GOCE High Level Processing Facility

GOCE XML Parser

Doc. No.: GO-TN-HPF-GS-0192
Issue: 2
Revision: 7.2
Date: 07 / 09 / 2011

Prepared by: The European GOCE Gravity Consortium
EGG-C

Document Information Sheet

Document Name
GOCE XML Parser

Document ID	Issue	Date
GP-TN-HPF-GS-0192	2.7.2	07/09/2011

Author	Institute
Sander de Witte	SRON Netherlands Institute for Space Research
Contributions from	**Institute**
Richard van Hees	SRON Netherlands Institute for Space Research
Sietse Rispens	SRON Netherlands Institute for Space Research
Sophie Fiorot	SRON Netherlands Institute for Space Research

Document Category	Document Class	Document Level
3	R	3

Configuration Item		Confidentiality Level
CI002		N.A.

Appropriate Signatures		
Name	signature	Signature for approval
N.A.	N.A.	NO

Distribution List	
Person	Institute
R. Floberghagen	ESA/ESTEC
Th. Gruber	IAPG
EGG-c partners	various

List	
DIL	YES
CDL	NO
CIDL	NO
CSL	NO
CCN	NO
SWPRL	NO

Data Package	
SRR	NO
ADIR	NO
CDR	NO
AR0	NO
AR 1	NO
AR 2	NO
BP CDR	NO
AR 3	NO

Document Change Record

ISSUE /REV.	CLASS (R=Review /A=Approval)	DATE	REASON FOR CHANGE	CHANGED PAGES / PARAGRAPHS
1.0	R	25/04/2007	Initial release	All
2.0	R	20/06/2008	Updates after major software changes	Chapter 1 and chapter 4
2.1	R	08/07/2008	Results from test report added	Chapter 6 added
2.2	R	25/07/2008	Detailed installation instructions added	Minor updates to paragraph 4.2.2 and 4.2.4. Added paragraph 4.2.3.
2.3	R	01/06/2010	Windows installation Instructions added Updated time GG format Update Table 1-1, 4-2	Minor updates to paragraph 4.2.2 and 4.2.5. Added paragraph 4.2.4.
2.4	R	27/09/2010	Update spatial GG format (EGG_TRF_2)	Minor update to paragraph 5.3.3.2
2.5	R	12/11/2010	Change the default directory of the style-sheets	Minor update to paragraph 4.2.2.
2.6	R	23/12/2010	Description of the parser for level 1b products	New chapter for level 1b product description
2.7	R	10/03/2011	Updated installation description	Major update Chapter 4. Minor changes to Chapter 5. Moved file name definition to appendix.
2.7.1	R	30/03/2011	Fixed typos & layout	Chapter 4 and 5.1
2.7.2	R	07/09/2011	Fixed links to ESA website	

Abbreviations and Acronyms

AD	Applicable Document
ADD	Architectural Design Document
ADIR	Architectural Design and Interface Review
ADP	Auxiliary Data Provider
AIT	Acceptance, Integration, Test
AO	Announcement of Opportunity
AR	Acceptance Review
AS	Anti-Spoofing
ATP	Authorisation To Proceed
ATR	Algorithm Test Review
CAB	Change Appeal Board
CBCP	Current Baseline Cost Plan
CCN	Contract Change Notice
CDAF	Command and Data Acquisition Facility
CDP	Configuration and Documentation management Plan
CDR	Critical Design Review
CFI	Customer Furnished Item
CHAMP	CHAllenging Minisatellite Payload for geophysical research and application
CMF	Calibration and Monitoring Facility
CNL	Contract change Notices status List
COP	Commissioning Operations Phase
COS	Consortium Organisation Structure
CPF	Central Processing Facility
CPR	Cycle Per Revolution
CPS	Company Project Structure
CR	Change Request
CRB	Change Review Board
DCN	Document Change Notice
DDP	Design and Development Plan
DFACS	Drag-Free and Attitude Control System
DPA	Data Processing Archive
DPM	Detailed Processing Model
DSAT	Development Site Acceptance Test
DTL	Documentation Tree and status List
E2E	End-to-End Simulator
ECMWF	European Centre for Medium-range Weather Forecast
ECP	External Calibration Products
ECSS	European Cooperation for Space Standardization
EFRF	Earth Fixed Reference Frame
EGG	Electrostatic Gravity Gradiometer
EGG-C	European GOCE Gravity Consortium
EGM96	Earth Gravity Model 1996
EM	Engineering Model
EME2000	Equinox and Mean Equator of J2000.0
EO	Earth Observation
EOEP	Earth Observation Envelope Programme
EPAR	Extended mission Product Acceptance Review
ESA	European Space Agency
FM	Flight Model
FOCC	Flight Operations Control Centre
FOS	Flight Operations Segment
GOCE	Gravity field and steady-state Ocean Circulation Explorer
GG	Gravity Gradient
GPS	Global Positioning System
GRACE	Gravity Recovery And Climate Experiment
GRF	Gradiometer Reference Frame
GS	Ground Segment
GSOV	Ground Segment Overall Validation
GSRR	Ground Segment Readiness Review
HK	House-Keeping
HOP	Hibernation Operations Phase
HPF	High level Processing Facility
HW	Hardware
IAG	International Association of Geodesy
ICD	Interface Control Document
IGS	International GPS Service
ILRS	International Laser Ranging Service
IPF1	Instrument Processing Facility level 1
ISP	Instrument Source Packet
ITT	Invitation To Tender
L	Level, L-band frequency
LAN	Local Area Network
LEOP	Launch and Early Orbit Phase
LORF	Local Orbital Reference Frame
LRR	Laser Retro-Reflector
LSC	Least Squares Collocation
LTA	Long-Term Archive
MBW	Measurement BandWidth
MOP	Measurement Operational Phase
MPS	Mission Planning System
NA	Not Applicable
NRT	Near-Real Time
OBCP	On-Board Control Procedures
OBT	On-Board Time

