileName>
          </eop:BrowseInformation>
        </eop:browse>
      <eop:product>
        <eop:ProductInformation>
          <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
          <eop:fileName/>
          <eop:size uom="MB">6985</eop:size>
        </eop:ProductInformation>
      </eop:product>
    <eop:mask>
      <eop:MaskInformation>
        <eop:type>SNOW</eop:type>
        <eop:format>RASTER</eop:format>

        <eop:fileName>vito:vgt:s10:V2KRNS10__20070511E</eop:fileName>
        </eop:MaskInformation>
      <eop:MaskInformation>
        <eop:type>CLOUD</eop:type>
        <eop:format>RASTER</eop:format>

        <eop:fileName>vito:vgt:s10:V2KRNS10__20070511E</eop:fileName>
        </eop:MaskInformation>
      </eop:mask>
    </eop:EarthObservationResult>
  </gml:resultOf>
</vgt:EarthObservation>

```

### Example 3: VGT4Africa DMP

```

<?xml version="1.0" encoding="utf-8"?>
<?xml-stylesheet type="text/xsl" href="schematron_result_for_cvb.xsl"?>
<vgt:EarthObservation version="1.2.1" gml:id="vito_vgt_p1_V2KRNP____20070510F158"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:vgt="http://www.vito.be/vgt"
xmlns:eop="http://earth.esa.int/eop" xsi:schemaLocation="http://www.vito.be/vgt xsd-v1.2.1-
GIM/eop/1.2.1/vgt.xsd http://earth.esa.int/eop xsd-v1.2.1-GIM/eop/1.2.1/eop.xsd">
  <gml:metaDataProperty>
    <vgt:EarthObservationMetaData>

      <eop:identifier>vito:vgt4A:dmp:VGT4AFRICA_DMP_20080901_Africa</eop:identifier>
      <eop:parentIdentifier>vito:vgt4A:dmp</eop:parentIdentifier>
      <eop:acquisitionType>NOMINAL</eop:acquisitionType>
      <eop:status>ARCHIVED</eop:status>
      <eop:downloadedTo>
        <eop:DownlinkInformation>
          <eop:acquisitionStation
codeSpace="urn:eop:PHR:stationCode">KIRUNA</eop:acquisitionStation>
          </eop:DownlinkInformation>
        </eop:downloadedTo>
      <eop:archivedIn>
        <eop:ArchivingInformation>
          <eop:archivingCenter
codeSpace="urn:eop:PHR:stationCode">VITO:CVB</eop:archivingCenter>
          <eop:archivingDate>2008-09-
14T00:00:00.0</eop:archivingDate>
          </eop:ArchivingInformation>
        </eop:archivedIn>
      <eop:composedOf/>
      <eop:processing>
        <eop:ProcessingInformation>
          <eop:processingCenter>VITO:CVB</eop:processingCenter>
          <eop:method>DMP Calculation</eop:method>
          <eop:processorName>PI_backU.exe</eop:processorName>
          <eop:processorVersion>V710</eop:processorVersion>
        </eop:ProcessingInformation>
      </eop:processing>
      <vgt:DerivedProductInformation>
        <vgt:derivedProductProcessingInformation>VGT-
NDVI=m:\dgl\rois\gpi\act\s10\vt0825i.img, Pmax=m:\dgl\rois\gpi\met\s10\wt0825p.img, IPol=0
</vgt:derivedProductProcessingInformation>
        <vgt:minValueSignificantDigital>0</vgt:minValueSignificantDigital>
        <vgt:maxValueSignificantDigital>32767</vgt:maxValueSignificantDigital>
        <vgt:scaleFactor>0.01</vgt:scaleFactor>
        <vgt:offset>0</vgt:offset>
        <vgt:minValueDisplayDigital>0</vgt:minValueDisplayDigital>
        <vgt:maxValueDisplayDigital>32767</vgt:maxValueDisplayDigital>
        <vgt:minValuePhysical>0</vgt:minValuePhysical>
        <vgt:maxValuePhysical>327.67</vgt:maxValuePhysical>
        <vgt:flaginformation>
          <vgt:flagCode>METMis</vgt:flagCode>
          <vgt:flagDescription>Missing meteo value</vgt:flagDescription>
          <vgt:flagValue>-300</vgt:flagValue>
        </vgt:flaginformation>
        <vgt:flaginformation>
          <vgt:flagCode>NDVI<math>\leq 0</math></vgt:flagCode>

```

```

        <vgt:flagDescription>Negative NDVI</vgt:flagDescription>
        <vgt:flagValue>-300</vgt:flagValue>
    </vgt:flaginformation>
    <vgt:flaginformation>
        <vgt:flagCode>Missing</vgt:flagCode>
        <vgt:flagDescription>Missing Value</vgt:flagDescription>
        <vgt:flagValue>-5</vgt:flagValue>
    </vgt:flaginformation>
    <vgt:flaginformation>
        <vgt:flagCode>Missing</vgt:flagCode>
        <vgt:flagDescription>Missing Value</vgt:flagDescription>
        <vgt:flagValue>-5</vgt:flagValue>
    </vgt:flaginformation>
    <vgt:flaginformation>
        <vgt:flagCode>Cloud</vgt:flagCode>
        <vgt:flagDescription>Cloud</vgt:flagDescription>
        <vgt:flagValue>-4</vgt:flagValue>
    </vgt:flaginformation>
    <vgt:flaginformation>
        <vgt:flagCode>snow</vgt:flagCode>
        <vgt:flagDescription>Snow</vgt:flagDescription>
        <vgt:flagValue>-3</vgt:flagValue>
    </vgt:flaginformation>
    <vgt:flaginformation>
        <vgt:flagCode>sea</vgt:flagCode>
        <vgt:flagDescription>Sea</vgt:flagDescription>
        <vgt:flagValue>-2</vgt:flagValue>
    </vgt:flaginformation>
    <vgt:flaginformation>
        <vgt:flagCode>back</vgt:flagCode>
        <vgt:flagDescription>background</vgt:flagDescription>
        <vgt:flagValue>-1</vgt:flagValue>
    </vgt:flaginformation>
    </vgt:DerivedProductInformation>
</vgt:EarthObservationMetaData>
</gml:metaDataProperty>
<gml:validTime>
    <gml:TimePeriod>
        <gml:beginPosition>2008-09-01T00:00:00</gml:beginPosition>
        <gml:endPosition>2008-09-10T23:59:59</gml:endPosition>
    </gml:TimePeriod>
</gml:validTime>
<gml:using>
    <eop:EarthObservationEquipment>
        <eop:platform>
            <eop:Platform>
                <eop:shortName>SPOT</eop:shortName>
                <eop:serialIdentifier>5</eop:serialIdentifier>
            </eop:Platform>
        </eop:platform>
        <eop:instrument>
            <eop:Instrument>
                <eop:shortName>VGT2</eop:shortName>
            </eop:Instrument>
        </eop:instrument>
        <eop:sensor>
            <eop:Sensor>
                <eop:sensorType>OPTICAL</eop:sensorType>
            </eop:Sensor>
        </eop:sensor>
    </eop:EarthObservationEquipment>
</gml:using>

```



---

```

                                <eop:resolution
uom="deg">0.00892857142857</eop:resolution>
                                </eop:Sensor>
                                </eop:sensor>
                                </eop:EarthObservationEquipment>
</gml:using>
<gml:target>
    <eop:Footprint>
        <gml:multiExtentOf><gml:MultiSurface
srsName="EPSG:4326"><gml:surfaceMembers><gml:Polygon
srsName="EPSG:4326"><gml:exterior><gml:LinearRing> <gml:posList>38 -26 38 60 -35 60 -35 -26 38 -
26</gml:posList></gml:LinearRing></gml:exterior></gml:Polygon></gml:surfaceMembers></gml:MultiSurfa
ce></gml:multiExtentOf>
        </eop:Footprint>
    </gml:target>
    <gml:resultOf>
        <eop:EarthObservationResult>
            <eop:browse>
                <eop:BrowseInformation>
                    <eop:type>QUICKLOOK</eop:type>
                    <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
                    <eop:fileName>20080901_QL.TIF</eop:fileName>
                </eop:BrowseInformation>
            </eop:browse>
            <eop:product>
                <eop:ProductInformation>
                    <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
                    <eop:fileName>20080901_DMP.HDF</eop:fileName>
                </eop:ProductInformation>
            </eop:product>
        </eop:EarthObservationResult>
    </gml:resultOf>
</vgt:EarthObservation>

```

**Example 4: VGT4Africa fcover**

```

<?xml version="1.0" encoding="utf-8"?>
<?xml-stylesheet type="text/xsl" href="schematron_result_for_cvb.xsl"?>
<vgt:EarthObservation version="1.2.1" gml:id="vito_vgt_p1_V2KRNP____20070510F158"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:vgt="http://www.vito.be/vgt"
xmlns:eop="http://earth.esa.int/eop" xsi:schemaLocation="http://www.vito.be/vgt xsd-v1.2.1-
GIM/eop/1.2.1/vgt.xsd http://earth.esa.int/eop xsd-v1.2.1-GIM/eop/1.2.1/eop.xsd">
  <gml:metaDataProperty>
    <vgt:EarthObservationMetaData>

      <eop:identifier>vito:vgt4A:fcover:VGT4AFRICA_FCOVER_20080901_Africa_POSTEL</eop:identifi
er>

