Standard Archive Format for Europe

Mission Specialisation Control Book

GOCE

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Author(s)	GMV	date: 28/08/2014

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Approved by		date:

ESRIN
Via Galileo Galilei - Casella Postale 64 - 00044 Frascati - Italy
Tel. (39) 06 94180 1 - Fax (39) 06 94180 280

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1. Introduction

1.1. Purpose and scope

The present document is part of the Standard Archive Format for Europe specialisation for GOCE (SAFE Specialisation for GOCE). This specialisation consists of the following set of documents:

- the current book, which is the GOCE mission specialisation control book, and is the top-level document of the specialisation, containing all the information that is common to all SAFE GOCE products and auxiliary files.
- three GOCE product specialisation control books organized by product level, one for GOCE Level-0 products and auxiliary files, one for Level-1 auxiliary files and one for GOCE Level-2 products.

1.2. Book Organisation

The GOCE mission specialisation control book is organized as follows:

Chapter 1: Introduction	Introductory part of the document.
Chapter 2: General Description	Overall description of the mission, instruments and products/auxiliary files generated for each processing level and in scope of this specialisation.
Chapter 3: Metadata Specialisation	SAFE GOCE metadata specialisation.
Chapter 4: Naming Conventions	SAFE GOCE package names and URN specifications.
Appendix A: Representation Information Packages	List of SAFE GOCE Representation Information Packages characteristic of the SAFE GOCE specialisation.
Appendix B: SAFE Package Examples	List of SAFE GOCE EO Product and EO Auxiliary Packages examples.

1.3. Specialisation Volume Set

The following list references the documents that constitute the SAFE GOCE specialisation volume set.

[GOCE-BOOK-MISSION]	GOCE Mission Specialisation (PDGS-SAFE-GMV-GOCE-MISSION)
[GOCE-BOOK-L0]	GOCE Specialisation for Level 0 processing (PDGS-SAFE-GMV-GOCE-L0)
[GOCE-BOOK-L1]	GOCE Specialisation for Level 1 processing (PDGS-SAFE-GMV-GOCE-L1)
[GOCE-BOOK-L2]	GOCE Specialisation for Level 2 processing (PDGS-SAFE-GMV-GOCE-L2)

The specialised SAFE GOCE Representation Information Packages and examples of SAFE GOCE EO Product/Auxiliary Packages are also considered part of the present specialisation and are provided alongside the documents as separate files. The complete file list is described in Appendix A and Appendix B.

1.4. Bibliography

[OAIS-RM]	*Reference Model for an Open Archival Information System (OAIS)* - 650.0-B-1- January 2002- Blue Book- Copyright © 2002 Consultative Committee for Space Data Systems (CCSDS) -
[OGC EOP O&M]	*Earth Observation Metadata profile of Observations & Measurements* – OGC 10-157r3- 2012-06-12- v1.0- Copyright © 2012 Open Geospatial Consortium -
[SAFE_CORE]	*Standard Archive Format for Europe - Control Book - Volume 1 - Core Specifications* - PGSI-GSEG-EOPG-FS-05-0001- v2.2.1-
[SAFE_REC_SPEC]	*Standard Archive Format for Europe - Control Book - Volume 2 - Recommendations for Specialisations* - PGSI-GSEG-EOPG-FS-05-0002- v2.2.1-
[SI]	*The International System of Units (SI)* - 1998- 7th edition- Bureau International des Poids et Mesures - Copyright © 1998 Organisation Intergouvernementale de la Convention du Mètre -
[SI-SUP2000]	*The International System of Units (SI)*- Supplement 2000: addenda and corrigenda of the 7th edition (1998) - 1998- 7th edition- Bureau International des Poids et Mesures – Copyright © 1998 Organisation Intergouvernementale de la Convention du Mètre -
[XFDU]	*XML Formatted Data Unit (XFDU) - Structure and Construction Rules* - 661.0-B-1- September 2008- Blue Book - Copyright © 2008 Consultative Committee for Space Data Systems (CCSDS) -

1.5. Glossary of Terms

1.5.1. Definitions

1.5.1.1. General

Auxiliary data	All data used to generate a product, other than the direct measurements of the instrument. EO Auxiliary data include calibration data measured on-board that are not part of the main measurements of the instrument, external calibration files from sources other than the satellite, processor configuration files, and any other files needed by instrument processors.
Auxiliary file-type	A file type that characterizes all auxiliary/EO Auxiliary files sharing common representation information.
EO Product	The result of the processing of remote sensing data. Earth Observation products are specific to each mission and sensor combination. A data product can be an entire acquisition strip (the data segment continuously acquired by a ground station) or a single frame (a subset of the acquisition strip of standard length as defined by the WRS).
Manifest	A document containing metadata about Components, and the relationships among them. This information is stored as a Component, using an XML language designed for just this purpose. [XFDU].
Metadata	Data about other Data [OAIS-RM].
Metadata file	A file containing the Metadata associated to an EO Product or EO Auxiliary file.
Product-type	A file type that characterizes all the EO Product files sharing common representation information.
SAFE Package	An XFDU Package specialised for Earth Observation data purposes. In previous versions of SAFE, the term SAFE product was used instead because the content information was limited to Earth Observation products. It has been replaced by SAFE Package because the types of Content Information described by SAFE are not only Earth Observation products, but also Representation Information files and EO Auxiliary files.
SAFE Specialisation	A SAFE Specialisation is a restriction of the SAFE Core specifications for a more specific type of data. Examples of SAFE Specialisation include specialisations for ENVISAT or LANDSAT Products, for CCSDS Telemetry Data, or for SPOT Measurements.
XFDU Package	A Package Interchange File that contains an XFDU Manifest and is conforming to the semantics specified in the XFDU Specifications. An XFDU Package is a specialization of Package Interchange File [XFDU].

1.5.2. Acronyms and Abbreviations

1.5.2.1. General

CCSDS	Consultative Committee for Space Data Systems
EO	Earth Observation
ESA	European Space Agency
GML	Geography Mark-up Language
ISO	International Organization for Standardization
O&M	Observations and Measurements
OAIS(-RM)	Reference Model for an Open Archival Information System
OGC	Open Geospatial Consortium
SAFE	SAFE Standard Archive Format for Europe
SI	The International System of Units
URN	Uniform Resource Name
WRS	World Reference System
XFDU	XML Formatting Data Unit
XML	eXtensible Mark-up Language

1.5.2.2. Specialisation

APID	Application Process Identifier
CONS	Consolidation
CPM	Coarse Pointing Mode
DFACS	Drag-Free and Attitude Control System
DFC	Drag-Free Control
DFM_COARSE	Drag-free Mode, Coarse Pointing
DFM_FINE	Drag-free Mode, Fine Pointing
DFM_PREP	Drag-free Mode, Preparation
ECPM	Extended Coarse Pointing Mode
EFRF	Earth-Fixed Reference Frame
EGG	Electrostatic Gravity Gradiometer
ESOC	European Space Operations Centre
FPM	Fine Pointing Mode
GGT	Gravity-Gradient-Tensor
GOCE	Gravity field and Ocean Circulation Explorer
GPS	Global Positioning System
GRACE	Gravity Recovery And Climate Experiment
GRF	Gradiometer Reference Frame
ICB	Inter-Channel Bias
ICM	Inverse Calibration Matrix
IRF	Inertial Reference Frame
LNOF	Local North Oriented Frame
OPER	Operational (file class)
PDS	Payload Data Segment
RPRO	Reprocessing (file class)
S/C	Spacecraft
SST	Satellite to Satellite Tracking Instrument
STR	Star Tracker

SuperSTAR	Super Space Three-axis Accelerometer for Research mission
TEST	Test (file class)
TM	Telemetry
VC2	Virtual Channel 2 (telemetry)
VC3	Virtual Channel 3 (telemetry)

1.5.3. Conventions Used

All metadata types that are defined from scratch or modified by the present specialisation have been included in this book. Several of the non-modified metadata types, such as those from XFDU or from OGC EOP O&M, are not repeated in the present book as they are considered implicitly inherited and therefore, unchanged (the reader is simply referred to the corresponding schemas). However, for some of the OGC EOP O&M metadata types, additional clarifications or restrictions applicable to the SAFE specialisation for GOCE are provided.

The present book assumes that all physical quantities are expressed according to a standard system of units. The selected standard is the SI defined by the Bureau International des Poids et Mesures (BIPM) in documents [SI] and [SI-SUP2000].

2.General Description

2.1. Mission Overview

GOCE is the acronym for “Gravity field and steady-state Ocean Circulation Explorer”. It was the first core satellite mission of the ESA “Living Planet” programme. The objective of GOCE was the determination of the stationary part of the Earth gravity field and geoid with highest possible spatial detail and accuracy. Data from this advanced gravity mission serves to improve human knowledge of ocean circulation, which plays a crucial role in energy exchanges around the globe, sea-level change and Earth-interior processes. GOCE data can also be used to support significant advances in geodesy and surveying.

ESA's dart-like Gravity field and Ocean Circulation Explorer (GOCE) Earth Explorer orbited as close to Earth as possible - just 260 km up - to maximise its sensitivity to variations in Earth's gravity field.

Mission details	Launched: 17 March 2009 Duration: After 4 years and 8 months orbiting Earth, the mission came to an end on 11 November 2013 - far exceeding its 20-month design life.
Mission objectives:	• to determine gravity-field anomalies with an accuracy of 1 mGal (where 1mGal = 10^{-5} ms^{-2}). • to determine the geoid with an accuracy of 1^{-2} cm. • to achieve the above at a spatial resolution better than 100 km.
Mission orbit:	Orbit: Sun-synchronous, near-circular, dusk-dawn, low-Earth. Inclination: 96.7° Measurement altitude: about 250 km Hibernation altitude: above 270 km
Configuration:	GOCE was a slim, octagonal spacecraft approximately 5 m long and 1 m in diameter. It was a rigid structure with no moving parts weighing about 1050 kg.
Payload:	• Gradiometer; 3 pairs of 3-axis, servo-controlled, capacitive accelerometers (each pair separated by a distance of about 0.5 m). • 12-channel dual-frequency GPS receiver with geodetic quality. • Laser retro-reflector enabled tracking by ground-based lasers.
Launch	Launch vehicle Rockot (converted SS-19), from Plesetsk, Russia.
Flight operations	Monitored and controlled by ESA-ESOC via the Kiruna ground station in Sweden and secondary ground station in Svalbard, Norway.