ORR	Operational Readiness Review
OSAT	On-Site Acceptance Test
PAR	Product Acceptance Review
PCD	Product Confidence Data
PDD	Product Definition Document
PDF	Portable Document Format
PDS	Payload Data Segment
PF	Processing Facility
PI	Principal Investigator
POD	Precise Orbit Determination
PSD	Packet Structure Definition; Power Spectral Density
QL	Quick-Look
QLP	Quick-Look Products
RD	Reference Document
RERF	Radial Earth-pointing Reference Frame
RFQ	Request For Quotation
RMS	Root-Mean Square
RPF	Reference Planning Facility
RSS	Root-Sum Square
S/C	Space-Craft
SCP	Secure Copy (remote file copy program)
SDE	Software Development Environment
SFTP	Secure File Transfer Program
SGG	Satellite Gravity Gradiometer
SLR	Satellite Laser Ranging
SMF	Software Maintenance Facility
SOW	Statement Of Work
SPC	Satellite Prime Contractor
SPF	Sub-Processing Facility
SPR	Software Problem Report
SPRL	Software PRoblems status List
SRD	System Requirements Document
SRR	System Requirements Review
SST	Satellite-to-Satellite Tracking
SSTI	Satellite-to-Satellite Tracking Instrument
SSTR	Sub-System Test Review
STP	Software Test Plan
SVT	System Validation Test
SW	SoftWare
SWRD	SoftWare Requirements Document
TBC	To Be Confirmed
TBD	To Be Defined
TC	TeleCommand
TM	TeleMetry
TP	Test Plan
TR	Test Report
USF	User Services Facility
UTC	Universal Time Coordinated
V0/1/2	Version 0/1/2
VC	Virtual Channel
WAN	Wide Area Network
WBS	Work Breakdown Structure
WP	Work Package
XML	eXtensible Markup Language

Table of Contents

1 INTRODUCTION....7
1.1 PURPOSE AND SUMMARY....7
1.2 APPLICABILITY....7
1.3 DEFINITIONS....7
2 APPLICABLE AND REFERENCE DOCUMENTS....9
2.1 APPLICABLE DOCUMENTS....9
2.2 REFERENCE DOCUMENTS....9
3 GOCE GROUND SEGMENT....11
3.1 OVERVIEW GOCE GROUND SEGMENT....11
3.2 HIGH-LEVEL PROCESSING FACILITY....11
4 GOCE XML PARSER....12
4.1 INTRODUCTION....12
4.2 INSTALLATION OF THE GOCE XML PARSER....12
4.2.1 PREREQUISITES....12
4.2.2 GENERAL LINUX/MAC INSTALLATION INSTRUCTIONS....13
4.2.2.1 DEBIAN SPECIFIC INSTRUCTIONS....14
4.2.2.2 FEDORA/REDHAD/SUSE SPECIFIC INSTRUCTIONS....14
4.2.2.3 MAC OSX SPECIFIC INSTRUCTIONS....14
4.2.2.4 CPAN, YOUR LAST RESORT....14
4.2.3 INSTALLATION INSTRUCTIONS (WINDOWS)....15
4.3 TESTING THE GOCE XML PARSER....16
4.4 USAGE OF THE GOCE XML PARSER....17
5 FORMAT DESCRIPTIONS - L1B PRODUCTS....19
5.1 L1B PRODUCTS AND THEIR FORMATS....19
5.2 L1B OUTPUT FORMATS....19
5.2.1 GENERAL LAYOUT....19
5.2.2 HEADER FORMAT....19
5.2.3 EGG_NOM_1B OUTPUT PRODUCTS....21
5.2.3.1 EGG_CCD_DS SUB-PRODUCT FORMAT....21
5.2.3.2 EGG_GGT_DS SUB-PRODUCT FORMAT....22
5.2.3.3 EGG_IAQ_DS SUB-PRODUCT FORMAT....22
5.2.4 SST_NOM_1B OUTPUT PRODUCTS....23
5.2.4.1 SST_COV_DS SUB-PRODUCT FORMAT....23
5.2.4.2 SST_PVT_DS SUB-PRODUCT FORMAT....23
5.2.4.3 STR_VC2_DS AND STR_VC3_DS PRODUCT FORMAT....24
6 FORMAT DESCRIPTIONS – L2 PRODUCTS....25
6.1 L2 PRODUCTS AND THEIR FORMATS....25
6.2 L2 OUTPUT FORMATS....25
6.2.1 GENERAL LAYOUT....25
6.2.2 HEADER FORMAT....25
6.2.3 GG FORMAT....25
6.2.3.1 TIME GG FORMAT....25
6.2.3.2 SPATIAL GG FORMAT....27
6.2.4 SP3C FORMAT....28
6.2.5 COVARIANCE FORMAT....29
6.2.6 ROTATION MATRIX FORMAT....30
6.2.7 ICGEM FORMAT....32
6.2.8 GRID FORMAT....36

7 FILENAME CONVENTIONS.....39
7.1 GENERAL FILENAME FORMAT.....39

1 INTRODUCTION

1.1 PURPOSE AND SUMMARY

The purpose of this document is to describe the GOCE XML Parser. It will describe the software and how to use it. Furthermore, it will describe the output formats. In general, this document will act as the GOCE XML parsers manual.

1.2 APPLICABILITY

This document applies to the development phase and to the actual implementation and operational phases of the GOCE ground segment.

1.3 DEFINITIONS

The term “Contract” is used to indicate the HPF implementation contract.
The term “the Contractor” is used to indicate the entity in charge of implementing the HPF.
The term “Agency” is used to indicate the European Space Agency (ESA).

EGG-C is composed by 10 European institutions. Institutions and team members contributing to the HPF project are defined in Table 1-1.