        <eop:parentIdentifier>vito:vgt4A:fcover</eop:parentIdentifier>
        <eop:acquisitionType>NOMINAL</eop:acquisitionType>
        <eop:status>ARCHIVED</eop:status>
        <eop:downloadedTo>
          <eop:DownlinkInformation>
            <eop:acquisitionStation
codeSpace="urn:eop:PHR:stationCode">KIRUNA</eop:acquisitionStation>
            </eop:DownlinkInformation>
          </eop:downloadedTo>
          <eop:archivedIn>
            <eop:ArchivingInformation>
              <eop:archivingCenter
codeSpace="urn:eop:PHR:stationCode">VITO:CVB</eop:archivingCenter>
              <eop:archivingDate>2008-09-
18T00:00:00.0</eop:archivingDate>
            </eop:ArchivingInformation>
          </eop:archivedIn>
          <eop:composedOf/>
          <eop:processing>
            <eop:ProcessingInformation>
              <eop:processingCenter>VITO:CVB</eop:processingCenter>
              <eop:method>FCOVER calculation</eop:method>
              <eop:processorName>stickTiles</eop:processorName>
              <eop:processorVersion>1.0</eop:processorVersion>
            </eop:ProcessingInformation>
          </eop:processing>
          <vgt:DerivedProductInformation>
            <vgt:minValueSignificantDigital>0</vgt:minValueSignificantDigital>
            <vgt:maxValueSignificantDigital>250</vgt:maxValueSignificantDigital>
            <vgt:scaleFactor>0.004</vgt:scaleFactor>
            <vgt:offset>0.0</vgt:offset>
            <vgt:minValueDisplayDigital>0</vgt:minValueDisplayDigital>
            <vgt:maxValueDisplayDigital>250</vgt:maxValueDisplayDigital>
            <vgt:minValuePhysical>0</vgt:minValuePhysical>
            <vgt:maxValuePhysical>1</vgt:maxValuePhysical>
            <vgt:flaginformation>
              <vgt:flagCode>OutOfRange_Sup</vgt:flagCode>
              <vgt:flagDescription>Out of range
superior</vgt:flagDescription>
              <vgt:flagValue>253</vgt:flagValue>
            </vgt:flaginformation>
            <vgt:flaginformation>
              <vgt:flagCode>OutOfRange_Inf</vgt:flagCode>
              <vgt:flagDescription>Out of range inferior</vgt:flagDescription>
              <vgt:flagValue>254</vgt:flagValue>
            </vgt:flaginformation>
          </vgt:DerivedProductInformation>
        </eop:processing>
      </eop:parentIdentifier>
    </vgt:EarthObservationMetaData>
  </gml:metaDataProperty>
</vgt:EarthObservation>

```

```

        </vgt:flaginformation>
        <vgt:flaginformation>
            <vgt:flagCode>Invalid</vgt:flagCode>
            <vgt:flagDescription>Invalid data</vgt:flagDescription>
            <vgt:flagValue>255</vgt:flagValue>
        </vgt:flaginformation>
    </vgt:DerivedProductInformation>
</vgt:EarthObservationMetaData>
</gml:metaDataProperty>
<gml:validTime>
    <gml:TimePeriod>
        <gml:beginPosition>2008-09-01T00:00:00</gml:beginPosition>
        <gml:endPosition>2008-09-10T23:59:59</gml:endPosition>
    </gml:TimePeriod>
</gml:validTime>
<gml:using>
    <eop:EarthObservationEquipment>
        <eop:platform>
            <eop:Platform>
                <eop:shortName>SPOT</eop:shortName>
                <eop:serialIdentifier>5</eop:serialIdentifier>
            </eop:Platform>
        </eop:platform>
        <eop:instrument>
            <eop:Instrument>
                <eop:shortName>VGT2</eop:shortName>
            </eop:Instrument>
        </eop:instrument>
        <eop:sensor>
            <eop:Sensor>
                <eop:sensorType>OPTICAL</eop:sensorType>
                <eop:resolution
uom="deg">0.00892857142857</eop:resolution>
            </eop:Sensor>
        </eop:sensor>
    </eop:EarthObservationEquipment>
</gml:using>
<gml:target>
    <eop:Footprint>
        <gml:multiExtentOf>
            <gml:MultiSurface srsName="EPSG:4326">
                <gml:surfaceMembers>
                    <gml:Polygon srsName="EPSG:4326">
                        <gml:exterior>
                            <gml:LinearRing>
                                <gml:posList>38 -26 38 60 -35
60 -35 -26 38 -26</gml:posList>
                            </gml:LinearRing>
                        </gml:exterior>
                    </gml:Polygon>
                </gml:surfaceMembers>
            </gml:MultiSurface>
        </gml:multiExtentOf>
    </eop:Footprint>
</gml:target>
<gml:resultOf>
    <eop:EarthObservationResult>
        <eop:browse>
            <eop:BrowseInformation>

```

```

        <eop:type>QUICKLOOK</eop:type>
        <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
        <eop:fileName>20080901_QL.TIF</eop:fileName>
        </eop:BrowseInformation>
    </eop:browse>
    <eop:product>
        <eop:ProductInformation>
            <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
            <eop:fileName>20080901_FCOVER.HDF</eop:fileName>
        </eop:ProductInformation>
    </eop:product>
</eop:EarthObservationResult>
</gml:resultOf>
</vgt:EarthObservation>
```

## Example 5: VGT4Africa Albq example

```

<?xml version="1.0" encoding="utf-8"?>
<?xml-stylesheet type="text/xsl" href="schematron_result_for_cvb.xsl"?>
<vgt:EarthObservation version="1.2.1" gml:id="vito_vgt_p1_V2KRNP____20070510F158"
  xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:vgt="http://www.vito.be/vgt"
  xmlns:eop="http://earth.esa.int/eop" xsi:schemaLocation="http://www.vito.be/vgt xsd-v1.2.1-
  GIM/eop/1.2.1/vgt.xsd http://earth.esa.int/eop xsd-v1.2.1-GIM/eop/1.2.1/eop.xsd">
  <gml:metaDataProperty>
    <vgt:EarthObservationMetaData>
      <eop:identifier>vito:vgt4A:albq: 20080901_LMK</eop:identifier>
      <eop:parentIdentifier>vito:vgt4A:albq</eop:parentIdentifier>
      <eop:acquisitionType>NOMINAL</eop:acquisitionType>
      <eop:status>ARCHIVED</eop:status>
      <eop:downloadedTo>
        <eop:DownlinkInformation>
          <eop:acquisitionStation
codeSpace="urn:eop:PHR:stationCode">KIRUNA</eop:acquisitionStation>
          </eop:DownlinkInformation>
        </eop:downloadedTo>
      <eop:archivedIn>
        <eop:ArchivingInformation>
          <eop:archivingCenter
codeSpace="urn:eop:PHR:stationCode">VITO:CVB</eop:archivingCenter>
          <eop:archivingDate>2008-09-
18T00:00:00.0</eop:archivingDate>
        </eop:ArchivingInformation>
      </eop:archivedIn>
      <eop:composedOf/>
      <eop:processing>
        <eop:ProcessingInformation>
          <eop:processingCenter>VITO:CVB</eop:processingCenter>
          <eop:method>LMK Calculation</eop:method>
          <eop:processorName>stickTiles</eop:processorName>
          <eop:processorVersion>1.0</eop:processorVersion>
        </eop:ProcessingInformation>
      </eop:processing>
      <vgt:DerivedProductInformation>
        <vgt:minValueSignificantDigital>200</vgt:minValueSignificantDigital>
        <vgt:maxValueSignificantDigital>255</vgt:maxValueSignificantDigital>
        <vgt:scaleFactor>1.0</vgt:scaleFactor>
        <vgt:offset>0.0</vgt:offset>
        <vgt:minValueDisplayDigital>200</vgt:minValueDisplayDigital>
        <vgt:maxValueDisplayDigital>255</vgt:maxValueDisplayDigital>
        <vgt:minValuePhysical>0</vgt:minValuePhysical>
        <vgt:maxValuePhysical>55</vgt:maxValuePhysical>
      </vgt:DerivedProductInformation>
    </vgt:EarthObservationMetaData>
  </gml:metaDataProperty>
  <gml:validTime>
    <gml:TimePeriod>
      <gml:beginPosition>2008-09-01T00:00:00</gml:beginPosition>
      <gml:endPosition>2008-09-10T23:59:59</gml:endPosition>
    </gml:TimePeriod>
  </gml:validTime>
  <gml:using>
    <eop:EarthObservationEquipment>

```

```

    <eop:platform>
      <eop:Platform>
        <eop:shortName>SPOT</eop:shortName>
        <eop:serialIdentifier>5</eop:serialIdentifier>
      </eop:Platform>
    </eop:platform>
    <eop:instrument>
      <eop:Instrument>
        <eop:shortName>VGT2</eop:shortName>
      </eop:Instrument>
    </eop:instrument>
    <eop:sensor>
      <eop:Sensor>
        <eop:sensorType>OPTICAL</eop:sensorType>
        <eop:resolution
uom="deg">0.00892857142857</eop:resolution>
        </eop:Sensor>
      </eop:sensor>
    </eop:EarthObservationEquipment>
  </gml:using>
  <gml:target>
    <eop:Footprint>
      <gml:multiExtentOf><gml:MultiSurface
srsName="EPSG:4326"><gml:surfaceMembers><gml:Polygon
srsName="EPSG:4326"><gml:exterior><gml:LinearRing> <gml:posList>38 -26 38 60 -35 60 -35 -26 38 -
26</gml:posList></gml:LinearRing></gml:exterior></gml:Polygon></gml:surfaceMembers></gml:MultiSurfa
ce></gml:multiExtentOf>
      </eop:Footprint>
    </gml:target>
    <gml:resultOf>
      <eop:EarthObservationResult>
        <eop:browse>
          <eop:BrowseInformation>
            <eop:type>QUICKLOOK</eop:type>
            <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
            <eop:fileName>20080901_QL.TIF</eop:fileName>
          </eop:BrowseInformation>
        </eop:browse>
        <eop:product>
          <eop:ProductInformation>
            <eop:referenceSystemIdentifier
codeSpace="EPSG">4326</eop:referenceSystemIdentifier>
            <eop:fileName>20080901_LMK.HDF</eop:fileName>
          </eop:ProductInformation>
        </eop:product>
      </eop:EarthObservationResult>
    </gml:resultOf>
  </vgt:EarthObservation>

```

## ANNEX 2 VGT SCHEMA

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSpy v2008 rel. 2 sp2 (http://www.altova.com) by Steven Smolders(GIM nv) 09/02/09-->
<xs:schema xmlns:vgt="http://www.vito.be/vgt" xmlns:eop="http://earth.esa.int/eop"
xmlns:gml="http://www.opengis.net/gml" xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.vito.be/vgt" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="0.0.0">
  <xs:import namespace="http://www.opengis.net/gml"
schemaLocation="../../gml/3.1.1/base/gmlSubset.xsd"/>
  <xs:import namespace="http://earth.esa.int/eop" schemaLocation="./eop.xsd"/>
  <!-- <xs:import namespace="http://www.isotc211.org/2005/gmd"
schemaLocation="http://www.isotc211.org/2005/gmd/gmd.xsd"/> -->
  <!-- ===== -->
  <!-- This schema defines the extensions to the HMA eop and opt schemas as required for VITO's
vgt centrum Voor Beeldverwerking products) -->
  <!-- VGT EarthObservation : -->
  <!--           + Extends eop:AbstractObservation -->
  <!-- ===== -->
  <xs:element name="EarthObservation" type="vgt:EarthObservationType"
substitutionGroup="eop:EarthObservation">
    <xs:annotation>
      <xs:documentation>Namespace for VITO vgt
EarthObservationProduct.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name="EarthObservationType">
    <xs:complexContent>
      <xs:extension base="eop:EarthObservationType">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <!-- ===== -->
  <!-- EarthObservationMetadata :
-->
  <!--           + this feature extends eop:EarthObservationMetadata -->
  <!--           The following elements are added -->
  <!--           -->
  <!--           + GeometricCorrectionInformation for CTIV P, S1, S10 and D10
Products -->
  <!--           + RadiometricCorrectionInformation for CTIV P, S1, S10 and D10 Products -->
  <!--           -->
  <!--           + Synthesis Information for CTIV S1, S10 and D10 Products -->
  <!--           -->
  <!--           + Derived product Information for VGT4Africa Products -->
  <!-- ===== -->
  <xs:element name="EarthObservationMetaData" type="vgt:EarthObservationMetaDataType"
substitutionGroup="eop:EarthObservationMetaData"/>
  <xs:complexType name="EarthObservationMetaDataType" mixed="true">