2.2. Instruments Overview

2.2.1. EGG Instrument

The main objective of EGG was to measure the three components of the GGT (Gravity-Gradient Tensor). The EGG instrument was based on an ambient temperature, closed loop, capacitive accelerometer concept. EGG was a three-axis gradiometer consisting of 3 pairs of three-axis servo-controlled capacitive accelerometers on an ultra-stable carbon-carbon structure. The EGG was also

used as a main sensor in the DFACS.

Type	Three-axis diagonal gradiometer, based on three pairs of electrostatic servo-controlled accelerometers.
Technical Characteristics	Spatial Resolution: Resolution of accelerometer measurements is less than 2.0×10^{-12} m/s^{-2} Hz$^{-1/2}$
Earth Topics	Solid Earth (Geoid)
Related Instruments	SuperSTAR on GRACE

2.2.2. SSTI Instrument

The SSTI consisted of an advanced dual-frequency, 12-channel GPS receiver and an L-band antenna.

The receiver was capable of simultaneously acquiring signals broadcast from up to 12 spacecraft in the GPS constellation. The SSTI instrument delivered, at 1Hz, so-called pseudo-range and carrier-phase measurements on both GPS frequencies, as well as a real-time orbit navigation solution.

Type	12-channel dual-frequency GPS receiver
Technical Characteristics	Accuracy: Phase centre knowledge accuracy (L1/L2): 1.84 mm / 2.35 mm
Earth Topics	Solid Earth (Geoid)

2.3. Product and Auxiliary file-type List

The following sections list all the product-types and auxiliary-types which are in scope of the SAFE Specialisation for GOCE.

2.3.1. Level 0

2.3.1.1. Product Types

Acronym	Description
EGG_TOT_0_	Contains all EGG nominal-ICM-proof mass shaking packets (Not used by L1b EGG processor)
EGG_NOM_0_	EGG Nominal Level-0 containing the nominal measurements packets
EGG_ICM_0_	EGG Calibration Level-0: Inverse Calibration Matrix
EGG_AUX_0_	EGG Auxiliary from VC3 containing the ICM start-stop activity
DFC_F01_0_	DFAC 1 Hz Level-Data
DFC_F10_0_	DFAC 10Hz Data collected during Monitoring
GRF_LOR_0_	Satellite Rotation Angle data from VC3
STR_VC2_0_	Star Tracker Quaternions Level-0 from VC2
STR_VC3_01	Star Tracker Quaternions Level-0 from VC3 APID =477
STR_VC3_02	Star Tracker Quaternions Level-0 from VC3 APID =493
STR_VC3_03	Star Tracker Quaternions Level-0 from VC3 APID =509
SST_TOT_0_	SSTI TM packets, either nominal or calibration.
SST_NOM_0_	SSTI Nominal Level-0 data containing only the nominal packets
SSTI_ICB_0_	SSTI Calibration Level-0, containing the packets relative to the Inter-Channel Bias Calibration.
DFC_Anw_0_	EGG Calibration Level-0: DFACS @ 10 Hz of Accelerometer and axis under calibration. Represents different product types, where: n: 1, 2, 3, 4, 5 or 6 w: X, Y or Z e.g. DFC_A1X_0_ or DFC_A4Z_0_

Table 1: GOCE L0 product-type list

2.3.1.2. Auxiliary Types

Acronym	Description
AUX_NOM_0_	Configurable set of TM packets from VC3

Table 2: GOCE L0 auxiliary-type list

2.3.2. Level 1

2.3.2.1. Auxiliary Types

Acronym	Description
AUX_ANT_OS	This file contains the antenna phase centre offsets of the GPS satellites tracked. It was used by the PDS to support the ground processing software. This file was not updated during the mission.
AUX_CAL_K2	This file contains information about the frequency and the amplitude of the applied signal during proof mass shaking, required for K2 Calibration Processor. It was used by the PDS to determine quadratic factors and corrections for axis and accelerometer under calibration.
AUX_EGG_DB	Auxiliary File containing pre-flight parameters and characterization parameters for EGG. It contains constants, instrument specific parameters, filter constants, processor flags to support the ground processing software.
AUX_ICB_1b	This product contains the Inter Channel Bias correction parameters. It was used by the PDS to perform the Interchannel Bias Correction.
AUX_ICM_1b	This product contains the Auxiliary Inverse Calibration Matrix It was used by the PDS to compute the actual common and differential mode accelerations of the proof masses of the accelerometer pairs.
AUX_SST_DB	Data file containing all GOCE Spacecraft Parameters specified before launch. It contains constants, instrument specific parameters, filter constants, processor flags to support the ground processing software.
AUX_VC3_TM	This product contains the parameters to be extracted for the AUX_MON processor. It was used by the PDS to identify the parameters which will form the AUX_NOM_1b product.
MPL_ORBSCT	This file contains reference or bit parameters for each change of orbit planned during the mission. It was used to determine timing of orbit events (e.g. ANX time, zones visibility duration, etc...).
AUX_TCHI__	Telecommands (TC) History File
TLM_HKTM__	Extracted House-Keeping (HK) Telemetry Data
AUX_OUTC__	Time correlation file (correlation of On-board time with UTC time)
MPL_OBPL__	Plan Increment File
MPL_ORBPRE	Predicted Orbit File

Table 3: GOCE L1 auxiliary-type list

2.3.3. Level 2

2.3.3.1. Product Types

Acronym	Description
EGG_NOM_2_	L2 gravity gradients in GRF with corrections: • Externally calibrated and corrected gravity gradients • Corrections to gravity gradients due to temporal gravity variations • Flags for outliers, fill-in gravity gradients for data gaps with flags Gravity gradient error estimates Latency 2 weeks
EGG_TRF_2_	L2 gravity gradients in LNOF with corrections: • Externally calibrated gravity gradients in local north oriented frame including corrections to gravity gradients due to temporal gravity variations • Flags for outliers, fill-in gravity gradients for data gaps with flags • Gravity gradient error estimates Latency 1 month
SST_PSO_2_	Precise science orbits • Reduced-dynamic and kinematic precise science orbits • Rotation matrices between IRF and EFRF • Variance-covariance information for kinematic positions • Quality report for precise orbits Latency 4 weeks
EGM_GOC_2_	Final GOCE gravity field model • Spherical harmonic series including error estimates • Grids of geoid heights, gravity anomalies and deflections of the vertical • Propagated error estimates in terms of geoid heights • Quality report for GOCE gravity field model Latency 6 months

Table 4: GOCE L2 product-type list

2.4. Processing chain

This section provides a conceptual workflow description for the GOCE processing chain, giving general information about the processors involved in the process and the inputs/outputs that are

needed/generated in each step.

2.4.1. L0 processors

GOCE L0 processors and the type of products and auxiliary files that are used/generated during the process are summarised in the next figure:

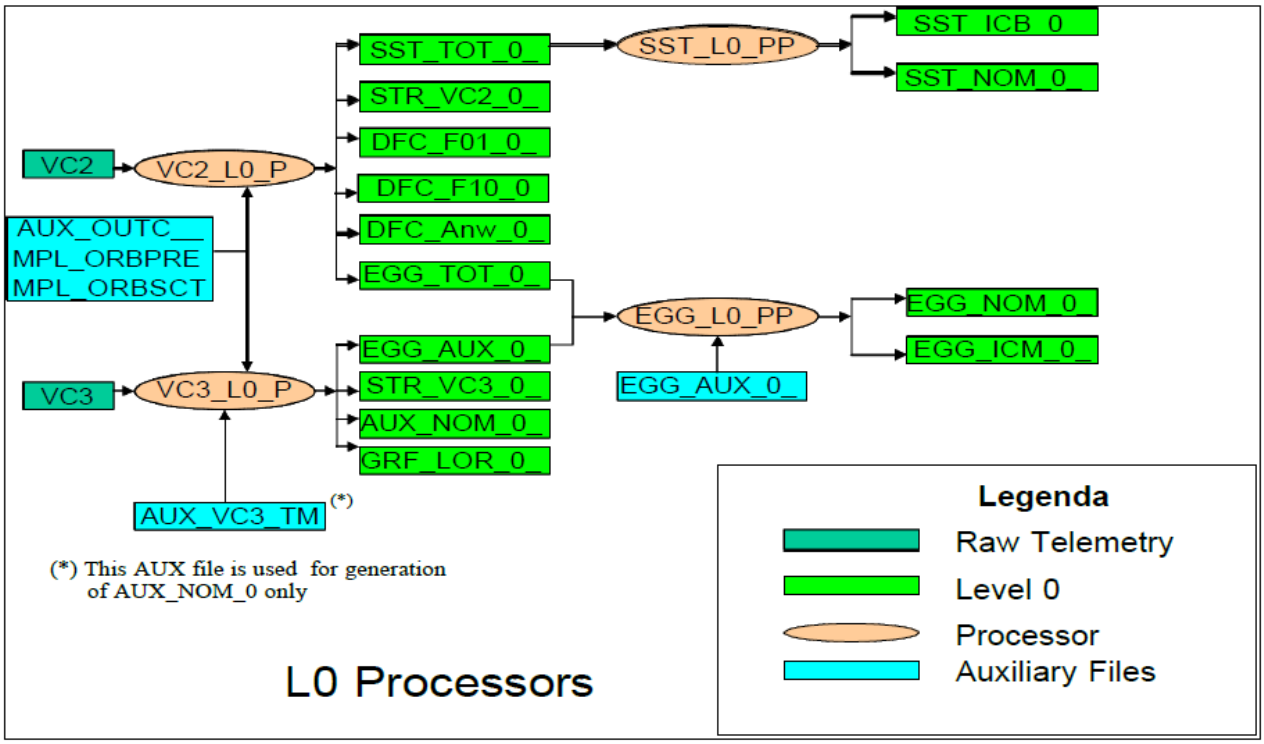

Figure 1: GOCE L0 Processing flow

2.4.1.1. VC2_L0_P

Telemetry Processor which de-packets the Telemetry streams to generate the L0 products which are acted upon by the L0 processors.