Table 1-1: EGG-C Team Members in Alphabetical Order

Acronym	Institution	Function	Team Members
AIUB	Astronomical Institute, University of Bern, Switzerland	WP4000 Partner	G. Beutler H. Bock
CNES	Centre National d'Etudes Spatiales, Groupe de Recherche de Géodésie Spatiale, Toulouse, France	WP5000 Manager	G. Balmino S. Bruinsma
DEOS	Delft Institute for Earth-Oriented Space Research, Delft University of Technology, Delft, The Netherlands	WP4000 Manager WP 3000 Partner WP 8000 Partner	P. Visser J. van den IJssel
GFZ	GeoForschungsZentrum Potsdam, Department 1 Geodesy and Remote Sensing, Potsdam, Germany	WP 5000 Partner	M. Rothacher Ch. Förste
IAPG	Institute of Astronomical and Physical Geodesy, Technical University Munich, Germany	Principal Investigator Management WP 3000 Manager WP 4000 Partner WP 6000 Partner WP 8000 Manager	R. Rummel Th. Gruber U. Hugentobler J. Bouman
ITG	Institute of Theoretical Geodesy, University Bonn, Germany	WP 6000 Partner	W.D. Schuh
POLIMI	DIIAR – Sezione Rilevamento, Politecnico di Milano, Italy	WP 7000 Manager	F. Sanso F. Migliaccio
SRON	SRON National Institute for Space Research , Utrecht, The Netherlands	Management WP3000 Partner	 R. van Hees S. Fiorot
TUG	Institute of Navigation and Satellite Geodesy, Graz University of Technology	WP 6000 Manager	H. Sünkel R. Pail E. Höck
UCPH	Department of Geophysics, University of Copenhagen, Denmark	WP 3000 Partner WP 7000 Partner	Ch. Tscherning M. Veicherts

2 APPLICABLE AND REFERENCE DOCUMENTS

2.1 APPLICABLE DOCUMENTS

[AD-1] GO-SW-ESA-GS-0079: GOCE High Level processing Facility, Statement of Work, Issue 2.0, 4. May 2004

[AD-2] GO-RS-ESA-GS-0080: GOCE High Level processing Facility, Statement of Work Appendix 1, Management Requirements, Issue 2.0, 4. May 2004

[AD-3] GO-LI-ESA-GS-0081: GOCE High Level Processing Facility, Statement of Work Appendix 2, Deliverable Items List, Issue 2.0, 4. May 2004

[AD-4] GO-RS-ESA-GS-0082: GOCE High Level Processing Facility, Statement of Work Appendix 3, Technical Requirements Specification, Issue 2.0, 4. May 2004

[AD-5] GO-LI-ESA-GS-0087: GOCE High Level Processing Facility, Statement of Work Appendix 4, List of CFI, Issue 1.0, 5. December 2003

[AD-6] GO-TN-ESA-GS-0085: GOCE High Level Processing Facility, Statement of Work Appendix 5, Tailoring of ECSS Standards, Issue 1.0, 5. December 2003

[AD-7] ECSS-E-40B: Space Engineering, Software Standards, Draft Issue, 28. July 2000

[AD-8] ECSS-Q-80B: Space Product Assurance, Software Product Assurance, Issue 3. April 2000

[AD-9] PE-TN-ESA-GS-0001: Earth Explorer Ground Segment File Format Standard, Issue 1.4, 13.6.2003

[AD-10] GO-ID-ACS-GS-0109: PDS Product Specification Document, Issue 3.1, 31.10.2006

[AD-11] GO-IC-AI-0009: End-to-End Simulator Post-Processing, Issue 6 Draft, 9.2.2006

[AD-14] GO-ID-ACS-GS-0111: PDS-HPF Interface Control Document: L2, QL and External Calibration Products, Issue 2.3, 31.10.2006

2.2 REFERENCE DOCUMENTS

[RD-1] ESA-SP-1233(1): Gravity Field and Steady-State Ocean Circulation Mission

[RD-2] GO-RS-ESA-SY-0001: GOCE Mission requirements Document

[RD-3] GO-TN-ESA-GS-0017: GOCE Ground Segment Concept and Architecture

[RD-4] GO-SP-AI-0004: GPS Receiver Ground Processing Algorithms Specification

[RD-5] GO-SP-AI-0003: Gradiometer Ground Processing Algorithms Specification

[RD-6] GO-TN-AI-0067: Gradiometer Ground Processing Algorithms Documentation

[RD-7] GO-TN-AI-0068: Gradiometer Ground processing Analysis

[RD-8] GO-PL-AI-0039: Gradiometer Calibration Plan

[RD-9] GO-TN-AI-0069: Gradiometer On-Orbit Calibration Procedure Analysis

[RD-10] GO-RP-AI-0014: Mission Analysis Report

[RD-11] CS-MA-DMS-GS-0001: Earth Explorer Mission Conventions Document

[RD-12] GO-MA-AI-0002: GOCE User's Manual

[RD-13] GO-TN-AI-0027: Performance Requirements and Budgets for the Gradiometric Mission