```

```

        <xs:complexContent mixed="true">
          <xs:extension base="eop:EarthObservationMetaDataType">
            <xs:sequence>
              <xs:element ref="vgt:GeometricCorrectionInformation"
minOccurs="0"/>
              <xs:element ref="vgt:RadiometricCorrectionInformation"
minOccurs="0"/>
              <xs:element ref="vgt:SynthesisInformation" minOccurs="0"/>
              <xs:element ref="vgt:DerivedProductInformation"
minOccurs="0"/>
            </xs:sequence>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
      <!-- ===== -->
      <!-- Geometric Correction -->
      <!-- ===== -->
      <xs:element name="GeometricCorrectionInformation"
type="vgt:GeometricCorrectionInformationType"/>
      <xs:complexType name="GeometricCorrectionInformationType">
        <xs:annotation>
          <xs:documentation>
            The information related to the geometric correction that was performed
          </xs:documentation>
        </xs:annotation>
        <xs:sequence>
          <xs:element name="demRef" type="xs:string"/>
          <xs:element name="demDate" type="xs:date"/>
          <xs:element name="geometricalCharacteristicsRef" type="xs:string"/>
          <xs:element name="geometricCorrectionBandRef"
type="vgt:GeometricCorrectionBandRefType"/>
          <xs:element name="ControlPointAvailability" type="xs:boolean"/>
          <xs:element name="geomCorrQualityFlag" type="vgt:GeomCorrQualityFlag"
minOccurs="0"/>
        </xs:sequence>
      </xs:complexType>
      <xs:simpleType name="GeometricCorrectionBandRefType">
        <xs:restriction base="xs:string">
          <xs:enumeration value="B2"/>
          <xs:enumeration value="B3"/>
        </xs:restriction>
      </xs:simpleType>
      <xs:simpleType name="GeomCorrQualityFlag">
        <xs:restriction base="xs:string">
          <xs:enumeration value="Good"/>
          <xs:enumeration value="Bad"/>
        </xs:restriction>
      </xs:simpleType>
      <!-- ===== -->
      <!-- Radiometric Correction -->
      <!-- ===== -->
      <xs:element name="RadiometricCorrectionInformation"
type="vgt:RadiometricCorrectionInformationType"/>
      <xs:complexType name="RadiometricCorrectionInformationType">
        <xs:annotation>
          <xs:documentation>
            The information related to the geometric correction that was performed
          </xs:documentation>
        </xs:annotation>

```



```

        <xs:sequence>
          <xs:element name="equalisationCharacteristicsRef" type="xs:string"/>
          <xs:element name="calibrationCharacteristicsRef" type="xs:string"/>
        </xs:sequence>
      </xs:complexType>
      <!-- ===== ->
      <!-- Synthesis Information ->
      <!-- ===== ->
      <xs:element name="SynthesisInformation" type="vgt:SynthesisInformationType"/>
      <xs:complexType name="SynthesisInformationType">
        <xs:annotation>
          <xs:documentation>
            The information is related to the production of the synthesis
          </xs:documentation>
        </xs:annotation>
        <xs:sequence>
          <xs:element name="synthesisNominalDate" type="xs:date"/>
          <xs:element name="synthesisAlgorithm" type="xs:string"/>
        </xs:sequence>
      </xs:complexType>
      <!-- ===== ->
      <!-- Derived Product Information ->
      <!-- ===== ->
      <xs:element name="DerivedProductInformation" type="vgt:DerivedProductInformationType"/>
      <xs:complexType name="DerivedProductInformationType">
        <xs:annotation>
          <xs:documentation>
            The information is related to content of the derived Product. It defines the dimensional content of
            the product and the flag values.
          </xs:documentation>
        </xs:annotation>
        <xs:sequence>
          <xs:element name="derivedProductProcessingInformation" type="xs:string"
minOccurs="0"/>
          <xs:element name="minValueSignificantDigital" type="xs:decimal"
minOccurs="0"/>
          <xs:element name="maxValueSignificantDigital" type="xs:decimal"
minOccurs="0"/>
          <xs:element name="scaleFactor" type="xs:decimal" minOccurs="0"/>
          <xs:element name="offset" type="xs:decimal" minOccurs="0"/>
          <xs:element name="minValueDisplayDigital" type="xs:decimal" minOccurs="0"/>
          <xs:element name="maxValueDisplayDigital" type="xs:decimal" minOccurs="0"/>
          <xs:element name="minValuePhysical" type="xs:decimal" minOccurs="0"/>
          <xs:element name="maxValuePhysical" type="xs:decimal" minOccurs="0"/>
          <xs:element name="units" type="xs:string" minOccurs="0"/>
          <!-- should refer to gml:unitdefinition ->
          <xs:element name="flagInformation" type="vgt:FlagInformationType"
minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
      <xs:complexType name="FlagInformationType">
        <xs:annotation>
          <xs:documentation>
            The information related to the Flag values present in the derived product
          </xs:documentation>
        </xs:annotation>
        <xs:sequence>
          <xs:element name="flagCode" type="xs:string"/>
          <xs:element name="flagDescription" type="xs:string" minOccurs="0"/>

```

```
        <xs:element name="flagValue" type="xs:decimal"/>
      </xs:sequence>
    </xs:complexType>
  </xs:schema>
```

## ANNEX 3 ORIGINAL METADATA FILES

### Example 1: VGT P Logical Volume file

PRODUCT_ID	V2KRNP____20070510F158
BAND_REF	B3
QUICK_LOOK_BAND	B2
MAP_PROJ_NAME	PLATE_CARREE_1KMG nom provisoirement egal au code
MAP_PROJ_FAMILY	UNPROJECTED
MAP_PROJ_CODE	PLATE_CARREE_1KMG
MAP_PROJ_UNIT	DEGREES
MAP_PROJ_RESOLUTION	0.0089285714
GEODETTIC_SYST_NAME	WGS 1984
GEODETTIC_SYST_CODE	WG84
HORIZ_DATUM	WGS 1984
MERIDIAN_NAME	GREENWICH
MERIDIAN_ORIGIN	+000.000
SPHEROID_NAME	WGS 1984
SPHEROID_SEMI_MAJ_AXIS	6378137.000
SPHEROID_SEMI_MIN_AXIS	6356752.314
CARTO_UPPER_LEFT_X	54.901786
CARTO_UPPER_LEFT_Y	72.410714
CARTO_UPPER_RIGHT_X	112.803571
CARTO_UPPER_RIGHT_Y	72.410714
CARTO_LOWER_RIGHT_X	112.803571
CARTO_LOWER_RIGHT_Y	12.491071
CARTO_LOWER_LEFT_X	54.901786
CARTO_LOWER_LEFT_Y	12.491071
CARTO_CENTER_X	83.852679
CARTO_CENTER_Y	42.450893
CARTO_HEIGHT	59.919643
CARTO_WIDTH	57.901786
GEO_UPPER_LEFT_LAT	+072.410714
GEO_UPPER_LEFT_LONG	+054.901786
GEO_UPPER_RIGHT_LAT	+072.410714
GEO_UPPER_RIGHT_LONG	+112.803571
GEO_LOWER_RIGHT_LAT	+012.491071
GEO_LOWER_RIGHT_LONG	+112.803571
GEO_LOWER_LEFT_LAT	+012.491071
GEO_LOWER_LEFT_LONG	+054.901786
IMAGE_UPPER_LEFT_ROW	1
IMAGE_UPPER_LEFT_COL	1
IMAGE_UPPER_RIGHT_ROW	1
IMAGE_UPPER_RIGHT_COL	6486
IMAGE_LOWER_RIGHT_ROW	6712
IMAGE_LOWER_RIGHT_COL	6486
IMAGE_LOWER_LEFT_ROW	6712
IMAGE_LOWER_LEFT_COL	1
IMAGE_CENTER_ROW	3356.5
IMAGE_CENTER_COL	3243.5
GEOM_CHAR_REF	V2_G_000_2002_07_24_01.PCI
GEOM_BAND_REF	B3
DEM_REF	dtm_vgt_system_proj
DEM_DATE	19971205
USE_GCP	S
GEOM_QUALITY_FLAG	GOOD

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RADIOM_EQUAL_REF	V2_E_126_2007_04_28_02.PCI
RADIOM_ABS_CAL_REF	V2_A_000_2007_05_01_05.PCI
ORBIT_NUMBER	338
GROUND_TRACK_NUMBER	95
SEGM_REFERENCE	V220070510158
SEGM_FIRST_DATE	20070510
SEGM_FIRST_TIME	055720
SEGM_LAST_DATE	20070510
SEGM_LAST_TIME	061319
CLOUD_COVER_REF	CTIV_CLOUD_COVER_V2.0
SNOW_COVER_REF	CTIV_SNOW_ICE_COVER_V2.0
PRODUCTION_DATE	20070511