VC2_L0_P was a closed-source binary processor developed by ACS and its description is out of the scope of the present document.

2.4.1.2. VC3_L0_P

Telemetry Processor which de-packets the Telemetry streams to generate the L0 products which are acted upon by the L0 processors.

VC2_L0_P was a closed-source binary processor developed by ACS and its description is out of the scope of the present document.

2.4.1.3. SST_L0_PP

Summary information about the SST_L0_PP processor:

Instrument:	SST
Output Processing Level:	L0

Known/reference implementations	
Developer:	ACS
Documentation reference:	PDS/IPF1 System Technical Description and Operational Concept, GO-TN-ACS-GS-0101 v2.2 05 February 2007
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	No (binary)

The inputs used by the SST_L0_PP processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	**Processor**	**Output**	**Destination (next Processor)**
Product-types:	SST_L0_PP	**Product-types:**	
SST_TOT_0		SST_ICB_0	SST_L1ICB_P
		SST_NOM_0	SST_L1NOM_P
Auxiliary-types:		**Auxiliary-types:**	
N/A		N/A	

Table 5: SST_L0_PP Inputs/Outputs

2.4.1.4. EGG_L0_PP

Summary information about the EGG_L0_PP processor:

Instrument:	EGG
Output Processing Level:	L0
Known/reference implementations	
Developer:	ACS
Documentation reference:	PDS/IPF1 System Technical Description and Operational Concept, GO-TN-ACS-GS-0101 v2.2 05 February 2007
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	No (binary)

The inputs used by the EGG_L0_PP processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	**Processor**	**Output**	**Destination (next Processor)**
Product-types:	EGG_L0_PP	**Product-types:**	
EGG_TOT_0		EGG_ICM_0	SST_L1ICB_P
		EGG_NOM_0	EGG_ICM
Auxiliary-types:		**Auxiliary-types:**	
EGG_AUX_0		N/A	

Table 6: EGG_L0_PP Inputs/Outputs

2.4.2. L1b processors

The next figure provides an overview of the GOCE L1b processors and the type of products and auxiliary files that are used/generated during the L1 processing:

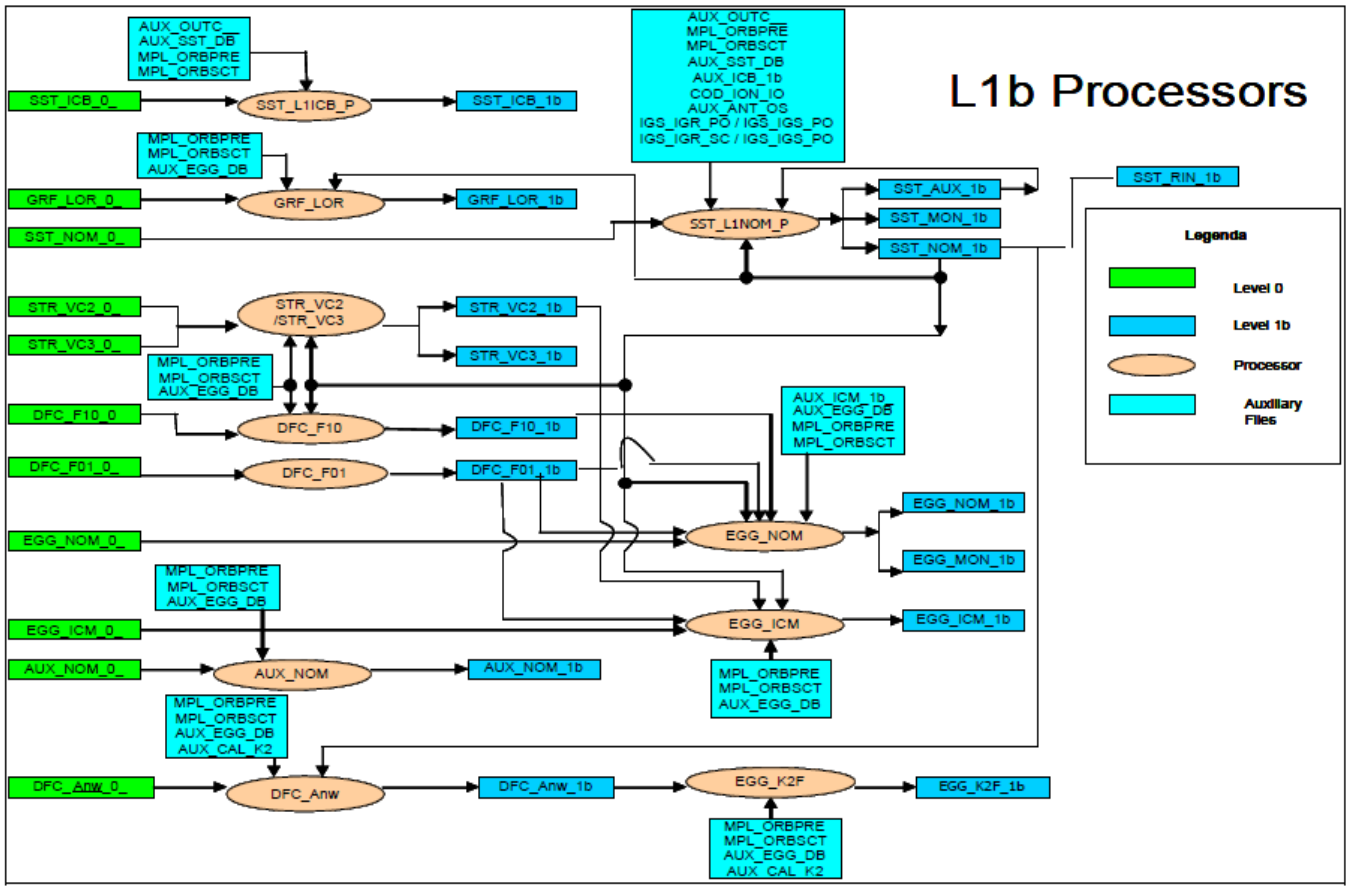

Figure 2: GOCE L1b Processing flow

2.4.2.1. SST_L1ICB_P

Summary information about the SST_L1ICB_P processor:

Instrument:	SST
Output Processing Level:	L1
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for SSTI GO-TN-IAPG-GS-0002 v4.2. 05 February 2007
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the SST_L1ICB_P processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	SST_L1ICB_P	**Product-types:**	
SST_ICB_0_		SST_ICB_1b	N/A
Auxiliary-types:		**Auxiliary-types:**	
AUX_OUTC		N/A	
AUX_SST_DB			
MPL_ORBPRE			
MPL_ORBSCT			

Table 7: SST_L1ICB_P Inputs/Outputs

2.4.2.2. SST_L1NOM_P

Summary information about the SST_L1NOM_P processor:

Instrument:	SST
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for SSTI GO-TN-IAPG-GS-0002 v4.2 05.02.2007
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the SST_L1NOM_P processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	SST_L1NOM_P	**Product-types:**	
SST_NOM_0_		SST_NOM_1b	To L2 Processing Facility
		SST_MON_1b	N/A
		SST_RIN_1b	N/A
Auxiliary-types:		**Auxiliary-types:**	
AUX_OUTC		SST_AUX_1b	
MPL_ORBPRE			
MPL_ORBSCT			
AUX_SST_DB			
AUX_ICB_1b			
COD_ION_IO			
AUX_ANT_OS			
IGS_IGR_PO / IGS_IGS_PO			
IGS_IGR_SC / IGS_IGS_PO			

Table 8: SST_L1NOM_P Inputs/Outputs

2.4.2.3. STR_VC2/STR_VC3

Summary information about the STR_VC2 and STR_VC3 processors:

Instrument:	STR
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the STR_VC2/STR_VC3 processors and the outputs generated by them are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	STR_VC2/STR_VC3	**Product-types:**	
STR_VC2_0_/ STR_VC3_0_		STR_VC2_1b/ STR_VC3_1b	EGG_NOM_1b/EGG_ICM_1b
Auxiliary-types:		**Auxiliary-types:**	
MPL_ORBPRE		N/A	
MPL_ORBSCT			
AUX_EGG_DB			

Table 9: STR_VC2/STR_VC3 Inputs/Outputs

2.4.2.4. DFC_F10

Summary information about the DFC_F10 processor:

Instrument:	DFACS
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the DFC_F10 processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	DFC_F10	**Product-types:**	
DFC_F10_0		DFC_F10_1b	EGG_NOM_1b
Auxiliary-types:		**Auxiliary-types:**	
MPL_ORBPRE		N/A	
MPL_ORBSCT			
AUX_EGG_DB			

Table 10: DFC_F10 Inputs/Outputs

2.4.2.5. DFC_F01

Summary information about the DFC_F01 processor:

Instrument:	DFACS
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the DFC_F01 processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	DFC_F01	**Product-types:**	
DFC_F01_0		DFC_F01_1b	EGG_NOM_1b
Auxiliary-types:		**Auxiliary-types:**	
MPL_ORBPRE		N/A	
MPL_ORBSCT			
AUX_EGG_DB			

Table 11: DFC_F01 Inputs/Outputs

2.4.2.6. DFC_Anw [n=1..6;w={XYZ}]

Summary information about the DFC_Anw [n=1..6;w={XYZ}] processors:

Instrument:	DFACS
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)

Possibility to modify the processor:	Yes (source available)

The inputs used by the DFC_Anw processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	**Processor**	**Output**	**Destination (next Processor)**
Product-types:	DFC_Anw	**Product-types:**	
SST_NOM_1b		DFC_A*nw*_1b	To calibration routines
DFC_A*nw*_0			
Auxiliary-types:		**Auxiliary-types:**	
AUX_EGG_DB		AUX_NOM_1b	
MPL_ORBPRE			
MPL_ORBSCT			
AUX_CAL_K2			

Table 12: DFC_Anw Inputs/Outputs

2.4.2.7. EGG_NOM

Summary information about the EGG_NOM processor:

Instrument:	EGG
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the EGG_NOM processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	EGG_NOM	**Product-types:**	
EGG_NOM_0		EGG_NOM_1b	EGG_NOM_1b
DFC_F01_1b		EGG_MON_1b	EGG_ICM_1b
DFC_F10_1b			
SST_NOM_1b			
STR_VC2_1b/ STR_VC3_1b			
Auxiliary-types:		**Auxiliary-types:**	
AUX_EGG_DB		N/A	
AUX_ICM_1b_			
MPL_ORBPRE			
MPL_ORBSCT			
AUX_OUTC			