[RD-14] GO-TN-IAPG-0001: Detailed Processing Model for EGG

[RD-15] GO-TN-IAPG-0002: Detailed Processing Model for SSTI
[RD-16] GO-ID-ESC-FS-5070: FOS/PDS – PDS/SLR: Predicted Orbit File
[RD-17] GO-RS-ESA-GS-0052: Product Requirement Document
[RD-18] ECSS-M-00A: Policy Principles
[RD-19] ECSS-M-10A: Project Breakdown and Structures
[RD-20] ECSS-M-20A: Project Organization
[RD-21] ECSS-M-30A: Project Phasing and Planning
[RD-22] ECSS-M-40A: Configuration Management
[RD-23] ECSS-M-50A: Information / Documentation Management
[RD-24] ECSS-M-60A : Cost Schedule Management
[RD-25] ECSS-M-70A: Integrated Logistics Support
[RD-26] GO-MI-ESA-0101: Minutes of the HPF Negotiation Meeting
[RD-27] GO-AI-HPF-GS-0008: Action Item Reply of HPF Negotiation Meeting
[RD-28] GO-AI-HPF-GS-0013: Action Item Reply of HPF Negotiation Meeting
[RD-29] GO-ID-ESC-FS-5070: FOS/FDS to PDS/SLR: Predicted Orbit File Interface Control Document
[RD-30] DTOS-FDOS-FDIS-ICD-0250-TOS-GFM: Flight Dynamics Infrastructure Software Napeos Interface Control Document
[RD-31] PE-TN-ESA-GS-0001: Earth Explorer Ground Segment File Format Standard
[RD-32] GO-ID-ESA-GS-0037: GOCE Ground Segment Master ICD
[RD-33] GO-MO-HPF-GS-0122: Memo on Definition of Latency and Turn-around Time
[RD-34] GO-ID-ACS-GS-0147: PDS-RPF ICD
[RD-35] GO-MA-HPF-GS-0110: GOCE Level 2 Product Data Handbook

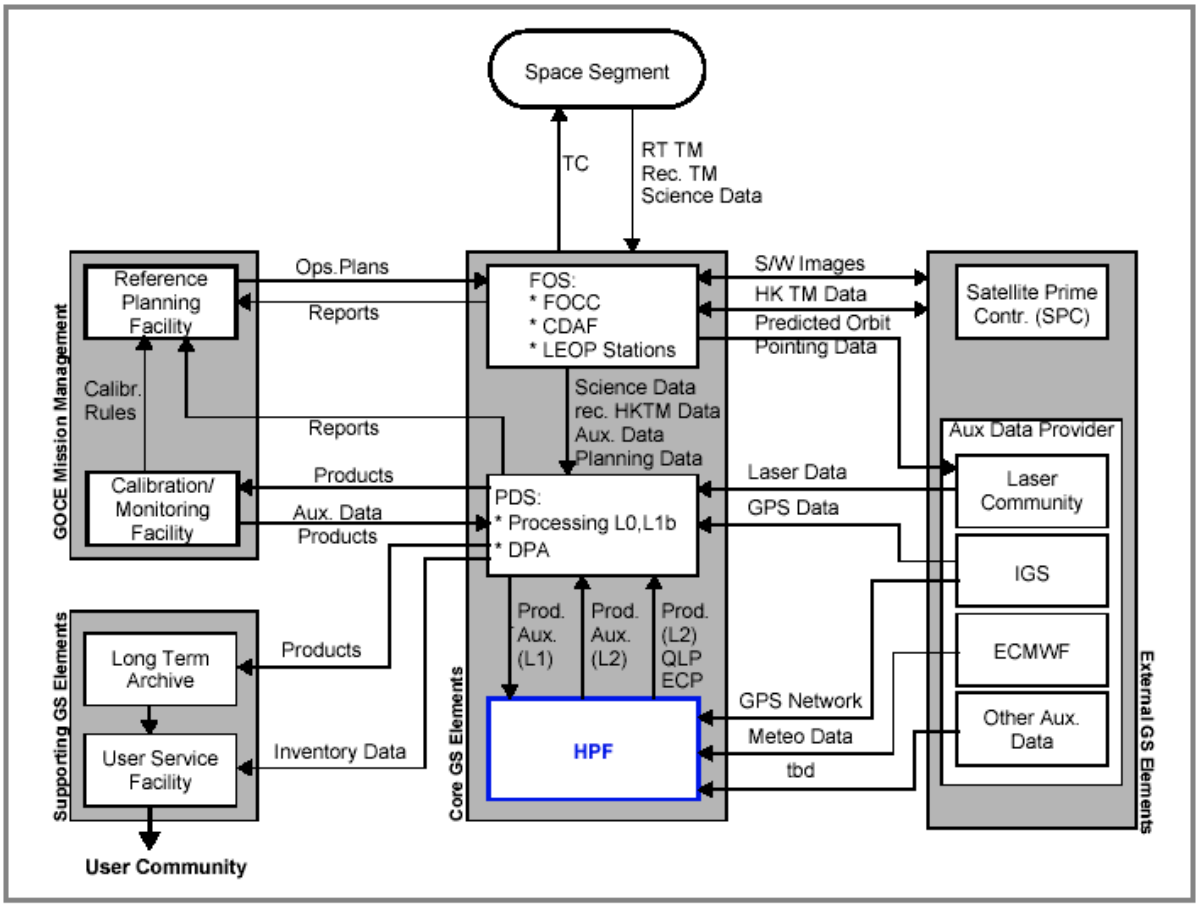
As a general rule it holds that the latest approved issue of the document is applicable, except if the issue number and the document date are specified.

3 GOCE GROUND SEGMENT

3.1 OVERVIEW GOCE GROUND SEGMENT

The GOCE ground segment concept and architecture is described in [RD-3]. The following gives a brief summary of all ground segment elements, depicted in Figure 3-1.

Figure 3-1: GOCE Ground System



3.2 HIGH-LEVEL PROCESSING FACILITY

Within the GOCE GS the HPF is one of the Core GS Elements (ESA-controlled), and it is charged with the generation of L2 products and acquisition of the external (auxiliary) data needed to generate these products, the delivery of these products (auxiliary, intermediate and final) to the PDS/DPA and/or the LTA and the generation of QLP and ECP for the purpose of the activities of the CMF.