**Example 2: VGT S10 Logical Volume file**

PRODUCT_ID	V2KRNS10__20070511E
BAND_REF	B3
QUICK_LOOK_BAND	NDV
MAP_PROJ_NAME	PLATE_CARREE_1KMG nom provisoirement egal au code
MAP_PROJ_FAMILY	UNPROJECTED
MAP_PROJ_CODE	PLATE_CARREE_1KMG
MAP_PROJ_UNIT	DEGREES
MAP_PROJ_RESOLUTION	0.0089285714
GEODETTIC_SYST_NAME	WGS 1984
GEODETTIC_SYST_CODE	WG84
HORIZ_DATUM	WGS 1984
MERIDIAN_NAME	GREENWICH
MERIDIAN_ORIGIN	+000.000
SPHEROID_NAME	WGS 1984
SPHEROID_SEMI_MAJ_AXIS	6378137.000
SPHEROID_SEMI_MIN_AXIS	6356752.314
CARTO_UPPER_LEFT_X	-26.000000
CARTO_UPPER_LEFT_Y	38.000000
CARTO_UPPER_RIGHT_X	60.000000
CARTO_UPPER_RIGHT_Y	38.000000
CARTO_LOWER_RIGHT_X	60.000000
CARTO_LOWER_RIGHT_Y	-35.000000
CARTO_LOWER_LEFT_X	-26.000000
CARTO_LOWER_LEFT_Y	-35.000000
CARTO_CENTER_X	17.000000
CARTO_CENTER_Y	1.500000
CARTO_HEIGHT	73.000000
CARTO_WIDTH	86.000000
GEO_UPPER_LEFT_LAT	+038.000000
GEO_UPPER_LEFT_LONG	-026.000000
GEO_UPPER_RIGHT_LAT	+038.000000
GEO_UPPER_RIGHT_LONG	+060.000000
GEO_LOWER_RIGHT_LAT	-035.000000
GEO_LOWER_RIGHT_LONG	+060.000000
GEO_LOWER_LEFT_LAT	-035.000000
GEO_LOWER_LEFT_LONG	-026.000000
IMAGE_UPPER_LEFT_ROW	1
IMAGE_UPPER_LEFT_COL	1
IMAGE_UPPER_RIGHT_ROW	1
IMAGE_UPPER_RIGHT_COL	9633
IMAGE_LOWER_RIGHT_ROW	8177
IMAGE_LOWER_RIGHT_COL	9633
IMAGE_LOWER_LEFT_ROW	8177
IMAGE_LOWER_LEFT_COL	1
IMAGE_CENTER_ROW	4089.0
IMAGE_CENTER_COL	4817.0
GEOM_CHAR_REF	V2_G_000_2002_07_24_01.PCI
GEOM_BAND_REF	B3
DEM_REF	dtm_vgt_system_proj
DEM_DATE	19971205
USE_GCP	S
RADIOM_EQUAL_REF	V2_E_126_2007_04_28_02.PCI
RADIOM_ABS_CAL_REF	V2_A_000_2007_05_01_05.PCI
SYNTHESIS_NOM_DATE	20070511
SYNTHESIS_FIRST_DATE	20070510214130
SYNTHESIS_LAST_DATE	20070520225936
ATMOS_CORREC_REF	CTIV_SMAC_V4.0

CLOUD_COVER_REF	CTIV_CLOUD_COVER_V2.0
SNOW_COVER_REF	CTIV_SNOW_ICE_COVER_V2.0
SYNTHESIS_REF	CTIV_SYNTHESIS_V1.0
PRODUCTION_DATE	20070611

### Example 3: VGT4Africa DMP Original Metadata file (subset)

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xmlns:gmx="http://www.isotc211.org/2005/gmx" xmlns:gml="http://www.opengis.net/gml"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
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  and is directly related to the well-known NPP (Net Primary Productivity), but customized for agro-statistics and
expressed in
  kilograms of dry matter (kgDM) per hectare per day.
  The DMP products, produced and distributed in the framework of the VGT4AFRICA project, consist of a DMP dataset,
derived
  from measurements by the VEGETATION instruments on board the SPOT satellites and provided by the MARS-FOOD
project.
  The VGT4AFRICA DMP products cover Africa or any part thereof and are provided on a 10-daily basis. They are also
part
  of the seamless VGT4AFRICA product database and are distributed primarily via the EUMETCast satellite
telecommunications system
  to non-commercial users in Africa.
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expressed in
    kilograms of dry matter (kgDM) per hectare per day.
    The Dry Matter Productivity dataset is calculated by combining fAPAR, the absorbed fraction
photosynthetically active radiation,
    estimated from satellite measurements, with solar radiation and temperature information, as described by
Monteith.
    Higher DMP values indicate higher production of dry biomass, which implies that DMP can be used to
monitor crop growth rates and to
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    The DMP datasets are delivered as part of the VGT4AFRICA Dry Matter Productivity products to non-
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      <MD_RestrictionCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#MD_RestrictionCode"
codeListValue="restricted"/>
    </accessConstraints>
    <useConstraints>
      <MD_RestrictionCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#MD_RestrictionCode"
codeListValue="copyright">See copyright text file</MD_RestrictionCode>
    </useConstraints>
  </MD_LegalConstraints>
</resourceConstraints>
<spatialRepresentationType>
  <MD_SpatialRepresentationTypeCode
codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#MD_SpatialRepresentationTypeCode"
codeListValue="grid"/>
</spatialRepresentationType>
<language>
  <LanguageCode codeList="http://www.loc.gov/standards/iso639-2/langcodes.html" codeListValue="eng" codeSpace="ISO 639-
2">English</LanguageCode>
</language>

```

```

<characterSet>
  <MD_CharacterSetCode
codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodeLists.xml#MD_CharacterSetCode" codeListValue="utf8"/>
</characterSet>
<topicCategory>
  <MD_TopicCategoryCode>imageryBaseMapsEarthCover</MD_TopicCategoryCode>
</topicCategory>
<topicCategory>
  <MD_TopicCategoryCode>biota</MD_TopicCategoryCode>
</topicCategory>
<topicCategory>
  <MD_TopicCategoryCode>farming</MD_TopicCategoryCode>
</topicCategory>
<topicCategory>
  <MD_TopicCategoryCode>environment</MD_TopicCategoryCode>
</topicCategory>
<extent>
  <EX_Extent>
    <geographicElement>
      <EX_GeographicBoundingBox>
        <westBoundLongitude>
          <gco:Decimal>-26.00000000</gco:Decimal>
        </westBoundLongitude>
        <eastBoundLongitude>
          <gco:Decimal>60.00000000</gco:Decimal>
        </eastBoundLongitude>
        <southBoundLatitude>
          <gco:Decimal>-35.00000000</gco:Decimal>
        </southBoundLatitude>
        <northBoundLatitude>
          <gco:Decimal>38.00000000</gco:Decimal>
        </northBoundLatitude>
      </EX_GeographicBoundingBox>
    </geographicElement>
    <temporalElement>
      <EX_TemporalExtent>
        <extent>
          <gml:TimePeriod gml:id="tp1" frame="#ISO-8601">
            <gml:description>10-day composite period</gml:description>
            <gml:name>dekad</gml:name>
            <gml:beginPosition>2008-09-01T00:00:00</gml:beginPosition>
            <gml:endPosition>2008-09-10T23:59:59</gml:endPosition>
          </gml:TimePeriod>
        </extent>
      </EX_TemporalExtent>
    </temporalElement>
  </EX_Extent>
</extent>
<supplementalInformation>
  <gco:CharacterString>VGT-NDVI=m:\dgl\rois\gpi\act\s10\vt0825i.img, Pmax=m:\dgl\rois\gpi\met\s10\wt0825p.img,
IPol=0</gco:CharacterString>
</supplementalInformation>
</MD_DataIdentification>
</identificationInfo>
<contentInfo>
  <MD_CoverageDescription>
    <attributeDescription>
      <gco:RecordType>DMP values</gco:RecordType>
    </attributeDescription>
  </contentInfo>
  <MD_CoverageContentTypeCode
codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodeLists.xml#MD_CoverageContentTypeCode"
codeListValue="image"/>
</contentInfo>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>Physical</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>

```



```

    </gco:attributeType>
  </gco:MemberName>
</sequenceIdentifier>
<descriptor>
  <gco:CharacterString>Display digital value range</gco:CharacterString>
</descriptor>
<maxValue>
  <gco:Real>32767</gco:Real>
</maxValue>
<minValue>
  <gco:Real>0</gco:Real>
</minValue>
<bitsPerValue>
  <gco:Integer>16</gco:Integer>
</bitsPerValue>
<scaleFactor>
  <gco:Real>0.01</gco:Real>
</scaleFactor>
<offset>
  <gco:Real>0</gco:Real>
</offset>
</MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>Missing meteo value</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>
              <gco:CharacterString>flag type</gco:CharacterString>
            </gco:aName>
          </gco:TypeName>
        </gco:attributeType>
      </gco:MemberName>
    </sequenceIdentifier>
    <descriptor>
      <gco:CharacterString>METMis</gco:CharacterString>
    </descriptor>
    <maxValue>
      <gco:Real>-300</gco:Real>
    </maxValue>
    <minValue>
      <gco:Real>-300</gco:Real>
    </minValue>
    <bitsPerValue>
      <gco:Integer>16</gco:Integer>
    </bitsPerValue>
  </MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>NDVI less than 0</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>
              <gco:CharacterString>flag type</gco:CharacterString>
            </gco:aName>
          </gco:TypeName>
        </gco:attributeType>
      </gco:MemberName>
    </sequenceIdentifier>
    <descriptor>
      <gco:CharacterString>NDVI<&lt;0</gco:CharacterString>
    </descriptor>
    <maxValue>
      <gco:Real>-257</gco:Real>

```



```

</maxValue>
<minValue>
  <gco:Real>-257</gco:Real>
</minValue>
<bitsPerValue>
  <gco:Integer>16</gco:Integer>
</bitsPerValue>
</MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>Missing value</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>
              <gco:CharacterString>flag type</gco:CharacterString>
            </gco:aName>
          </gco:TypeName>
        </gco:attributeType>
      </gco:MemberName>
    </sequenceIdentifier>
    <descriptor>
      <gco:CharacterString>Missing</gco:CharacterString>
    </descriptor>
    <maxValue>
      <gco:Real>-5</gco:Real>
    </maxValue>
    <minValue>
      <gco:Real>-5</gco:Real>
    </minValue>
    <bitsPerValue>
      <gco:Integer>16</gco:Integer>
    </bitsPerValue>
  </MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>cloud</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>
              <gco:CharacterString>flag type</gco:CharacterString>
            </gco:aName>
          </gco:TypeName>
        </gco:attributeType>
      </gco:MemberName>
    </sequenceIdentifier>
    <descriptor>
      <gco:CharacterString>cloud</gco:CharacterString>
    </descriptor>
    <maxValue>
      <gco:Real>-4</gco:Real>
    </maxValue>
    <minValue>
      <gco:Real>-4</gco:Real>
    </minValue>
    <bitsPerValue>
      <gco:Integer>16</gco:Integer>
    </bitsPerValue>
  </MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>

```

---