Table 13: EGG_NOM Inputs/Outputs

2.4.2.8. AUX_NOM

Summary information about the AUX_NOM processor:

Instrument:	EGG
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the AUX_NOM processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	AUX_NOM	**Product-types:**	
AUX_NOM_0		N/A	
Auxiliary-types:		**Auxiliary-types:**	
AUX_EGG_DB		AUX_NOM_1b	
MPL_ORBPRE			
MPL_ORBSCT			

Table 14: AUX_NOM Inputs/Outputs

2.4.2.9. GRF_LOR

Summary information about the GRF_LOR processor:

Instrument:	EGG

Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the GRF_LOR processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	**Processor**	**Output**	**Destination (next Processor)**
Product-types:	GRF_LOR	**Product-types:**	
GRF_LOR_0		GRF_LOR_1b	N/A
Auxiliary-types:		**Auxiliary-types:**	
MPL_ORBPRE		N/A	
MPL_ORBSCT			
AUX_EGG_DB			

Table 15: GRF_LOR Inputs/Outputs

2.4.2.10. EGG_ICM

Summary information about the EGG_ICM processor:

Instrument:	EGG
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the EGG_ICM processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	EGG_ICM	**Product-types:**	
EGG_ICM_0		EGG_ICM_1b	To Calibration routines
DFC_F01_1b			
DFC_F10_1b			
SST_NOM_1b			
STR_VC2_1b/ STR_VC3_1b			
Auxiliary-types:		**Auxiliary-types:**	
AUX_EGG_DB		N/A	
AUX_ICM_1b_			
MPL_ORBPRE			
MPL_ORBSCT			
AUX_EGG_DB			

Table 16: EGG_ICM Inputs/Outputs

2.4.2.11. EGG_K2F

Summary information about the EGG_K2F processor:

Instrument:	EGG
Output Processing Level:	L1b
Known/reference implementations	
Developer:	ACS
Documentation reference:	Detailed Processing Model for EGG; GO-TN-IAPG-GS-0001 4.8 draft 09.03.2011
Possibility to reuse the processor:	Yes (ESA)
Possibility to modify the processor:	Yes (source available)

The inputs used by the EGG_K2F processor and the outputs generated by it are listed below. Additionally, the names of the processors that will make use of each specific output are also specified in the following table:

Input	Processor	Output	Destination (next Processor)
Product-types:	EGG_K2F	**Product-types:**	
DFC_A*nw*_1b		EGG_K2F_1b	
Auxiliary-types:		**Auxiliary-types:**	
MPL_ORBPRE		N/A	
MPL_ORBSCT			
AUX_EGG_DB			
AUX_CAL_K2			

Table 17: EGG_K2F Inputs/Outputs

2.4.3. L2 processors

The GOCE Level-2 High-Level Processing Facility (HPF) is as a distributed system developed and

operated by the European GOCE Gravity Consortium (EGG-C), comprising Universities and Research Institutes:

- **AIUB** Astronomical Institute, University of Bern, Switzerland
- **CNES** Centre National d'Etudes Spatiales, Groupe de Recherche de Géodésie Spatiale, Toulouse, France
- **FAE/A&S** Faculty of Aerospace Engineering, Astrodynamics & Satellite systems, Delft University of Technology
- **GFZ** GeoForschungsZentrum Potsdam
- **IAPG** Institute of Astronomical and Physical Geodesy, Technical University Munich, Germany
- **ITG** Institute of Theoretical Geodesy, University Bonn, Germany
- **POLIMI** DIIAR – Sezione Rilevamento, Politecnico di Milano, Italy
- **SRON** SRON National Institute for Space Research , Utrecht, The Netherlands
- **TUG** Institute of Navigation and Satellite Geodesy, Graz University of Technology
- **UCPH** Department of Geophysics,University of Copenhagen, Denmark

The Facility is external to the GOCE Level-1 processing facility hosted at ESRIN (the PDS) , and it is part of the wider GOCE Ground Segment, together with the Flight Operations Segment (FOS), see Figure 3. The main processing tasks implemented at the HPF are:

- The generation of calibrated GOCE gravity gradient products (external calibration of gradiometer data, transformation to terrestrial reference frame)
- The generation of GOCE validation products (quick-look gravity field and orbit solutions for data validation)
- The generation of orbits and gravity fields from level 1b products generated by the PDS (nominal and calibrated products from the gradiometer and the GPS-receiver):

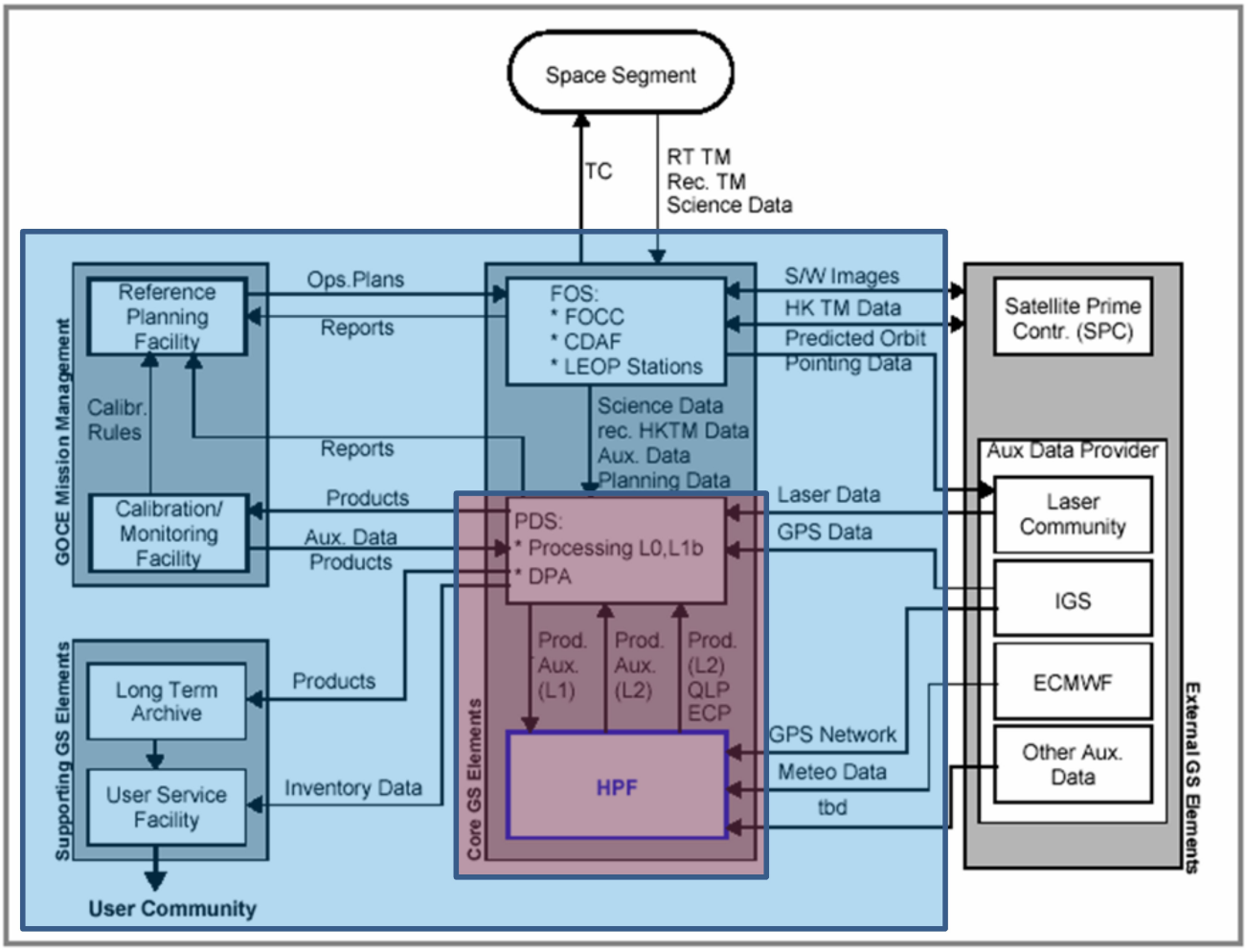

Figure 3: GOCE Ground Segment (blue) and the PDS<->HPF Level-2 facility Interface (red)

The HPF is a distributed system consisting of a Central Processing Facility (CPF) and several Sub Processing Facilities (SPF). Figure 4 identifies the types of sub-processing facilities implemented in the HPF.