4 GOCE XML PARSER

4.1 INTRODUCTION

The GOCE level 1b and level 2 products, which are offered by ESA to the GOCE user community are in EEF format. The EEF format is based on XML. However, many existing software is unable to use EEF formatted products for those cases the GOCE XML parser can be helpful. A parser is a program that takes input in the form of sequential instructions, tags (or any other defined sequence of tokens), and breaks them up into easily manageable parts. An XML parser is designed to read and, in a sense, interpret XML documents. As it executes, the parser recognizes and responds to each XML structure it encounters by taking some specified action based on the structure type. XML parsers typically convert an XML document into a tree structure that reflects the containment hierarchy of the XML data. This tree can be made available to any application, which is free to interpret and modify the data as appropriate. The XML parser described in this document can be used by the GOCE user community whenever they need to import data into existing applications by transforming the products in EEF format into another existing format.

The GOCE XML Parser will transform the EEF products described in Table 4-1 to well-known formats described in section 5 and 6 for level 1b and 2, respectively.

Table 4-1: List of data products which can be transformed using the GOCE XML Parser

Product ID	Product Description
EGG_NOM_1b	Nominal level 1b product of the Gradiometer
SST_NOM_1b	Nominal level 1b product of SSTI
STR_VC2_1b / STR_VC3_1b	Star Tracker Quaternions level 1b product
EGG_NOM_2	L2 gravity gradients in GRF with corrections
EGG_TRF_2	L2 gravity gradients in LNOF with corrections
EGM_GOC_2	Final GOCE gravity field model with error estimates and quality report
SST_AUX_2	SH coefficients for non-tidal temporal corrections
SST_PSO_2	Precise science orbits with quality report

4.2 INSTALLATION OF THE GOCE XML PARSER

This section is valid for the GOCE XML Parser version 1.2.1[1] or higher. The latest supported public release of the GOCE XML parser and its documentation are available from http://earth.esa.int/GOCE ==> *GOCE L1b-L2 XML Parser*.

4.2.1 Prerequisites

The GOCE XML Parser is written in Perl, which comes with all (modern) Linux distributions and Mac OSX. The parser is developed using version 5.10. In addition, several Perl modules are required, see Table 4-3. The listed modules, except XML::LibXML and XML::LibXSLT, belong to core Perl modules and should be available on your system by default.

[1] Not to be confused with the issue number of this document.

Table 4-2: List of Perl modules required by the GOCE XML Parser

Module	Description	Version		
		Linux	Mac OSX	Windows
Getopt::Long	Extended processing of command line options.	2.38	2.37	2.38
File::Basename	Parse file paths into directory, file-name and suffix.	2.77	2.76	2.77
XML::Parser	A Perl module for parsing XML documents. It is built on top of the XML::Parser::Expat Perl module, which is a lower level interface to the Expat XML parser library written in C (http://expat.sourceforge.net).	2.36	2.36	2.40
XML::LibXML	This module is an interface to libxml2 (http://www.xmlsoft.org), providing XML and HTML parsers with DOM, SAX and XMLReader interfaces, a large subset of the DOM Layer 3 interface and a XML::XPath-like interface to XPath API of libxml2.	1.70	1.69	1.65
XML::LibXSLT	This module is an interface to the Gnome project's libxslt (http://www.xmlsoft.org/XSLT).	1.70	1.69	1.63
MIME::Base64	This module provides functions to encode and decode strings into and from the Base64 encoding specified in RFC 2045	3.08	3.07_01	3.13

4.2.2 General Linux/Mac Installation instructions

Below the installation instructions GOCE XML Parser are given.

1. Open your favourite xterm simulator.
2. Check the version of Perl on your PC by entering:
   ```
   perl -version
   ```
   It should be major version 5 and at least v5.8.8
3. Check that the Perl modules listed in Table 1 are installed. For this, we suggest the following command (note the whole command should be entered in one line):
   ```
   perl -le 'eval "require $ARGV[0]" and print "$ARGV[0] v" . $ARGV[0]->VERSION' Getopt::Long
   perl -le 'eval "require $ARGV[0]" and print "$ARGV[0] v" . $ARGV[0]->VERSION' File::Basename
   perl -le 'eval "require $ARGV[0]" and print "$ARGV[0] v" . $ARGV[0]->VERSION' XML::Parser
   perl -le 'eval "require $ARGV[0]" and print "$ARGV[0] v" . $ARGV[0]->VERSION' XML::LibXML
   perl -le 'eval "require $ARGV[0]" and print "$ARGV[0] v" . $ARGV[0]->VERSION' XML::LibXSLT
   perl -le 'eval "require $ARGV[0]" and print "$ARGV[0] v" . $ARGV[0]->VERSION' MIME::Base64
   ```
   If nothing is returned it means that the Perl module is not installed, in that case, please follow the Mac and Linux-distribution specific instructions below.
4. Create a directory to install the GOCE XML Parser software:
   ```
   mkdir GOCE-XML-Parser
   cd GOCE-XML-Parser
   ```
5. Extract the GOCE XML Parser distribution:
   ```
   unzip <path-to>/hpf_eef_transform_<version>.zip
   ```

6. Make sure that the GOCE XML Parser program is executable, if not you can use the following command:
   chmod u+rwx hpf_eef_transform.pl

You are ready to use the GOCE XML Parser when these instructions have been successfully completed, see section 4.4 for usage examples.

4.2.2.1 Debian specific instructions[2]

In this section the installation of Perl and the required modules on a Debian/Ubuntu system are given. It is assumed that you are allowed to use sudo to execute apt-get, otherwise you have to login as root (skip "sudo" in the commands listed below).

1. In the very unlikely case that Perl is not installed on your system:
   sudo apt-get install perl perl-base perl-modules
2. If the Perl modules XML::LibXML and XML::LibXSLT are not installed:
   sudo apt-get install libxml-libxml-perl
   sudo apt-get install libxml-libxslt-perl
   Likely, you will have to allow the package manager to install a few depended packages.