```

    <gco:CharacterString>snow</gco:CharacterString>
  </gco:aName>
  <gco:attributeType>
    <gco:TypeName>
      <gco:aName>
        <gco:CharacterString>flag type</gco:CharacterString>
      </gco:aName>
    </gco:TypeName>
  </gco:attributeType>
</gco:MemberName>
</sequenceIdentifier>
<descriptor>
  <gco:CharacterString>snow</gco:CharacterString>
</descriptor>
<maxValue>
  <gco:Real>-3</gco:Real>
</maxValue>
<minValue>
  <gco:Real>-3</gco:Real>
</minValue>
<bitsPerValue>
  <gco:Integer>16</gco:Integer>
</bitsPerValue>
</MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>sea</gco:CharacterString>
        </gco:aName>
      <gco:attributeType>
        <gco:TypeName>
          <gco:aName>
            <gco:CharacterString>flag type</gco:CharacterString>
          </gco:aName>
        </gco:TypeName>
      </gco:attributeType>
    </gco:MemberName>
  </sequenceIdentifier>
  <descriptor>
    <gco:CharacterString>sea</gco:CharacterString>
  </descriptor>
  <maxValue>
    <gco:Real>-2</gco:Real>
  </maxValue>
  <minValue>
    <gco:Real>-2</gco:Real>
  </minValue>
  <bitsPerValue>
    <gco:Integer>16</gco:Integer>
  </bitsPerValue>
</MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>back</gco:CharacterString>
        </gco:aName>
      <gco:attributeType>
        <gco:TypeName>
          <gco:aName>
            <gco:CharacterString>flag type</gco:CharacterString>
          </gco:aName>
        </gco:TypeName>
      </gco:attributeType>
    </gco:MemberName>
  </sequenceIdentifier>
  <descriptor>
    <gco:CharacterString>back</gco:CharacterString>
  </descriptor>

```

```

    <maxValue>
    <gco:Real>-1</gco:Real>
  </maxValue>
  <minValue>
    <gco:Real>-1</gco:Real>
  </minValue>
  <bitsPerValue>
    <gco:Integer>16</gco:Integer>
  </bitsPerValue>
</MD_Band>
</dimension>
<dimension>
  <MD_Band>
    <sequenceIdentifier>
      <gco:MemberName>
        <gco:aName>
          <gco:CharacterString>back2</gco:CharacterString>
        </gco:aName>
        <gco:attributeType>
          <gco:TypeName>
            <gco:aName>
              <gco:CharacterString>flag type</gco:CharacterString>
            </gco:aName>
          </gco:TypeName>
        </gco:attributeType>
      </gco:MemberName>
    </sequenceIdentifier>
    <descriptor>
      <gco:CharacterString>back</gco:CharacterString>
    </descriptor>
    <maxValue>
      <gco:Real>-2</gco:Real>
    </maxValue>
    <minValue>
      <gco:Real>-2</gco:Real>
    </minValue>
    <bitsPerValue>
      <gco:Integer>16</gco:Integer>
    </bitsPerValue>
  </MD_Band>
</dimension>
</MD_CoverageDescription>
</contentInfo>
<metadataConstraints>
  <MD_LegalConstraints>
    <useLimitation>
      <gco:CharacterString>Non-commercial use by African users and in support of African sustainable
        development is free. All other use is restricted. See data policy for details.</gco:CharacterString>
    </useLimitation>
    <accessConstraints>
      <MD_RestrictionCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodellists.xml#MD_RestrictionCode"
        codeListValue="restricted"/>
    </accessConstraints>
    <useConstraints>
      <MD_RestrictionCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodellists.xml#MD_RestrictionCode"
        codeListValue="copyright">See copyright text file</MD_RestrictionCode>
    </useConstraints>
  </MD_LegalConstraints>
</metadataConstraints>
<metadataMaintenance>
  <MD_MaintenanceInformation>
    <maintenanceAndUpdateFrequency>
      <MD_MaintenanceFrequencyCode
        codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodellists.xml#MD_MaintenanceFrequencyCode"
        codeListValue="asNeeded"/>
    </maintenanceAndUpdateFrequency>
  </MD_MaintenanceInformation>
</metadataMaintenance>
</MD_Metadata>
</has>
<gmx:dataFile>
  <gmx:MX_DataFile>
    <gmx:fileName>
      <gmx:FileName>20080901_DMP.HDF</gmx:FileName>
    </gmx:fileName>
  </gmx:MX_DataFile>
</gmx:dataFile>

```

---

```

</gmx:fileName>
<gmx:fileDescription>
  <gco:CharacterString>DMP pixel data file</gco:CharacterString>
</gmx:fileDescription>
<gmx:fileType>
  <gmx:MimeType type="application/x-hdf">HDF</gmx:MimeType>
</gmx:fileType>
<gmx:fileFormat>
  <MD_Format>
    <name>
      <gco:CharacterString>Hierarchical Data Format (HDF)</gco:CharacterString>
    </name>
    <version>
      <gco:CharacterString>4</gco:CharacterString>
    </version>
    <formatDistributor>
      <MD_Distributor>
        <distributorContact>
          <CI_ResponsibleParty>
            <organisationName>
              <gco:CharacterString>The HDF Group</gco:CharacterString>
            </organisationName>
            <contactInfo>
              <CI_Contact>
                <onlineResource>
                  <CI_OnlineResource>
                    <linkage>
                      <URL>http://www.hdfgroup.com/</URL>
                    </linkage>
                    <protocol>
                      <gco:CharacterString>HTTP</gco:CharacterString>
                    </protocol>
                    <name>
                      <gco:CharacterString>HDF Group website</gco:CharacterString>
                    </name>
                    <function>
                      <CI_OnlineFunctionCode
codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#CI_OnlineFunctionCode"
codeListValue="information"/>
                    </function>
                  </CI_OnlineResource>
                </onlineResource>
              </CI_Contact>
            </contactInfo>
            <role>
              <CI_RoleCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="originator"/>
            </role>
          </CI_ResponsibleParty>
        </distributorContact>
      </MD_Distributor>
    </formatDistributor>
  </MD_Format>
</gmx:fileFormat>
</gmx:MX_DataFile>
</gmx:dataFile>
<gmx:datasetCatalogue>
  <gmx:CT_CrsCatalogue>
    <gmx:name>
      <gco:CharacterString>Catalogue of available coordinate reference systems</gco:CharacterString>
    </gmx:name>
    <gmx:scope>
      <gmx:MX_ScopeCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#MD_ScopeCode"
codeListValue="series">All datasets of the series</gmx:MX_ScopeCode>
    </gmx:scope>
    <gmx:versionNumber>
      <gco:CharacterString>1.0</gco:CharacterString>
    </gmx:versionNumber>
    <gmx:versionDate>
      <gco:Date>2006-10-01</gco:Date>
    </gmx:versionDate>
    <gmx:language>
      <gco:CharacterString>English</gco:CharacterString>
    </gmx:language>
  </gmx:CT_CrsCatalogue>

```

```

<gmx:characterSet>
  <MD_CharacterSetCode codeList="http://www.isotc211.org/2005/resources/codelist/gmxCodelists.xml#MD_ScopeCode"
codeListValue="utf8"/>
</gmx:characterSet>
<gmx:crs>
  <gml:GeodeticCRS gml:id="EPSG4326">
    <gml:identifier codeSpace="EPSG_v65">4326</gml:identifier>
    <gml:name codeSpace="IGN-F">WGS84G</gml:name>
    <gml:name>World Geodetic System 1984</gml:name>
    <gml:domainOfValidity>
      <EX_Extent>
        <geographicElement>
          <EX_GeographicDescription>
            <geographicIdentifier>
              <MD_Identifier>
                <code>
          <gco:CharacterString>World: Afghanistan, Albania, Algeria, American Samoa, Andorra, Angola, Anguilla, Antarctica, Antigua
and Barbuda, Argentina, Armenia, Aruba, Australia,
                Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belgium, Belgium, Belize, Benin, Bermuda,
Bhutan, Bolivia, Bosnia and Herzegowina,
                Botswana, Bouvet Island, Brazil, British Indian Ocean Territory, British Virgin Islands, Brunei Darussalam,
Bulgaria, Burkina Faso, Burundi, Cambodia,
                Cameroon, Canada, Cape Verde, Cayman Islands, Central African Republic, Chad, Chile, China, Christmas
Island, Cocos (Keeling) Islands, Comoros,
                Congo, Cook Islands, Costa Rica, CÃ´te d'Ivoire (Ivory Coast), Croatia, Cuba, Cyprus, Czech Republic,
Denmark, Djibouti, Dominica, Dominican Republic,
                East Timor, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Falkland Islands
(Malvinas), Faroe Islands, Fiji, Finland, France,
                French Guiana, French Polynesia, French Southern Territories, Gabon, Gambia, Georgia, Germany, Ghana,
Gibraltar, Greece, Greenland, Grenada,
                Guadeloupe, Guam, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Heard Island and McDonald Islands,
Holy See (Vatican City State), Honduras, China
                - Hong Kong, Hungary, Iceland, India, Indonesia, Islamic Republic of Iran, Iraq, Ireland, Israel, Italy, Jamaica,
Japan, Jordan, Kazakstan, Kenya, Kiribati,
                Democratic People's Republic of Korea (North Korea), Republic of Korea (South Korea), Kuwait, Kyrgyzstan,
Lao People's Democratic Republic (Laos),
                Latvia, Lebanon, Lesotho, Liberia, Libyan Arab Jamahiriya, Liechtenstein, Lithuania, Luxembourg, China -
Macau, The Former Yugoslav Republic of
                Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Martinique, Mauritania,
Mauritius, Mayotte, Mexico, Federated States
                of Micronesia, Monaco, Mongolia, Montserrat, Morocco, Mozambique, Myanmar (Burma), Namibia, Nauru,
Nepal, Netherlands, Netherlands Antilles, New
                Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Niue, Norfolk Island, Northern Mariana Islands, Norway,
Oman, Pakistan, Palau, Panama, Papua New
                Guinea (PNG), Paraguay, Peru, Philippines, Pitcairn, Poland, Portugal, Puerto Rico, Qatar, Reunion, Romania,
Russian Federation, Rwanda, Saint Kitts and
                Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi
Arabia, Senegal, Seychelles, Sierra Leone,
                Singapore, Slovakia (Slovak Republic), Slovenia, Solomon Islands, Somalia, South Africa, South Georgia and
the South Sandwich Islands, Spain, Sri Lanka,
                Saint Helena, Saint Pierre and Miquelon, Sudan, Suriname, Svalbard and Jan Mayen, Swaziland, Sweden,
Switzerland, Syrian Arab Republic, Taiwan,
                Tajikistan, United Republic of Tanzania, Thailand, The Democratic Republic of the Congo (Zaire), Togo,
Tokelau, Tonga, Trinidad and Tobago, Tunisia,
                Turkey, Turkmenistan, Turks and Caicos Islands, Tuvalu, Uganda, Ukraine, United Arab Emirates (UAE), United
Kingdom (UK), United States (USA),
                United States Minor Outlying Islands, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, US Virgin Islands,
Wallis and Futuna, Western Sahara, Yemen,
                Yugoslavia - Union of Serbia and Montenegro, Zambia, Zimbabwe.</gco:CharacterString>
              </code>
            </MD_Identifier>
          </geographicIdentifier>
        </EX_GeographicDescription>
      </geographicElement>
    </EX_Extent>
  </gml:domainOfValidity>
  <gml:scope>not known</gml:scope>
  <gml:ellipsoidalCS/>
  <gml:geodeticDatum/>
</gml:GeodeticCRS>
</gmx:crs>
<gmx:datum>
  <gml:GeodeticDatum gml:id="EPSG6326">
    <gml:identifier codeSpace="EPSG_v65">6326</gml:identifier>

```