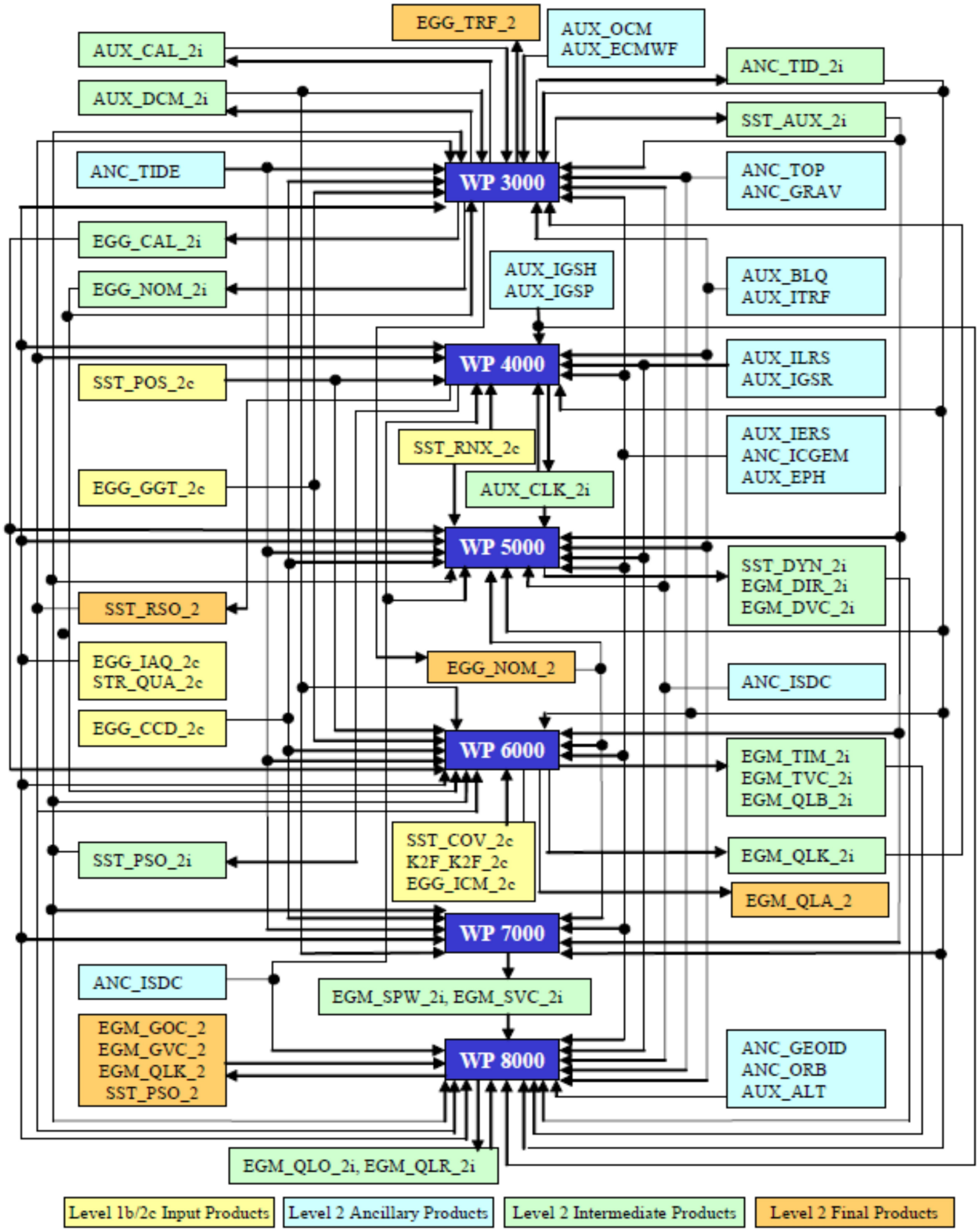

Figure 4: The HPF Architecture and processing flow

Tables 18, 19, 20 and 21 list the products exchanged between the HPF and the PDS .

Product	Description
AUX_ICB_1b	Auxiliary Interchannel Bias Calibration
AUX_EGG_DB	Auxiliary File containing pre-flight parameters and characterization parameters for EGG
AUX_SST_DB	Auxiliary File containing pre-flight parameters and characterization parameters for SST
AUX_ANT_OS	GPS Antenna Off-set
AUX_ICM_1b	Inverse Calibration Matrix
MPL_ORBSCT	Orbit Scenario file
MPL_ORBPRE	Predicted Orbit File

Table 18: PDS->HPF Interface Exchanged Files: GOCE External Auxiliary Files

Product	Description
COD_ION_IO	Global ionosphere maps from IGS

Table 19: HPF Interface Exchanged Files: Exotic External Auxiliary Files used at PDS level

Product ID	Description
EGG_NOM_1b	EGG Nominal Level 1b
STR_VC3_1b	Star Tracker Quaternions Level 1b from VC2/VC3 STR_VC2_1b,
SST_NOM_1b	SSTI Nominal Level 1b
EGG_K2F_1b	Global Quadratic Factor Correction Parameters
EGG_ICM_1b	EGG Inverse calibration level 1b
SST_RIN_1b	SST RINEX Level 1b Product

Table 20: PDS->HPF Interface Exchanged Files: PDS L1 Products

Product ID	Description
EGG_NOM_2I	QL L2 gravity gradients in GRF with corrections
EGG_CAL_2I	Gravity gradient external calibration parameters
AUX_DCM_2I	Gravity gradient (DM) and CM calibration parameters
SST_AUX_2I	SH coefficients for non-tidal temporal corrections
ANC_TID_2I	Spherical harmonic coefficients computed from tide model
AUX_CAL_2I	Validation report of gravity gradient calibration
SST_PSO_2I	Precise science orbits
AUX_CLK_2I	High-rate GPS clock corrections
SST_DYN_2I	Precise orbit computed with the dynamical approach
EGM_DIR_2I	Gravity field model computed using the direct approach
EGM_TIM_2I	Gravity field model computed using the time-wise approach
EGM_QLK_2I	SGG error PSD estimated from QL gravity solutions
EGM_QLB_2I	Quick-look Earth gravity field models (SST only, SGG only, SST/SGG combination) with diagnosis report sheets based on rapid science and intermediate level 2 gradients
EGM_SPW_2I	Gravity field model computed using the space-wise approach
EGM_QLO_2I	Gravity field model quality report from validation with orbits
EGM_QLR_2I	Gravity field model quality report
EGG_NOM_2	L2 gravity gradients in GRF with corrections
EGG_TRF_2	L2 gravity gradients in LNOF with corrections

Product ID	Description
SST_RSO_2	Rapid science orbits
EGM_QLA_2_	Quick-look Earth gravity field models (SGG only) with diagnosis report sheets based on level 1b radients
EGM_QLK_2_	2 Quick-look Earth gravity field models (SST only, SGG only, SST/SGG combination) with diagnosis report sheets
SST_PSO_2_	Precise science orbits with quality report
EGM_GOC_2_	Final GOCE gravity field model with error estimates and quality report
AUX_IERS__	Bulletin A, B, CO4
AUX_IGSR__	IGS ultra rapid and rapid products, IGS station tracking data, station equipment information
AUX_IGSH__	IGS station tracking data, station equipment information
AUX_IGSP__	CODE final products, internal Bernese GPS Software files
AUX_ILRS__	GOCE SLR observations
ANC_TOP___	Digital height models
ANC_ICGEM_	External global gravity field models
ANC_GRAV__	Terrestrial or airborne gravity anomaly data.
ANC_ISDC__	Global gravity field models GFZ from GRACE (monthly solutions)
ANC_TIDE__	Ocean tide grids
AUX_BLQ___	Ocean loading tables
AUX_EPH___	Sun, moon and planetary ephemeris
ANC_GEOID_	Geoid information at GPS levelling points
AUX_ITRF__	Station coordinates and velocities
ANC_ORB___	Independent GOCE orbit solutions
EGG_NOV_2I	Not-validated L2 gravity gradients in GRF with corrections
EGG_NOC_2I	Not-calibrated L2 gravity gradients in GRF with temporal corrections

Table 21: PDS->HPF Interface Exchanged Files: PDS L1 Products

3.Metadata Specialisation

This section details the specific metadata elements that are considered from the OGC EOP O&M metadata model ([OGC EOP O&M]) as applicable to the GOCE products and those metadata elements that have been defined as optional by the SAFE auxiliary metadata model but are considered relevant for GOCE auxiliary files.

As part of this specialisation, the following sections describe the extensions that are needed to be included in the metadata models to allocate a particular metadata not foreseen by the model, and/or to restrict the metadata model to accommodate some of the values that are required by the GOCE products/auxiliary files.

The metadata specialisation considers 3 different abstraction levels:

- Mission level: These metadata are common to all products generated for the mission (analogue for auxiliary files).
- Instrument level: These metadata are common to all products generated for a specific instrument (analogue for auxiliary files).
- Processing level: These metadata are common to all products generated for a specific product level. In this case, the specialisation is specified in a separate GOCE control book (i.e. [GOCE-BOOK-L0] for L0 products/auxiliary files, [GOCE-BOOK-L1] for L1 auxiliary files and [GOCE-BOOK-L2] for L2 products).

3.1. Metadata Specialisation at Mission Level

3.1.1. EO Products

OGC 10-157r3 version 1.0 (Publication Date: 2012-06-12) with the following set of approved Change Requests is the version of OGC EOP O&M applicable to the SAFE specialisation for GOCE:

- Change proposal: EO PMOS SWG Improved expression of EO product quality and status information, OGC 13-085
- Change Proposal: EO PMOS SWG Addition of optional group identificator, OGC 13-086
- Change Proposal: EO PMOS SWG Improve the description of EO Product Masks, OGC 13-087
- Change Proposal: EO PMOS SWG Correct inconsistencies between UML model and tables, OGC 13-088

- Change Proposal: EO PMOS SWG Improved way of expressing the timeliness of EO Product acquisition and processing, OGC 13-093
- Change Proposal: EO PMOS SWG Add optional elements referring to products instead of images, OGC 13-094
- Change Proposal: EO PMOS SWG Replace example of EO Product Metadata extension, OGC 13-098
- Change Proposal: EO-PMOS Corrections related to the implementation of the eoptype attribute, OGC 14-031
- Change Proposal: EO-PMOS Addition of optional elements creationDate and modificationDate, OGC 14-032

The following table represents the metadata specialisation with respect to the OGC EOP O&M metadata model applicable to all products of the GOCE mission.

Where:

- ***XML element or attribute***: Element or attribute from the EOP O&M metadata model (leaf node is in black).
- ***Cardinality:*** Cardinality of the element/attribute tailored for GOCE.
- ***Description:*** Brief description of the element/attribute.
- ***Format/Allowed Values:*** Expected format and possible values identified for GOCE.