4.2.2.2 Fedora/RedHad/SuSe specific instructions[3]

In this section the installation of Perl and the required modules on a Fedora/RedHat system are given. It is assumed that you can use su to execute yum, otherwise you have to login as root (skip "su" in the commands listed below).

1. In the very unlikely case that Perl is not installed on your system:
   su -c "yum install perl perl-libs perl-XML-Parser"
2. If the Perl modules XML::LibXML and XML::LibXSLT are not installed:
   su -c "yum install perl-XML-LibXML perl-XML-LibXSLT"
   Likely, you will have to allow the package manager to install a few depended packages.

4.2.2.3 Mac OSX specific instructions[4]

The only missing module on our Mac OSX (v10.6.6), was the XML::LibXSLT module. Using DarwinPorts/MacPorts[5], we installed the package p5-xml-libxslt using sudo:

sudo port install p5-xml-libxslt

4.2.2.4 CPAN, your last resort...

Only when you are an experienced Linux user familiar with CPAN, we advice you to use CPAN. And in case the above instructions do not work and/or are not applicable for your Linux installation. Please install the required Perl modules and go to the GOCE XML Parser usage section.

[2]The installation instructions have been verified on Debian Lenny & Squeeze and Ubuntu 10.04 & 10.10
[3]The installation instructions have been verified only on Fedora 14, please give us feedback on other RPM-based distributions.
[4]Please, let us know if the assumption made in this section are also true for your Mac OS installation.
[5]See also http://p5-xml-libxslt.darwinports.com

4.2.3 Installation Instructions (Windows)

Below the installation instructions GOCE XML Parser are given. Note that administrator rights are required to install the necessary software. Below, it is assumed that you do not have Perl installed on your system (else you can start with step 3).

1. Most Microsoft Windows installations do not have Perl installed, we have used ActiveState Perl from (http://downloads.activestate.com/ActivePerl/releases). The installation was tested with version 5.10.1.1008.
2. The perl bin directory must be added to PATH, or you will have to type every time the full path to the perl executable. The installer should do this for you, however, you may need to re-login in order to have set PATH correctly.
3. Use the Perl Package Manager to install the required Perl modules, see Table 4-1.
   - Add special repository, use PPM Preference [Ctrl+P]: http://cpan.uwinnipeg.ca/PPMPackages/10xx/
   - Add the following packages: XML-LibXML and XML-LibXSLT[6]
4. Check that the Perl modules listed in Table 1 are installed. For this, we suggest to open the "Command Prompt" window and try the following commands (note the whole command should be entered in one line):

```
perl -e "use Getopt::Long; print $Getopt::Long::VERSION"
perl -e "use File::Basename; print $File::Basename::VERSION"
perl -e "use XML::Parser; print $XML::Parser::VERSION"
perl -e "use XML::LibXML; print $XML::LibXML::VERSION"
perl -e "use XML::LibXSLT; print $XML::LibXSLT::VERSION"
perl -e "use MIME::Base64; print $MIME::Base64::VERSION"
```

   If nothing is returned it means that the Perl module is not installed, in that case please install the missing packages using the Perl Package Manager.
5. Create a directory to install the GOCE XML Parser software:

```
mkdir GOCE-XML-Parser
cd GOCE-XML-Parser
```

6. Extract the GOCE XML Parser distribution:

```
unzip <path-to>/hpf_eef_transform_<version>.zip
```

7. Check if everything works by using the following command:

```
perl hpf_eef_transform.pl --help
```

You are ready to use the GOCE XML Parser when these instructions have been successfully completed, see section 4.4 for usage examples.

[6] We had to install XML::LibXML-Common (v0.13), XML::LibXML (v1.65) and XML::LibXSLT (v1.63). Important: XML::LibXSLT (v1.70) is incompatible with XML::LibXML (v1.6x).

4.3 TESTING THE GOCE XML PARSER

A test suite for the GOCE XML Parser is available from http://earth.esa.int/GOCE ==> *GOCE L1b-L2 XML Parser*, currently the test suite only works on Linux and Mac OSX platforms. Perform the following steps to use the test suite:

1. Move to the same directory where the GOCE XML Parser is installed and unpack the test suite:
   ```
   cd GOCE-XML-Parser
   ```
2. Unpack the test suite:
   ```
   tar zxvf xml_parser_test_suite-v0.4.tgz
   ```
3. Run the test suite:
   ```
   ./check_eef_transform.sh
   ```
4. Below the output of a succesfull run of the test suite is given, using our reference system (Debian Squeeze 32-bit, Intel(R) Core2 Duo CPU E6550, 4 GB RAM):

```
Perl: using version 5.010001
Getopt::Long: using version 2.38
File::Basename: using version 2.77
MIME::Base64: using version 3.08
XML::Parser: using version 2.36
XML::LibXML: using version 1.70
XML::LibXSLT: using version 1.70
Good, all required modules are available on this system

Processing productID: EGG_NOM_1b this may take a while...
Elapsed real time 1:42.65 (98%), Memory used (max) 118784 KB

Processing productID: SST_NOM_1b this may take a while...
Elapsed real time 1:32.94 (98%), Memory used (max) 193504 KB

Processing productID: STR_VC2_1b this may take a while...
Elapsed real time 0:30.41 (99%), Memory used (max) 250064 KB

Processing productID: STR_VC3_1b this may take a while...
Elapsed real time 0:52.70 (99%), Memory used (max) 250112 KB

Processing productID: EGG_NOM_2_ this may take a while...
Elapsed real time 6:44.45 (99%), Memory used (max) 6758400 KB

Processing productID: EGG_TRF_2_ this may take a while...
Elapsed real time 2:37.15 (99%), Memory used (max) 2707456 KB

Processing productID: SST_AUX_2_ this may take a while...
Elapsed real time 0:05.99 (98%), Memory used (max) 127520 KB

Processing productID: SST_PSO_2_ this may take a while...
Elapsed real time 18:19.12 (99%), Memory used (max) 6754304 KB

Good, all products have been sucessfully generated
```