```
<gml:name>World Geodetic System 1984</gml:name>
<gml:scope>not known</gml:scope>
<gml:primeMeridian>
  <gml:PrimeMeridian gml:id="EPSG8901">
    <gml:identifier codeSpace="EPSG_v65">8901</gml:identifier>
    <gml:name>Greenwich</gml:name>
    <gml:greenwichLongitude uom="deg">0</gml:greenwichLongitude>
  </gml:PrimeMeridian>
</gml:primeMeridian>
<gml:ellipsoid>
  <gml:Ellipsoid gml:id="EPSG7030">
    <gml:identifier codeSpace="EPSG_v65">7030</gml:identifier>
    <gml:name>WGS 84</gml:name>
    <gml:semiMajorAxis uom="m">6378137</gml:semiMajorAxis>
    <gml:secondDefiningParameter>
      <gml:SecondDefiningParameter>
        <gml:semiMinorAxis uom="m">6356752.314</gml:semiMinorAxis>
      </gml:SecondDefiningParameter>
    </gml:secondDefiningParameter>
  </gml:Ellipsoid>
</gml:ellipsoid>
</gml:GeodeticDatum>
</gmx:datum>
</gmx:CT_CrsCatalogue>
</gmx:datasetCatalogue>
<gmx:supportFile>
  <gmx:MX_SupportFile>
    <gmx:fileName>
      <gmx:FileName>20080901_QL.TIF</gmx:FileName>
    </gmx:fileName>
    <gmx:fileDescription>
      <gco:CharacterString>Quicklook image of DMP dataset</gco:CharacterString>
    </gmx:fileDescription>
    <gmx:fileType>
      <gmx:MimeType type="image/tiff"/>
    </gmx:fileType>
  </gmx:MX_SupportFile>
</gmx:supportFile>
<gmx:supportFile>
  <gmx:MX_SupportFile>
    <gmx:fileName>
      <gmx:FileName>20080901_RIG.TXT</gmx:FileName>
    </gmx:fileName>
    <gmx:fileDescription>
      <gco:CharacterString>Copyright text file</gco:CharacterString>
    </gmx:fileDescription>
    <gmx:fileType>
      <gmx:MimeType type="text/plain"/>
    </gmx:fileType>
  </gmx:MX_SupportFile>
</gmx:supportFile>
</gmx:MX_DataSet>
</describes>
</MD_Metadata>
```

## ANNEX 4 MODIFIED EOP BASE SCHEMA TAKING INTO ACCOUNT THE CHANGE REQUESTS

```
?xml version="1.0" encoding="utf-8"?>
```

```
<!-- Version 1.2.1-GIM 06-02-2009 takes into account issues 170, 171 and 172 raised in the EOxebRIM SWG -->
```

```
<xs:schema xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:eop="http://earth.esa.int/eop" xmlns:xs="http://www.w3.org/2001/XMLSchema" targetNamespace="http://earth.esa.int/eop"
elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.2.1">
```

```
  <xs:import namespace="http://www.opengis.net/gml" schemaLocation="../../gml/3.1.1/base/gmlSubset.xsd"/>
```

```
  <xs:import namespace="http://www.w3.org/1999/xlink" schemaLocation="../../xlink/1.0.0/xlinks.xsd"/>
```

```
  <xs:element name="EarthObservation" type="eop:EarthObservationType" substitutionGroup="gml:Observation">
```

```
    <xs:annotation>
```

```
      <xs:documentation>eop root element for generic Earth Observation Product
description</xs:documentation>
```

```
    </xs:annotation>
```

```
  </xs:element>
```

```
  <xs:complexType name="EarthObservationType" mixed="false">
```

```
    <xs:annotation>
```

```
      <xs:documentation>Earth Observation Product description</xs:documentation>
```

```
    </xs:annotation>
```

```
    <xs:complexContent mixed="false">
```

```
      <xs:extension base="gml:ObservationType">
```

```
        <xs:attribute name="version" type="xs:string" use="required" fixed="1.2.1">
```

```
          <xs:annotation>
```

```
            <xs:documentation>Reference to the schema version number used to
validate the instance</xs:documentation>
```

```
          </xs:annotation>
```

```
        </xs:attribute>
```

```
      </xs:extension>
```

```
    </xs:complexContent>
```

```
  </xs:complexType>
```

```
  <xs:complexType name="EarthObservationPropertyType">
```

```
    <xs:sequence>
```

```
      <xs:element ref="eop:EarthObservation" minOccurs="0"/>
```

```
    </xs:sequence>
```

```
    <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
```

```
  </xs:complexType>
```

```
  <xs:element name="EarthObservationEquipment" type="eop:EarthObservationEquipmentType"
substitutionGroup="gml:_Feature"/>
```

```
  <xs:complexType name="EarthObservationEquipmentType" mixed="false">
```

```
    <xs:complexContent mixed="false">
```

```
      <xs:extension base="gml:AbstractFeatureType">
```

```
        <xs:sequence>
```

```
          <xs:element name="platform" type="eop:PlatformPropertyType"
minOccurs="0"/>
```

```

minOccurs="0"/>
<xs:element name="instrument" type="eop:InstrumentPropertyType"
minOccurs="0"/>
<xs:element name="sensor" type="eop:SensorPropertyType" minOccurs="0"/>
minOccurs="0"/>
<xs:element name="acquisitionParameters" type="eop:AcquisitionPropertyType"
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="EarthObservationEquipmentPropertyType">
<xs:sequence>
<xs:element ref="eop:EarthObservationEquipment"/>
</xs:sequence>
</xs:complexType>
<xs:attribute name="type" type="xs:QName"/>
<xs:element name="ArchivingInformation" type="eop:ArchivingInformationType"/>
<xs:complexType name="ArchivingInformationArrayPropertyType">
<xs:sequence>
<xs:element ref="eop:ArchivingInformation" maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="ArchivingInformationType">
<xs:sequence>
<xs:element name="archivingCenter" type="gml:CodeListType">
<xs:annotation>
<xs:documentation>Archiving centre code. Possible values are mission specific
and should be retrieved using codespace.
PHR : value is a valid station code
eop/EOLI : N/A</xs:documentation>
</xs:annotation>
</xs:element>
<xs:element name="archivingDate" type="xs:dateTime">
<xs:annotation>
<xs:documentation>Archiving date time</xs:documentation>
</xs:annotation>
</xs:element>
<xs:element name="archivingIdentifier" type="eop:CodeWithAuthorityType" minOccurs="0">
<xs:annotation>
<xs:documentation>Local archiving id as created by the mission ground
segment that may required to allow subsequent order processing</xs:documentation>
</xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
<xs:element name="DownlinkInformation" type="eop:DownlinkInformationType"/>
<xs:complexType name="DownlinkInformationArrayPropertyType">

```



---

```

    <xs:sequence>
      <xs:element ref="eop:DownlinkInformation" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="DownlinkInformationType">
    <xs:sequence>
      <xs:element name="acquisitionStation" type="gml:CodeListType">
        <xs:annotation>
          <xs:documentation>Acquisition / receiving station code. Possible values are
mission specific and should be retrieved using codespace.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="acquisitionDate" type="xs:dateTime" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Acquisition date time</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:element name="EarthObservationMetaData" type="eop:EarthObservationMetaDataType"
substitutionGroup="gml:_MetaData"/>
  <xs:complexType name="EarthObservationMetaDataType" mixed="true">
    <xs:complexContent mixed="true">
      <xs:extension base="gml:AbstractMetaDataType">
        <xs:sequence>
          <xs:element ref="eop:identifier"/>
          <xs:element ref="eop:doi" minOccurs="0"/>
          <xs:element ref="eop:parentIdentifier" minOccurs="0"/>
          <xs:element ref="eop:acquisitionType"/>
          <xs:element ref="eop:acquisitionSubType" minOccurs="0"/>
          <xs:element ref="eop:productType" minOccurs="0"/>
          <xs:element ref="eop:status"/>
          <xs:element name="downlinkedTo"
type="eop:DownlinkInformationArrayPropertyType" minOccurs="0"/>
          <xs:element name="archivedIn"
type="eop:ArchivingInformationArrayPropertyType" minOccurs="0"/>
          <xs:element ref="eop:imageQualityDegradation" minOccurs="0"/>
          <xs:element ref="eop:imageQualityDegradationQuotationMode"
minOccurs="0"/>
          <xs:element ref="eop:histograms" minOccurs="0"/>
          <xs:element ref="eop:composedOf" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element ref="eop:subsetOf" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element ref="eop:linkedWith" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element name="processing" type="eop:ProcessingInformationPropertyType"
minOccurs="0"/>
          <xs:element name="vendorSpecific"
type="eop:SpecificInformationArrayPropertyType" minOccurs="0"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

```

---