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:EarthObservation/ **@gml:id**	1	Mandatory identifier required by GML. Its value must be unique among all the gml:id attributes of the XML file.	Format: String The convention is to use eop:identifier + _N (as a suffix), where N is a counter starting from 1 and incremented with each gml:id attribute present in a given file
gss:EarthObservation/	1	Mandatory identifier required by GML.	Format: String

XML element or attribute	Cardinality	Description	Format/Allowed values
om:phenomenonTime/ *gml:TimePeriod/* **@gml:id**		Its value must be unique among all the gml:id attributes of the XML file.	The convention is to use eop:identifier + _N (as a suffix), where N is a counter starting from 1 and incremented with each gml:id attribute present in a given file
eop:EarthObservation/ *om:phenomenonTime/* *gml:TimePeriod/* **gml:beginPosition**	1	Acquisition start date time in ISO 8601 format	Format: CCYY-MMDDThh:mm[:ss[.cc]]Z
gss:EarthObservation/ *om:phenomenonTime/* *gml:TimePeriod/* **gml:endPosition**	1	Acquisition end date time in ISO 8601 format	Format: CCYY-MMDDThh:mm[:ss[.cc]]Z
eop:EarthObservation/ *om:resultTime/* *gml:TimeInstant/* **@gml:id**	1	Mandatory identifier required by GML. Its value must be unique among all the gml:id attributes of the XML file.	Format: String The convention is to use eop:identifier + _N (as a suffix), where N is a counter starting from 1 and incremented with each gml:id attribute present in a given file
eop:EarthObservation/ *om:resultTime/*	1	The time when result becomes available in ISO 8601 format.	Format: CCYY-MMDDThh:mm[:ss[.cc]]Z

XML element or attribute	Cardinality	Description	Format/Allowed values
gml:TimeInstant/ **gml:timePosition**			same value as: *om:phenomenonTime/* *gml:TimePeriod/* **gml:endPosition**
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* **@gml:id**	1	Mandatory identifier required by GML. Its value must be unique among all the gml:id attributes of the XML file.	Format: String The convention is to use eop:identifier + _N (as a suffix), where N is a counter starting from 1 and incremented with each gml:id attribute present in a given file
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:platform/* *eop:Platform/* **eop:shortName**	1	Platform short name	Format: String Value: **GOCE**
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:instrument/* *eop:Instrument/* **eop:shortName**	1	Instrument (Sensor) name.	Format: String Possible values: • EGG • SST

XML element or attribute	Cardinality	Description	Format/Allowed values
			• AUX • DFC • STR • GRF
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:sensor/* *eop:Sensor/* **eop:sensorType**	0..1	Type of sensor.	Format: String Possible values: • other: GRADIOMETER • other: GPS
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:sensor/* *eop:Sensor/* **eop:operationalMode**	0..1	Sensor mode. For EGG products can be • "Science Mode" (this is the nominal one) • "Acquisition Mode" (this is non-nominal but was used during the GOCE re-entry, so products from that phase should use it) For DFC products can be: • “Coarse Pointing Mode” (CPM) • “Extended Coarse Pointing Mode” (ECPM)	Format: String Possible values: • SCIENCE • ACQUISITION • CPM • ECPM • FPM • DFM_PREP • DFM_COARSE

XML element or attribute	Cardinality	Description	Format/Allowed values

		• "Fine pointing Mode" (FPM)
		• "Drag-free-mode" (DFM)
		  ○ DFM-prep
		  ○ DFM-coarse
		  ○ DFM-fine
		For SST and STR products there are no modes.
			• DFM_FINE
			• NONE

eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:acquisitionParameters/* *eop:Acquisition/* **eop:orbitNumber**	1	Acquisition orbit number	Format: Integer
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:acquisitionParameters/* *eop:Acquisition/* **eop:orbitDirection**	0..1	Acquisition orbit direction	Format: String Possible values: • ASCENDING • DESCENDING
eop:EarthObservation/ *om:procedure/*	0..1	Start time of acquisition from Ascending node date.	Format: Real

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:EarthObservationEquipment/ *eop:acquisitionParameters/* *eop:Acquisition/* **eop:startTimeFromAscendingNode**			
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:acquisitionParameters/* *eop:Acquisition/* *eop:startTimeFromAscendingNode* **@uom**	0..1	Unit of measure attribute for start time of acquisition from Ascending node date Mandatory if eop:startTimeFromAscendingNode is used.	Value: **s**
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:acquisitionParameters/* *eop:Acquisition/* **eop:completionTimeFromAscendingNode**	0..1	Completion time of acquisition from Ascending node date.	Format: Float
eop:EarthObservation/ *om:procedure/* *eop:EarthObservationEquipment/* *eop:acquisitionParameters/*	0..1	Unit of measure attribute for completion time of acquisition from Ascending node date. Mandatory if	Value: **s**

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:Acquisition/ *eop:completionTimeFromAscendingNode* **@uom**		eop:startTimeFromAscendingNode is used.	
eop:EarthObservation/ **om:observedProperty**	1	xlink to the observed property definition	This field is mandatory but not used with GOCE and has to be set to null as reported below. `<om:observedProperty xsi:nil="true" nilReason="inapplicable"/>`
eop:EarthObservation/ **om:featureOfInterest**	1	The observed area (or its projection) on the ground i.e. the footprint of acquisition	This field is mandatory but not used with GOCE and has to be set to null as reported below. `<om:featureOfInterest xsi:nil="true" nilReason="inapplicable"/>`
eop:EarthObservation/ *om:result/* *eop:EarthObservationResult/* **@gml:id**	1	Mandatory identifier required by GML. Its value must be unique among all the gml:id attributes of the XML file.	Format: String The convention is to use eop:identifier + _N (as a suffix), where N is a counter starting from 1 and incremented with each gml:id attribute present in a given file

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:EarthObservation/ *om:result/* *eop:EarthObservationResult/* *eop:product/* *eop:ProductInformation* *eop:filename* *ows:ServiceReference* **@xlink:href**	1	URN Reference to the EO product package.	Format: String
eop:EarthObservation/ *om:result/* *eop:EarthObservationResult/* *eop:product/* *eop:ProductInformation/* *eop:filename/* *ows:ServiceReference/* **ows:RequestMessage**	1	OWS request message.	This mandatory element shall be left blank
eop:EarthObservation/ *om:result/* *eop:EarthObservationResult/* *eop:product/* *eop:ProductInformation/* **eop:version**	0..1	Product version Shall be used to indicate the processing baseline	Format: String

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:EarthObservation/ *om:result/* *eop:EarthObservationResult/* *eop:product/* *eop:ProductInformation/* **eop:size**	0..1	Product size (of the contained EO Product)	Format: gml:MeasureListType Unit: bytes (i.e. uom='bytes')
eop:EarthObservation/ *om:result/* *eop:EarthObservationResult/* *eop:product/* *eop:ProductInformation/* *eop:size* **@uom**	0..1	Unit of measure attribute for the product size	Format: String Value: **bytes**
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* **eop:identifier**	1	Product identifier.	Format: String Unique identifier of the EO Product at mission level. For GOCE, product name (without extension)
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* **eop:parentIdentifier**	0..1	Collection Identifier	Format: String

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* **eop:acquisitionType**	1	Used to distinguish at a high level the appropriateness of the acquisition for "general" use.	Format: String Value: **NOMINAL**
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* **eop:productType**	1	GOCE product type.	Format: String Possible Values: • EGG_NOM_2_ • EGG_TOT_0_ • EGG_NOM_0_ • EGG_ICM_0_ • EGG_AUX_0_ • DFC_F01_0_ • DFC_F10_0_ • GRF_LOR_0_ • STR_VC2_0_ • STR_VC3_01 • STR_VC3_02 • STR_VC3_03 • SST_TOT_0_ • SST_NOM_0_

XML element or attribute	Cardinality	Description	Format/Allowed values
			• SST_ICB_0_ • DFC_A1X_0_ • DFC_A1Y_0_ • DFC_A1Z_0_ • … • … • DFC_A6X_0_ • DFC_A6Y_0_ • DFC_A6Z_0_ • SST_PSO_2_ • EGG_NOM_2_ • EGG_TRF_2_ • EGM_GOC_2_ • EGG_NOM_1b • SST_NOM_1b • SST_RIN_1b • STR_VC2_1b • STR_VC3_1b • DFC_F01_1b • DFC_F10_1B
eop:EarthObservation/	1	Product status.	Format: String

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:metaDataProperty/ *eop:EarthObservationMetaData/* **eop:status**			Value: **ARCHIVED**
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:downlinkedTo/* *eop:DownlinkInformation/* **eop:acquisitionStation**	0..1	Acquisition / receiving station code.	Format: String Possible values: • Kiruna
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:downlinkedTo/* *eop:DownlinkInformation/* **eop:acquisitionDate**	0..1	Acquisition date time	• Format:CCYY-MMDDThh:mm[:ss[.cc]]Z
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:processing/* *goce:ProcessingInformation/* **eop:processingCenter**	1	Processing centre code.	Value: **GLA**
eop:EarthObservation/	1	Processing date time in ISO 8601 format	Format: CCYY-

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:metaDataProperty/ *eop:EarthObservationMetaData/* *eop:processing/* *goce:ProcessingInformation/* **eop:processingDate**			MMDDThh:mm[:ss[.cc]]Z
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:processing/* *goce:ProcessingInformation/* **eop:processorVersion**	1	Processor software version	Format: String
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:processing/* *goce:ProcessingInformation/* **eop:processingLevel**	0.1	Processing level applied to the product	Format: String Possible values: • 1A • 1B • 2 • 3 • other: L0
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/*	0.1	Native product format	Format: String Value: **Earth Explorer tailored for GOCE**

XML element or attribute	Cardinality	Description	Format/Allowed values
eop:processing/ *goce:ProcessingInformation/* **eop:nativeProductFormat**			
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:processing/* *goce:ProcessingInformation/* **eop:processingMode**	0.1	Processing mode.	Format: String Possible values: • OPER • TEST • RPRO
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:vendorSpecific/* *eop:SpecificInformation/* **eop:localAttribute**	0..1	Local attribute to convey the applicable GOCE mission phase	Format: String Value: **missionPhase**
eop:EarthObservation/ *eop:metaDataProperty/* *eop:EarthObservationMetaData/* *eop:vendorSpecific/* *eop:SpecificInformation/* **eop:localValue**	0..1	Textual description of the mission phase: • LEOP and commissioning: From launch on 17/03/2009, S/C commissioning, orbit lowering from 283 km to 260 km mean altitude. • Routine operations phase: measurement phase at 260 km	Format: String Possible values: • LEOP_COM • ROUTINE • LOW_ORBIT

XML element or attribute	Cardinality	Description	Format/Allowed values
		from Sept 2009 to July 2012, with substantial anomalies on the central computer – failure of prime central computer and major telemetry downlink anomaly on the redundant side. • Low orbit operations campaign 2012-2013: lowering of the orbit to 229 km mean altitude for maximising the scientific return. • Re-entry operations Oct/Nov 2013: following fuel depletion, S/C operations proceeded in the ensuing decay phase up to shortly before re-entry into the atmosphere on 11/11/2013.	• RE_ENTRY

Table 22: EOP O&M Metadata tailoring for GOCE Products

3.1.2. Auxiliary files

The following table provides the tailoring of the XML elements to be used in the metadata file of GOCE EO Auxiliary Packages considering the auxiliary metadata model specified for SAFE.