4.4 USAGE OF THE GOCE XML PARSER

If all prerequisites from section 4.2 are met, the GOCE XML Parser can be run from the command line as follows (all on one line, the backslash character "\" at the end of the first line is just to indicate that the command continues on the next line; it should not be there if the whole command is entered in one line on the command line):

```
hpf_eef_transform.pl [--help] [--verbose] [--nocleanup] \
[--config <config file>] [--ouput <output dir>] <EEF file(s)>
```

where

--help	show usage and version information and exit (all other options are ignored)
--verbose	show extra information during processing
--nocleanup	do not cleanup temporary splitted files and their index file
--config	specify a different XML configuration file (default: *hpf_eef_transform.cfg*)
--output <output dir>	defines the output directory where the output file(s) will be written (when this option is not used, the output file(s) will be written in the same directory as the input EEF file(s))
<EEF file(s)>	is one or more input files (separated by spaces) in EEF format which need to be transformed (they have to follow the filename conventions described in Section 7)

An input product consists of a header and a data block, either within one file (EEF) or as two seperate files (extension HDR and DBL). The GOCE XML Parser supports only EEF files (1 unique file) for the level 1b products, and only HDR-DBL files (two seperate files) for level 2 products.

The format of the output products are listed in Table 4-3 and described in Section 5.2 and 6.2 . The name of the output header is equal to the name of the input file, except that the extension is EHD. The name of the ouput data files is unchanged, except for the file type (see Section 7) is replaced by the product ID' s listed in Table 4-3 and the the extension is replaced by EDF.

Table 4-3: List of data products (input/output) and their formats

Product ID		Product Description	Output Format
In	**Out**		
EGG_NOM_1b	EGG_CCD_DS	Internal calibrated common and differential accelerations	See section 5.2.3.1
	EGG_GGT_DS	Gravity gradient tensor (GRF system)	See section 5.2.3.2
	EGG_IAQ_DS	Gradiometer inertial attitude quaternions	See section 5.2.3.3
SST_NOM_1b	SST_COV_DS	Covariance matrix	See section 5.2.4.1
	SST_PVT_DS	Clock error and position vector	See section 5.2.4.2
STR_VC2_1b / STR_VC3_1b	STR_VC2_DS / STR_VC3_DS	Star tracker quaternions (level 1b)	See section 5.2.4.3
EGG_NOM_2	---	L2 gravity gradients in GRF with corrections	GG_time (6.2.3.1)
EGG_TRF_2	---	L2 gravity gradients in LNOF with corrections	GG_spatial (6.2.3.2)
EGM_GOC_2	EGM_GCF_2	Sperical harmonic series	ICGEM (6.2.7)
	EGM_GEO_2	Grid with geoid height	Grid (6.2.8)
	EGM_GAN_2	Grid with gravity anomalies	Grid (6.2.8)
	EGM_GVE_2	Grid with east-west vertical deflections	Grid (6.2.8)
	EGM_GVN_2	Grid with north-south vertical deflections	Grid (6.2.8)
	EGM_GER_2	Grid with geoid height errors	Grid (6.2.8)
	EGM_GRP_2	Quality report	PDF
SST_AUX_2	---	SH coefficients for non-tidal temporal corrections	ICGEM (6.2.7)
SST_PSO_2	SST_PRD_2	Reduced dynamic orbit solution	SP3c (6.2.4)
	SST_PKI_2	Kinematic orbit solution	SP3c (6.2.4)
	SST_PCV_2	Variance covariance matrix (kinematic)	Covariance (6.2.5)
	SST_PRM_2	Rotation matrix EFRF-IRF (quaternions)	Rotation (6.2.6)
	SST_PRP_2	Quality report	PDF

5 FORMAT DESCRIPTIONS - L1B PRODUCTS

5.1 L1B PRODUCTS AND THEIR FORMATS

Table 4-3 lists the level 1b products which can be transformed using the GOCE XML Parser, including a short description and their output format. A more detailed description of the products is included in the GOCE Level 2 Product Data Handbook [RD-35]

5.2 L1B OUTPUT FORMATS

5.2.1 General layout

The general layout of the output products consists of a header file and one (or more) data file(s). The layout of the header file will be the same for all level 1b products[7]. The data files have a specific layout for each product, as described in this paragraph. Unless otherwise specified the output field separator is one space and the output record separator is one new line character.

5.2.2 Header format

Header Records

The header format is the same for all Level 2 files. The header information consists of:

- One Product record, that relates to the whole product
- Several Data Set Descriptors (DSD's) that relate to the separate files that the product consists of, and to input files used to generate the product.

The first line contains the Product header; the following lines are a variable number of DSD's. Between all header fields a "|" character is added to separate the fields. All fields shall occupy the exact number of positions as indicated in the C format specifier, and have the format as given.

The exact format of the header records are given in Table 5-1 -- the product record – and Table 5-2 – the data-set descriptor records. The data-set descriptor records describe the data sets contained in the product and the input data sets that were used to generate this product.