```

        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:element name="Acquisition" type="eop:AcquisitionType"/>
<xs:complexType name="AcquisitionPropertyType">
    <xs:sequence>
        <xs:element ref="eop:Acquisition"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="AcquisitionType">
    <xs:sequence>
        <xs:element name="orbitNumber" type="xs:int" minOccurs="0">
            <xs:annotation>
                <xs:documentation>EOLI : orbit (F B b s)</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="lastOrbitNumber" type="xs:int" minOccurs="0">
            <xs:annotation>
                <xs:documentation>EOLI : lastOrbit (F)</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="orbitDirection" minOccurs="0">
            <xs:annotation>
                <xs:documentation>EOLI : orbitDir (F B b s)</xs:documentation>
            </xs:annotation>
            <xs:simpleType>
                <xs:restriction base="xs:string">
                    <xs:enumeration value="ASCENDING"/>
                    <xs:enumeration value="DESCENDING"/>
                </xs:restriction>
            </xs:simpleType>
        </xs:element>
        <xs:element name="wrsLongitudeGrid" minOccurs="0">
            <xs:annotation>
                <xs:documentation>Neutral wrsLongitudeGrid to replace track in track/frame, K
in K/J, etc. The optional attribute "eop:codeSpace" is used to point the reference grid.</xs:documentation>
            </xs:annotation>
            <xs:complexType>
                <xs:simpleContent>
                    <xs:extension base="xs:anySimpleType">
                        <xs:attribute name="codeSpace" type="xs:anyURI"/>
                    </xs:extension>
                </xs:simpleContent>
            </xs:complexType>
        </xs:element>
        <xs:element name="wrsLatitudeGrid" minOccurs="0">

```

---

```

        <xs:annotation>
            <xs:documentation>Neutral wrsLatitudeGrid to replace frame in track/frame, J
in K/J, etc. The optional attribute "codeSpace" is used to point the reference grid.</xs:documentation>
        </xs:annotation>
        <xs:complexType>
            <xs:simpleContent>
                <xs:extension base="xs:anySimpleType">
                    <xs:attribute name="codeSpace" type="xs:anyURI"/>
                </xs:extension>
            </xs:simpleContent>
        </xs:complexType>
    </xs:element>
    <xs:element name="ascendingNodeDate" type="xs:dateTime" minOccurs="0">
        <xs:annotation>
            <xs:documentation>UTC date and time at ascending node of
orbit</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="ascendingNodeLongitude" type="gml:MeasureType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Longitude at ascending node of orbit. should be expressed
in degrees</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="startTimeFromAscendingNode" type="gml:MeasureType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Start time of acquisition in milliseconds from Ascending
node date</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="completionTimeFromAscendingNode" type="gml:MeasureType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Completion time of acquisition in milliseconds from
Ascending node date</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="orbitDuration" type="gml:MeasureType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Actual orbit duration in milliseconds</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="acrossTrackIncidenceAngle" type="gml:AngleType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Across Track Incidence angle given in
degrees.</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="alongTrackIncidenceAngle" type="gml:AngleType" minOccurs="0">

```

---

```

        <xs:annotation>
            <xs:documentation>Along Track Incidence angle given in
degrees.</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="incidenceAngle" type="gml:AngleType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Global Incidence angle given in
degrees.</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="pitch" type="gml:AngleType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Pitch angle given in degrees.</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="roll" type="gml:AngleType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Roll angle given in degrees.</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="yaw" type="gml:AngleType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Yaw angle given in degrees.</xs:documentation>
        </xs:annotation>
    </xs:element>
</xs:sequence>
</xs:complexType>
<xs:complexType name="PlatformPropertyType">
    <xs:sequence>
        <xs:element ref="eop:Platform"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="InstrumentPropertyType">
    <xs:sequence>
        <xs:element ref="eop:Instrument"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="SensorPropertyType">
    <xs:sequence>
        <xs:element ref="eop:Sensor"/>
    </xs:sequence>
</xs:complexType>
<xs:element name="Platform" type="eop:PlatformType"/>
<xs:complexType name="PlatformType">
    <xs:sequence>

```

---

```

    <xs:element name="shortName" type="xs:string">
      <xs:annotation>
        <xs:documentation>Platform short name (eg. PHR) </xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="serialIdentifier" type="xs:string" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Platform serial identifier (eg. for PHR :
1A)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="orbitType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>High level characterisation of main mission types
(GEO/LEO)</xs:documentation>
      </xs:annotation>
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="GEO"/>
          <xs:enumeration value="LEO"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:element name="Instrument" type="eop:InstrumentType"/>
<xs:complexType name="InstrumentType">
  <xs:sequence>
    <xs:element name="shortName" type="xs:string">
      <xs:annotation>
        <xs:documentation>Instrument short name
EOLI : instShNm</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:element name="Sensor" type="eop:SensorType"/>
<xs:complexType name="SensorType">
  <xs:sequence>
    <xs:element name="sensorType" type="eop:SensorTypePropertyType" minOccurs="0"/>
    <xs:element name="operationalMode" type="gml:CodeListType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Sensor mode. Possible values are mission specific and
should
be retrieved using codespace. (eg. PHR : PA, XS or PX).</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```

---

```

    </xs:element>
    <xs:element name="resolution" type="gml:MeasureType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Image resolution</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="swathIdentifier" type="gml:CodeListType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Swath identifier (e.g. Envisat ASAR has 7 distinct swaths
(11,12,13...17) that correspond to precise incidence angles for the sensor). Value list can be retrieved with
codeSpace.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:simpleType name="SensorTypePropertyType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="ALTIMETRIC"/>
    <xs:enumeration value="ATMOSPHERIC"/>
    <xs:enumeration value="OPTICAL"/>
    <xs:enumeration value="RADAR"/>
  </xs:restriction>
</xs:simpleType>
<xs:element name="EarthObservationResult" type="eop:EarthObservationResultType" substitutionGroup="gml:_Feature">
  <xs:annotation>
    <xs:documentation>Defines the observation result, i.e. the Earth Observation
Product</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name="EarthObservationResultType" mixed="false">
  <xs:complexContent mixed="false">
    <xs:extension base="gml:AbstractFeatureType">
      <xs:sequence>
        <xs:element name="browse" type="eop:BrowseInformationArrayPropertyType"
minOccurs="0"/>
        <xs:element name="product" type="eop:ProductInformationArrayPropertyType"
minOccurs="0"/>
        <xs:element name="mask" type="eop:MaskInformationArrayPropertyType"
minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="EarthObservationResultPropertyType">
  <xs:sequence>
    <xs:element ref="eop:EarthObservationResult"/>
  </xs:sequence>
</xs:complexType>

```

```

<xs:element name="Footprint" type="eop:FootprintType" substitutionGroup="gml:_Feature">
  <xs:annotation>
    <xs:documentation>Defines the acquisition footprint, i.e. the region observed by the
Instrument</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name="FootprintType" mixed="false">
  <xs:complexContent mixed="false">
    <xs:extension base="gml:AbstractFeatureType">
      <xs:sequence>
        <xs:element ref="gml:multiExtentOf">
          <xs:annotation>
            <xs:documentation>Acquisition footprint coordinates,
described by a closed polygon (last point=first point), using CRS:WGS84, Latitude,Longitude pairs (per-WGS84 definition of point
ordering, not necessarily per all WFS implementations). Expected structure is gml:Polygon/gml:exterior/gml:LinearRing/gml:posList.

```

eop/EOLI : polygon/coordinates (F B b s)

```

          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element ref="gml:centerOf" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Acquisition center coordinates.

```

Expected structure is gml:Point/gml:pos.

eop/EOLI : scCenter/coordinates (F B b s)</xs:documentation>

```

          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="BrowseInformationArrayPropertyType">
  <xs:sequence>
    <xs:element ref="eop:BrowseInformation" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:element name="BrowseInformation" type="eop:BrowseInformationType"/>
<xs:complexType name="BrowseInformationType">
  <xs:sequence>
    <xs:element name="type">
      <xs:annotation>
        <xs:documentation>Browse type. Possible values are : THUMBNAIL,
QUICKLOOK and ALBUM. </xs:documentation>
      </xs:annotation>
    <xs:simpleType>
      <xs:restriction base="xs:string">

```

---

```

        <xs:enumeration value="THUMBNAIL"/>
        <xs:enumeration value="QUICKLOOK"/>
        <xs:enumeration value="ALBUM"/>
    </xs:restriction>
</xs:simpleType>
</xs:element>
<xs:element name="subType" type="gml:CodeListType" minOccurs="0">
    <xs:annotation>
        <xs:documentation>Value is mission specific. Value list can be retrieved with
codeSpace. Not used by PHR. For MODIS : OPTICAL, THERMAL</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="referenceSystemIdentifier" type="eop:CodeWithAuthorityType">
    <xs:annotation>
        <xs:documentation>Indicates if browse is geo-referenced, and thus can be
assumed to be displayed directly on a map (in which case should point to a code space for the CRS), when not supplied it is assumed
that the browse is provided in "raw" satellite frame of reference</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="fileName" type="xs:string">
    <xs:annotation>
        <xs:documentation>Path to the browse image (could be any kind of URL :
direct link to the image or WMS/WCS interface), it is assumed that if a client is prepared to "manage" a browse delivered by e.g.
WMS they would parse the URL to identify that it contains the OGC standard SERVICE=WMS</xs:documentation>
    </xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
<xs:complexType name="ProductInformationArrayPropertyType">
    <xs:sequence>
        <xs:element ref="eop:ProductInformation" maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
<xs:element name="ProductInformation" type="eop:ProductInformationType"/>
<xs:complexType name="ProductInformationType">
    <xs:sequence>
        <xs:element name="referenceSystemIdentifier" type="eop:CodeWithAuthorityType" minOccurs="0">
            <xs:annotation>
                <xs:documentation>Indicates if product is geo-referenced, (in which case should
point to a code space for the CRS), when not supplied it is assumed that the browse is provided in "raw" satellite frame of
reference</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="fileName" type="xs:string">
            <xs:annotation>
                <xs:documentation>Path to the actual product data if available online (could be
any kind of URL :