Where:

- ***XML element or attribute***: Element or attribute from the SAFE auxiliary metadata model (leaf node is in black).
- ***Cardinality:*** Cardinality of the element/attribute tailored for GOCE.
- ***Description:*** Brief description of the element/attribute.
- ***Format/Allowed Values:*** Expected format and possible values identified for GOCE.

XML element or attribute	Cardinality	Description	Format/Allowed values
goce:auxiliaryMetadata/ **safe-aux:auxFileType**	1	Code identifying the type of the auxiliary file, counterpart to the product-type for EO Products.	Format: String
goce:auxiliaryMetadata/ **safe-aux:validityStartTime**	1	Start date/time of the auxiliary file's validity period.	Format: dateTime
goce:auxiliaryMetadata/ **safe-aux:validityStopTime**	1	Stop date/time of the auxiliary file's validity period.	Format: dateTime
goce:auxiliaryMetadata/ **safe-aux:creationDate**	1	Creation date/time of the auxiliary file.	Format: dateTime
goce:auxiliaryMetadata/ **safe-aux:version**	1	Version of the auxiliary file itself, just to avoid duplication for regenerated files.	Format: String
goce:auxiliaryMetadata/ **goce:qualityInformation**	1	Quality information	Format: String P_O_FFFF encoding with: • P (Product Quality Status) being 1 character (O for OK, N for NOK), • O (Orbital Precision) being 1 character (0 for PREDICTED, 1 for PRECISE, 2

XML element or attribute	Cardinality	Description	Format/Allowed values
			for NON-ORBITAL) • FFFF (File Class) being 4 characters (OPER, TEST, RPRO)

Table 23: SAFE Metadata tailoring for GOCE Auxiliary files

3.2. Metadata specialisation at Instrument level

There are no metadata specialised at instrument level.

4.Naming Conventions

4.1. Level 0 Products and Auxiliary files

4.1.1. Package Names

Rep. Info Metadata Package
<*product_type*>_RPI-MTD_<*cccc*>.SAFE
Rep. Info Data Package
<*product_type*>_RPI-DAT_<*cccc*>.SAFE
Naming convention for product packages
GO_OPER_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>_<*cccc*>.SAFE

Table 24: GOCE L0 SAFE Package Names

Where:

<*product_type*> Can be any of the following:

EGG_TOT_0_	DFC_A1Z_0_
EGG_NOM_0_	DFC_A2X_0_
EGG_ICM_0_	DFC_A2Y_0_
EGG_AUX_0_	DFC_A2Z_0_
DFC_F01_0_	DFC_A3X_0_
DFC_F10_0_	DFC_A3Y_0_
GRF_LOR_0_	DFC_A3Z_0_
STR_VC2_0_	DFC_A4X_0_
STR_VC3_01	DFC_A4Y_0_
STR_VC3_02	DFC_A4Z_0_
STR_VC3_03	DFC_A5X_0_
SST_TOT_0_	DFC_A5Y_0_
SST_NOM_0_	DFC_A5Z_0_
SSTI_ICB_0_	DFC_A6X_0_
DFC_A1X_0_	DFC_A6Y_0_
DFC_A1Y_0_	DFC_A6Z_0_

<*cccc*> Is the CRC-16 value calculated over the manifest file inside the SAFE Package.

<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*> Are the Start/Stop Date and Time of the target of preservation.

<*vvvv*> Is the version number of the target of preservation

4.1.2. URN Specifications

Rep. Info Metadata Package
urn:x-safe:GOCE:<*product_type*>_RPI-MTD
Rep. Info Data Package
urn:x-safe:GOCE:<*product_type*>_RPI-DAT
Naming convention for product packages
urn:x-safe:GOCE:GO_OPER_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>

Table 25: GOCE L0 URN Specifications

Where:

<*product_type*> Can be any of the following:

EGG_TOT_0_	DFC_A1Z_0_
EGG_NOM_0_	DFC_A2X_0_
EGG_ICM_0_	DFC_A2Y_0_
EGG_AUX_0_	DFC_A2Z_0_
DFC_F01_0_	DFC_A3X_0_
DFC_F10_0_	DFC_A3Y_0_
GRF_LOR_0_	DFC_A3Z_0_
STR_VC2_0_	DFC_A4X_0_
STR_VC3_01	DFC_A4Y_0_
STR_VC3_02	DFC_A4Z_0_
STR_VC3_03	DFC_A5X_0_
SST_TOT_0_	DFC_A5Y_0_
SST_NOM_0_	DFC_A5Z_0_
SSTI_ICB_0_	DFC_A6X_0_
DFC_A1X_0_	DFC_A6Y_0_
DFC_A1Y_0_	DFC_A6Z_0_

<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*> Are the Start/Stop Date and Time of the target of preservation.

<*vvvv*> Is the version number of the target of preservation.

4.2. Level 1 Auxiliary files

4.2.1. Package Names

Rep. Info Metadata Package
<*product_type*>_RPI-MTD_<*cccc*>.SAFE
Rep. Info Data Package
<*product_type*>_RPI-DAT_<*cccc*>.SAFE
Naming convention for product packages
GO_CONS_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>_<*cccc*>.SAFE
GO_OPER_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>_<*cccc*>.SAFE

Table 26: GOCE L1 SAFE Package Names

Where:

<*product_type*>	Can be any of the following: AUX_ANT_OS AUX_CAL_K2 AUX_EGG_DB AUX_ICB_1b AUX_ICM_1b AUX_OUTC__ AUX_SST_DB AUX_TCHI__ AUX_VC3_TM MPL_OBPL__ MPL_ORBPRE MPL_ORBSCT TLM_HK
<*cccc*>	Is the CRC-16 value calculated over the manifest file inside the SAFE Package.
<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>	Are the Start/Stop Date and Time of the target of preservation.
<*vvvv*>	Is the version number of the target of preservation

4.2.2. URN Specifications

Rep. Info Metadata Package
urn:x-safe:GOCE:<*product_type*>_RPI-MTD
Rep. Info Data Package
urn:x-safe:GOCE:<*product_type*>_RPI-DAT
Naming convention for product packages
urn:x-safe:GOCE:GO_OPER_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>
urn:x-safe:GOCE:GO_CONS_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>

Table 27: GOCE L1 URN Specifications

Where:

<product_type>	Can be any of the following: AUX_ANT_OS AUX_CAL_K2 AUX_EGG_DB AUX_ICB_1b AUX_ICM_1b AUX_OUTC__ AUX_SST_DB AUX_TCHI__ AUX_VC3_TM MPL_OBPL__ MPL_ORBPRE MPL_ORBSCT TLM_HKTM_
<yyyymmddThhmmss>_<yyyymmddThhmmss>	Are the Start/Stop Date and Time of the target of preservation.
<vvvv>	Is the version number of the target of preservation.

4.3. Level 2 Products and Auxiliary files

4.3.1. Package Names

Rep. Info Metadata Package
*<product_type>*_RPI-MTD_*<cccc>*.SAFE
Rep. Info Data Package
*<product_type>*_RPI-DAT_*<cccc>*.SAFE
Naming convention for product packages
GO_CONS_*<product_type>*_*<yyyymmddThhmmss>*_*<yyyymmddThhmmss>*_*<vvvv>*_*<cccc>*.SAFE
GO_OPER_*<product_type>*_*<yyyymmddThhmmss>*_*<yyyymmddThhmmss>*_*<vvvv>*_*<cccc>*.SAFE

Table 28: GOCE L2 SAFE Package Names

Where:

<product_type>	Can be any of the following: SST_PSO_2_ EGG_NOM_2_ EGG_TRF_2_ EGM_GOC_2_
<cccc>	Is the CRC-16 value calculated over the manifest file inside the SAFE Package.
<yyyymmddThhmmss>_<yyyymmddThhmmss>	Are the Start/Stop Date and Time of the target of preservation.

<*vvvv*>	Is the version number of the target of preservation.

4.3.2. URN specifications

Rep. Info Metadata Package
urn:x-safe:GOCE:<*product_type*>_RPI-MTD
Rep. Info Data Package
urn:x-safe:GOCE:<*product_type*>_RPI-DAT
Naming convention for product packages
urn:x-safe:GOCE:GO_CONS_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>
urn:x-safe:GOCE:GO_OPER_<*product_type*>_<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>_<*vvvv*>

Table 29: GOCE L2 URN Specifications

Where:

<*product_type*>	Can be any of the following: SST_PSO_2_ EGG_NOM_2_ EGG_TRF_2_ EGM_GOC_2_
<*yyyymmddThhmmss*>_<*yyyymmddThhmmss*>	Are the Start/Stop Date and Time of the target of preservation.
<*vvvv*>	Is the version number of the target of preservation.

Appendix A. Representation Information Packages

SAFE GOCE Representation Information Packages are characteristic of the SAFE GOCE specialisation and during the nominal operations of a SAFE archive such Packages will not normally be created. Therefore, the packages listed in the following sections can be used as-is to introduce GOCE support to a SAFE archive.

A.I. Rep. Info Packages for Level 0 products/auxiliary files

The files listed below are distributed together with the set of documents that constitute the SAFE specialisation for GOCE L0. Each SAFE Package is compressed into a zip file which should be decompressed before usage.

These SAFE Packages may contain either the representation information of the target of preservation EO product/Auxiliary data (RPI-DAT) or the representation information of the metadata (RPI-MTD) for the product types and auxiliary file types.

The data structure of the target of preservation files stored inside the RPI-DAT packages is specified in [GOCE-BOOK-L0].