```



direct link to the image or WMS/WCS interface), it is assumed that if a client is prepared to "manage" a product delivered by e.g. WCS they would parse the URL to identify that it contains the OGC standard SERVICE=WCS</xs:documentation>

```

        </xs:annotation>
    </xs:element>
    <xs:element name="version" type="xs:string" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Product version</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="size" type="gml:MeasureListType" minOccurs="0">
        <xs:annotation>
            <xs:documentation>Product size (bytes) allowing the user to realise how long a
download is likely to take</xs:documentation>
        </xs:annotation>
    </xs:element>
</xs:sequence>
</xs:complexType>
<xs:complexType name="ProcessingInformationPropertyType">
    <xs:sequence>
        <xs:element ref="eop:ProcessingInformation" maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
<xs:element name="ProcessingInformation" type="eop:ProcessingInformationType"/>
<xs:complexType name="ProcessingInformationType">
    <xs:sequence>
        <xs:element name="processingCenter" type="gml:CodeListType" minOccurs="0">
            <xs:annotation>
                <xs:documentation>Processing centre code. Possible values are mission specific
and should be retrieved using codespace.</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="processingDate" type="xs:dateTime" minOccurs="0">
            <xs:annotation>
                <xs:documentation>Processing date time</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="compositeType" minOccurs="0" type="xs:duration"/>
        <xs:element name="method" type="xs:string" minOccurs="0">
            <xs:annotation>
                <xs:documentation>Method used to compute datalayer. (e.g. Kalman filtering,
ROSE)</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="methodVersion" type="xs:string" minOccurs="0">
            <xs:annotation>
                <xs:documentation>Method version (e.g. 1.0)</xs:documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>

```

---

```

    </xs:element>
    <xs:element name="processorName" type="xs:string" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Processor software name (e.g.
FastROSE)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="processorVersion" type="xs:string" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Processor software version (e.g. 1.0)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="processingLevel" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Processing level applied to the product</xs:documentation>
      </xs:annotation>
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="1A"/>
          <xs:enumeration value="1B"/>
          <xs:enumeration value="2"/>
          <xs:enumeration value="3"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:element>
    <xs:element name="nativeProductFormat" type="xs:string" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Native product format</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:element name="histograms" type="eop:HistogramArrayPropertyType"/>
<xs:element name="Histogram" type="eop:HistogramType" substitutionGroup="gml:_Object"/>
<xs:complexType name="HistogramArrayPropertyType">
  <xs:sequence>
    <xs:element ref="eop:Histogram" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="HistogramType">
  <xs:sequence>
    <xs:element name="bandId" type="xs:string" minOccurs="0"/>
    <xs:element name="min" type="xs:int"/>
    <xs:element name="max" type="xs:int"/>
    <xs:element name="mean" type="xs:double" minOccurs="0"/>
    <xs:element name="stdDeviation" type="xs:double" minOccurs="0"/>
  </xs:sequence>

```

---

```

    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="MaskInformationArrayPropertyType">
    <xs:sequence>
      <xs:element ref="eop:MaskInformation" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:element name="MaskInformation" type="eop:MaskInformationType"/>
  <xs:complexType name="MaskInformationType">
    <xs:sequence>
      <xs:element name="type">
        <xs:annotation>
          <xs:documentation>Mask type. Possible values are : SNOW, CLOUD and
QUALITY</xs:documentation>
        </xs:annotation>
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="SNOW"/>
            <xs:enumeration value="CLOUD"/>
            <xs:enumeration value="QUALITY"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:element name="format">
        <xs:annotation>
          <xs:documentation>Mask format. Possible values are : RASTER or
VECTOR</xs:documentation>
        </xs:annotation>
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="RASTER"/>
            <xs:enumeration value="VECTOR"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:element name="referenceSystemIdentifier" type="eop:CodeWithAuthorityType" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Indicates if mask is geo-referenced, and thus can be
assumed to be displayed directly on a map (in which case should point to a code space for the CRS), when not supplied it is assumed
that the mask is provided in "raw" satellite frame of reference</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="fileName" type="xs:string">
        <xs:annotation>
          <xs:documentation>Path to the mask (could be any kind of URL :
direct link to the image or WMS/WCS interface in case of RASTER mask; direct link to the file or WFS interface in case of VECTOR
file), it is assumed that if a client is prepared to "manage" a mask delivered by e.g. WMS they would parse the URL to identify that it
contains the OGC standard SERVICE=WMS</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>

```

```

        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:element name="Mask" type="eop:MaskType" substitutionGroup="gml:_Feature">
    <xs:annotation>

```

<xs:documentation>Mask defined as a feature collection (in the GML 3.2 sense : a feature collection is a feature having a property derived by extension from gml:AbstractFeatureMemberType). Mandates the following optional gml properties inherited from gml:\_Feature :

- gml:id attribute
- gml:name
- gml:boundedBy

Note : the upcoming gml:identifier will replace eop:identifier in GML 3.2</xs:documentation>

```

    </xs:annotation>
  </xs:element>
  <xs:complexType name="MaskType" mixed="false">
    <xs:complexContent mixed="false">
      <xs:extension base="gml:AbstractFeatureType">
        <xs:sequence>
          <xs:element ref="eop:maskMembers"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:element name="maskMembers" type="eop:MaskMembersPropertyType"/>
  <xs:complexType name="MaskMembersPropertyType">
    <xs:sequence>
      <xs:element ref="eop:MaskFeature" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:element name="MaskFeature" type="eop:MaskFeatureType" substitutionGroup="gml:_Feature">
    <xs:annotation>

```

<xs:documentation>Mask member : . Mandates the following optional gml properties inherited from gml:\_Feature :

- gml:id attribute
- gml:name
- gml:boundedBy

Note : the upcoming gml:identifier will replace eop:identifier in GML 3.2</xs:documentation>

```

    </xs:annotation>
  </xs:element>
  <xs:complexType name="MaskFeatureType" mixed="false">
    <xs:complexContent mixed="false">
      <xs:extension base="gml:AbstractFeatureType">
        <xs:sequence>
          <xs:element name="maskType" type="eop:CodeWithAuthorityType">

```

---

```

        <xs:annotation>
            <xs:documentation>Mask type. Value list can be retrieved
with codeSpace</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element ref="gml:extentOf">
        <xs:annotation>
            <xs:documentation>Mask member extent. Expected
structure is gml:Polygon/gml:exterior/gml:LinearRing/gml:posList with 0 to n gml:Polygon/gml:interior/gml:LinearRing/gml:posList
elements representing the holes.</xs:documentation>
        </xs:annotation>
    </xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:element name="SpecificInformation" type="eop:SpecificInformationType"/>
<xs:complexType name="SpecificInformationArrayPropertyType">
    <xs:sequence>
        <xs:element ref="eop:SpecificInformation" maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="SpecificInformationType">
    <xs:sequence>
        <xs:element name="localAttribute" type="xs:string">
            <xs:annotation>
                <xs:documentation>Container for ad-hoc metadata that does not merit a
mission specific schema or extension, the localAttribute describes the name of the attribute</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="localValue" type="xs:string">
            <xs:annotation>
                <xs:documentation>Container for ad-hoc metadata that does not merit a
mission specific schema or extension, the localAttribute describes the value of the attribute</xs:documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>
</xs:complexType>
<xs:element name="identifier">
    <xs:annotation>
        <xs:documentation>Identifier for metadata item, includes ground segment codespace to guarantee
uniqueness within eop :
urn:eop:GS:CollectionId:ProductId</xs:documentation>
    </xs:annotation>
    <xs:simpleType>
        <xs:restriction base="xs:string"/>
    </xs:simpleType>
</xs:element>

```

---

```

<xs:element name="doi">
  <xs:annotation>
    <xs:documentation>Digital Object Identifier identifying the product</xs:documentation>
  </xs:annotation>
  <xs:simpleType>
    <xs:restriction base="xs:string"/>
  </xs:simpleType>
</xs:element>
<xs:element name="parentIdentifier">
  <xs:annotation>
    <xs:documentation>Collection identifier</xs:documentation>
  </xs:annotation>
  <xs:simpleType>
    <xs:restriction base="xs:string"/>
  </xs:simpleType>
</xs:element>
<xs:element name="status">
  <xs:annotation>
    <xs:documentation>Refers to product status. PHR : always "ACQUIRED"</xs:documentation>
  </xs:annotation>
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:enumeration value="ACQUIRED"/>
      <xs:enumeration value="ARCHIVED"/>
      <xs:enumeration value="CANCELLED"/>
      <xs:enumeration value="FAILED"/>
      <xs:enumeration value="PLANNED"/>
      <xs:enumeration value="POTENTIAL"/>
      <xs:enumeration value="REJECTED"/>
    </xs:restriction>
  </xs:simpleType>
</xs:element>
<xs:element name="statusDetail" type="xs:string">
  <xs:annotation>
    <xs:documentation>This field refers to the eop:status value. It should be used to motivate the reason
of a failure deletion or rejection</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="acquisitionType">
  <xs:annotation>
    <xs:documentation>Used to distinguish at a high level the appropriateness of the acquisition for
"general" use, whether the product is a nominal acquisition, special calibration product or other. Values:
- NOMINAL
- CALIBRATION
- OTHER

```

---

More specific information (i.e. platform and sensor specific values) are expressed within the imageSubType tag.</xs:documentation>

```

</xs:annotation>
<xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:enumeration value="NOMINAL"/>
    <xs:enumeration value="CALIBRATION"/>
    <xs:enumeration value="OTHER"/>
  </xs:restriction>
</xs:simpleType>
</xs:element>
<xs:element name="acquisitionSubType" type="gml:CodeListType">
  <xs:annotation>
    <xs:documentation>The mission specific type definition should refer to mission/ground segment
dedicated codeSpace.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="productType" type="xs:string">
  <xs:annotation>
    <xs:documentation>Describes product type in case that mixed types are available within a single
collection. This is ground segment specific definition</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="imageQualityDegradation" type="gml:MeasureType">
  <xs:annotation>
    <xs:documentation>Must be expressed in percents. EOLI N/A (attTypes/attName
?)</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="imageQualityDegradationQuotationMode">
  <xs:annotation>
    <xs:documentation>Indicator to know how the quality quotation has been
calculated.</xs:documentation>
  </xs:annotation>
<xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:pattern value="AUTOMATIC"/>
    <xs:pattern value="MANUAL"/>
  </xs:restriction>
</xs:simpleType>
</xs:element>
<xs:element name="composedOf" type="eop:EarthObservationPropertyType"/>
<xs:element name="subsetOf" type="eop:EarthObservationPropertyType"/>
<xs:element name="linkedWith" type="eop:EarthObservationPropertyType"/>
<xs:complexType name="CodeWithAuthorityType">
  <xs:annotation>
    <xs:documentation>From GML 3.2 draft</xs:documentation>
  </xs:annotation>

```

```
<xs:simpleContent>
  <xs:extension base="xs:string">
    <xs:attribute name="codeSpace" type="xs:anyURI" use="required"/>
  </xs:extension>
</xs:simpleContent>
</xs:complexType>
</xs:schema>
```