#	Filename
1	AUX_NOM_0__RPI-DAT_3776.SAFE.zip
2	AUX_NOM_0__RPI-MTD_5257.SAFE.zip
3	DFC_A5Z_0__RPI-DAT_5570.SAFE.zip
4	DFC_A5Z_0__RPI-MTD_4345.SAFE.zip
5	DFC_F01_0__RPI-DAT_1005.SAFE.zip
6	DFC_F01_0__RPI-MTD_2176.SAFE.zip
7	DFC_F10_0__RPI-DAT_5937.SAFE.zip
8	DFC_F10_0__RPI-MTD_1841.SAFE.zip
9	EGG_AUX_0__RPI-DAT_4497.SAFE.zip
10	EGG_AUX_0__RPI-MTD_1855.SAFE.zip
11	EGG_ICM_0__RPI-DAT_2187.SAFE.zip
12	EGG_ICM_0__RPI-MTD_4570.SAFE.zip
13	EGG_NOM_0__RPI-DAT_1957.SAFE.zip
14	EGG_NOM_0__RPI-MTD_4154.SAFE.zip
15	EGG_TOT_0__RPI-DAT_3073.SAFE.zip
16	EGG_TOT_0__RPI-MTD_5423.SAFE.zip
17	GRF_LOR_0__RPI-DAT_1935.SAFE.zip
18	GRF_LOR_0__RPI-MTD_4329.SAFE.zip
19	SST_ICB_0__RPI-DAT_3201.SAFE.zip
20	SST_ICB_0__RPI-MTD_3507.SAFE.zip
21	SST_NOM_0__RPI-DAT_4467.SAFE.zip

22	SST_NOM_0__RPI-MTD_5030.SAFE.zip
23	SST_TOT_0__RPI-DAT_1646.SAFE.zip
24	SST_TOT_0__RPI-MTD_3096.SAFE.zip
25	STR_VC2_0__RPI-DAT_5714.SAFE.zip
26	STR_VC2_0__RPI-MTD_4213.SAFE.zip
27	STR_VC3_01_RPI-DAT_4006.SAFE.zip
28	STR_VC3_01_RPI-MTD_5417.SAFE.zip
29	STR_VC3_02_RPI-DAT_3767.SAFE.zip
30	STR_VC3_02_RPI-MTD_5274.SAFE.zip
31	STR_VC3_03_RPI-DAT_3679.SAFE.zip
32	STR_VC3_03_RPI-MTD_3208.SAFE.zip

A.II. Rep. Info Packages for Level 1 auxiliary files

The files listed below are distributed together with the set of documents that constitute the SAFE specialisation for GOCE L1. Each SAFE Package is compressed into a zip file which should be decompressed before usage.

These SAFE Packages may contain either the representation information of the target of preservation Auxiliary data (RPI-DAT) or the representation information of the metadata (RPI-MTD) for the auxiliary file types.

The data structure of the target of preservation files stored inside the RPI-DAT packages is specified in [GOCE-BOOK-L1].

#	Filename
1	AUX_ANT_OS_RPI-DAT_3923.SAFE.zip
2	AUX_ANT_OS_RPI-MTD_5527.SAFE.zip
3	AUX_CAL_K2_RPI-DAT_5333.SAFE.zip
4	AUX_CAL_K2_RPI-MTD_1700.SAFE.zip
5	AUX_EGG_DB_RPI-DAT_4568.SAFE.zip
6	AUX_EGG_DB_RPI-MTD_1341.SAFE.zip
7	AUX_ICB_1b_RPI-DAT_5892.SAFE.zip
8	AUX_ICB_1b_RPI-MTD_5175.SAFE.zip
9	AUX_ICM_1b_RPI-DAT_3811.SAFE.zip
10	AUX_ICM_1b_RPI-MTD_5645.SAFE.zip
11	AUX_OUTC___RPI-DAT_4970.SAFE.zip
12	AUX_OUTC___RPI-MTD_1245.SAFE.zip
13	AUX_SST_DB_RPI-DAT_5245.SAFE.zip
14	AUX_SST_DB_RPI-MTD_4943.SAFE.zip
15	AUX_TCHI___RPI-DAT_5061.SAFE.zip
16	AUX_TCHI___RPI-MTD_1651.SAFE.zip
17	AUX_VC3_TM_RPI-DAT_4724.SAFE.zip
18	AUX_VC3_TM_RPI-MTD_3232.SAFE.zip
19	MPL_OBPL___RPI-DAT_3397.SAFE.zip
20	MPL_OBPL___RPI-MTD_3078.SAFE.zip
21	MPL_ORBPRE_RPI-DAT_2194.SAFE.zip
22	MPL_ORBPRE_RPI-MTD_5949.SAFE.zip
23	MPL_ORBSCT_RPI-DAT_1372.SAFE.zip
24	MPL_ORBSCT_RPI-MTD_1252.SAFE.zip
25	TLM_HKTM___RPI-DAT_4185.SAFE.zip
26	TLM_HKTM___RPI-MTD_3920.SAFE.zip

A.III. Rep. Info Packages for Level 2 products

The files listed below are distributed together with the set of documents that constitute the SAFE specialisation for GOCE L2. Each SAFE Package is compressed into a zip file which should be decompressed before usage.

These SAFE Packages may contain either the representation information of the target of preservation EO product/Auxiliary data (RPI-DAT) or the representation information of the metadata (RPI-MTD) for the product types and auxiliary file types.

The data structure of the target of preservation files stored inside the RPI-DAT packages is specified in [GOCE-BOOK-L2].

#	Filename
1	EGG_NOM_2__RPI-DAT_5301.SAFE.zip
2	EGG_NOM_2__RPI-MTD_5468.SAFE.zip
3	EGG_TRF_2__RPI-DAT_2460.SAFE.zip
4	EGG_TRF_2__RPI-MTD_2556.SAFE.zip
5	EGM_GOC_2__RPI-DAT_1160.SAFE.zip
6	EGM_GOC_2__RPI-MTD_1622.SAFE.zip
7	SST_AUX_2__RPI-DAT_5834.SAFE.zip
8	SST_AUX_2__RPI-MTD_4177.SAFE.zip
9	SST_PSO_2__RPI-DAT_1530.SAFE.zip
10	SST_PSO_2__RPI-MTD_3581.SAFE.zip

Appendix B. SAFE Package Examples

The packages listed in the following subsections are examples of SAFE GOCE EO Product and EO Auxiliary Packages distributed only for illustrative purposes together with the set of documents that constitute the SAFE specialisation for GOCE.

Each SAFE Package is compressed into a zip file which should be decompressed before usage.

B.I. SAFE Package examples for Level 0

#	Filename
1	GO_OPER_AUX_NOM_0__20130331T201816_20130401T064035_0001_2035.SAFE.zip
2	GO_OPER_DFC_A5Z_0__20101006T160440_20101006T160800_0001_4102.SAFE.zip
3	GO_OPER_DFC_F01_0__20130331T190921_20130401T005046_0001_1572.SAFE.zip
4	GO_OPER_DFC_F10_0__20130331T235828_20130401T005046_0001_4920.SAFE.zip
5	GO_OPER_EGG_AUX_0__20130331T201815_20130401T064036_0001_2479.SAFE.zip
6	GO_OPER_EGG_ICM_0__20101207T224330_20101208T053200_0001_5017.SAFE.zip
7	GO_OPER_EGG_NOM_0__20130331T190921_20130401T005046_0001_5047.SAFE.zip
8	GO_OPER_EGG_TOT_0__20130331T190921_20130401T005046_0001_1076.SAFE.zip
9	GO_OPER_GRF_LOR_0__20130331T201816_20130401T064036_0001_2433.SAFE.zip
10	GO_OPER_SST_ICB_0__20090512T161914_20090512T161914_0001_5032.SAFE.zip
11	GO_OPER_SST_NOM_0__20130331T190921_20130401T005045_0001_2795.SAFE.zip
12	GO_OPER_SST_TOT_0__20130331T190921_20130401T005045_0001_3448.SAFE.zip
13	GO_OPER_STR_VC2_0__20130331T190920_20130401T005046_0001_4646.SAFE.zip
14	GO_OPER_STR_VC3_01_20130331T201814_20130401T064036_0001_4212.SAFE.zip
15	GO_OPER_STR_VC3_02_20130325T051408_20130325T070007_0001_3977.SAFE.zip
16	GO_OPER_STR_VC3_03_20130325T102545_20130325T102634_0001_4297.SAFE.zip

B.II. SAFE Package examples for Level 1

#	Filename
1	GO_OPER_AUX_ANT_OS_20090316T000000_20100316T235959_0001_5002.SAFE.zip
2	GO_OPER_AUX_CAL_K2_20090423T000000_20100423T000000_0001_3249.SAFE.zip
3	GO_OPER_AUX_EGG_DB_20130508T000000_20130801T000000_0001_2000.SAFE.zip
4	GO_OPER_AUX_ICB_1b_20100316T000000_20140316T235959_0001_1810.SAFE.zip
5	GO_OPER_AUX_ICM_1b_20130213T000000_20130701T000000_0001_1933.SAFE.zip
6	GO_OPER_AUX_OUTC___20130615T000000_20130624T235959_0001_4501.SAFE.zip
7	GO_OPER_AUX_SST_DB_20090316T000000_20140316T235959_0001_5577.SAFE.zip
8	GO_OPER_AUX_TCHI___20130615T000000_20130615T235959_0001_1040.SAFE.zip
9	GO_OPER_AUX_VC3_TM_20090318T000000_20190318T000000_0001_2759.SAFE.zip

10	GO_OPER_MPL_OBPL___20121217T000000_20121223T235959_0003_5050.SAFE.zip
11	GO_OPER_MPL_ORBPRE_20130630T040923_20130730T040923_0001_2663.SAFE.zip
12	GO_OPER_MPL_ORBSCT_20000101T054937_99999999T999999_0005_5636.SAFE.zip
13	GO_OPER_TLM_HKTM___20090424T000000_20090424T235959_0001_1133.SAFE.zip

B.III. SAFE Package examples for Level 2

#	Filename
1	GO_CONS_EGG_NOM_2__20091102T000000_20091102T235959_0002_4935.SAFE.zip
2	GO_CONS_EGG_TRF_2__20091031T000000_20091031T235959_0001_4314.SAFE.zip
3	GO_CONS_EGM_GOC_2__20091030T005757_20100111T073815_0002_3562.SAFE.zip
4	GO_CONS_SST_AUX_2__20091102T120000_20091102T120000_0001_4988.SAFE.zip
5	GO_CONS_SST_PSO_2__20091101T235945_20091102T235944_0001_3789.SAFE.zip