[7]Identical to the level 2 header files

Table 5-1: Product record format (first header record)

Fieldname	Description	Value if not applicable	# Bytes	C format specifier[8]
fileName	Product file name without the extension		62	%-62s
fileDescription	This field shall contain a description of the product. Each product type has its own description.		100	%-100s
Mission	This field shall always be GOCE		4	%-4s
fileClass	This field is part of the File Name and indicates the type of processing: OPER: QL products TEST: Test CONS: final products		4	%-4s
fileType	This field is part of the filename. E.g. EGG_NOM_2I		10	%-10s
validityStart	UTC sensing start time (same time as in the file name). This time is not re-computed but propagated from input files	UTC=00…	23	%-23s: UTC=yyyy-mm-ddThh:mm:ss
validityStop	UTC sensing stop time (same time as in the file name). This time is not re-computed but propagated from input files	UTC=99…	23	%-23s: UTC=yyyy-mm-ddThh:mm:ss
fileVersion	This field is the version number of the generation of the product. It shall start from 0001 and be increased by one anytime the same product shall be regenerated		4	%4d
System	Name of the Ground Segment component creating the product. It shall always be set as: HPF		3	%-3s
Creator	Name of the Ground Segment tool creating the product. E.g.: SPFnnnn		12	%-12s
creatorVersion	This field gives the version of the creator tool for example as: vv.rr		5	%-5s (only valid alpha-numeric characters and minus and dot)
creationDate	This is the local system time of creation of the product (CET)		23	%-23s: CET=yyyy-mm-ddThh:mm:ss
refDoc	Reference Document describing the product		23	%-23s
numDsd	Number of Data Set Descriptor records		11	%11d
Total (including separating characters, "|")			320	

[8]Decimal and float formats may optionally have a forced leading "+" and / or leading zeroes. For example where it says %4d, one may also use format %+4d, %+04d or %04d, and where it says %12.6f, one may also use format %+12.6f, %+012.6f or %012.6f.

Table 5-2: Data-set Descriptor record format (second and following header records)

Fieldname	Description	Value if not applicable	# Bytes	C-Format specifier
dsSetName	Name describing the Data Set		28	%-28s
dsSetType	Type of data set. It can be: O: data set that's part of the product (output file) I: input file S: supporting internal file		1	%-s
fileName	Name of the file that was created (O) or used for input (I/S). If the filename of a supporting internal file can refer to various versions, in this field the information shall be added to unambiguously identify the right version.		62	%-62s
numEpochs	Number of epochs in the Data Set	0	11	%11d
startGpsTime	GPS time of the first record in this data set	0000000000.000000000	20	%-20s: ssssssssss.nnnnnnnnn
stopGpsTime	GPS time of the last record in this data set	9999999999.999999999	20	%-20s: ssssssssss.nnnnnnnnn
Phase	Phase Code (A, B, …)	X	1	%-s
absOrbitStart	Absolute orbit number at data set start time	0	6	%6d
absOrbitStop	Absolute orbit number at data set stop time	0	6	%6d
Total (including separating characters, "|")			163	

5.2.3 EGG_NOM_1b output products

5.2.3.1 EGG_CCD_DS sub-product format

Each data record has the following format, where all fields are separated by a space:

Fieldname	Description	Units	# Bytes	Format
ttGps	GPS time	Seconds	20	ssssssssss.nnnnnnnnn
Pair14 CalComAccX	Common mode accelerations for each accelerometer pair ans each degree of freedom	m/s^2	15	%+15.8e
Pair14 CalComAccY		m/s^2	15	%+15.8e
Pair14 CalComAccZ		m/s^2	15	%+15.8e
Pair25 CalComAccX		m/s^2	15	%+15.8e
Pair25 CalComAccY		m/s^2	15	%+15.8e
Pair25 CalComAccZ		m/s^2	15	%+15.8e
Pair36 CalComAccX		m/s^2	15	%+15.8e
Pair36 CalComAccY		m/s^2	15	%+15.8e
Pair36 CalComAccZ		m/s^2	15	%+15.8e
Pair14 CalDifAccX	Differential mode	m/s^2	15	%+15.8e

Pair14_CalDifAccY	acceleration for each accelerometer pair and each degree of freedom	m/s^2	15	%+15.8e
Pair14_CalDifAccZ		m/s^2	15	%+15.8e
Pair25_CalDifAccX		m/s^2	15	%+15.8e
Pair25_CalDifAccY		m/s^2	15	%+15.8e
Pair25_CalDifAccZ		m/s^2	15	%+15.8e
Pair36_CalDifAccX		m/s^2	15	%+15.8e
Pair36_CalDifAccY		m/s^2	15	%+15.8e
Pair36_CalDifAccZ		m/s^2	15	%+15.8e
Total (including sep. spaces)			308	

5.2.3.2 EGG_GGT_DS sub-product format

Each data record has the following format, where all fields are separated by a space.

Fieldname	Description	Units	# Bytes	Format
ttGps	GPS time	Seconds	20	sssssssss.nnnnnnnnn
U_G_xx	Gravity gradient tensor	$1/s^2$	15	%+15.8e
U_G_yy		$1/s^2$	15	%+15.8e
U_G_zz		$1/s^2$	15	%+15.8e
U_G_xy		$1/s^2$	15	%+15.8e
U_G_xz		$1/s^2$	15	%+15.8e
U_G_yz		$1/s^2$	15	%+15.8e
qual_Flag_Ctr	flag (control voltages)		1	%d
qual_Flag_Dfc	flag (DFAGS)		1	%d
qual_Flag_Pv	flag (polarization voltages)		1	%d
qual_Flag_Dv	flag (detection voltages)		1	%d
qual_Flag_Nga	flag (gradiometer angular acceleration)		1	%d
qual_Flag_Na	flag (nominal angular acceleration)		1	%d
qual_Flag_DfcNcm	flag (differential angular acceleration)		1	%d
qual_Flag_AccNcm	flag (common angular acceleration)		1	%d
qual_Flag_Ggt	flag (trace GGT)		1	%d
Total (including sep. spaces)			134	

5.2.3.3 EGG_IAQ_DS sub-product format

Each data record has the following format, where all fields are separated by a space.

Fieldname	Description	Units	# Bytes	Format
ttGps	GPS time	Seconds	20	Sssssssss.nnnnnnnnn
q1	Gradiometer inertial attitude quaternions		15	%+15.8e
q2			15	%+15.8e
q3			15	%+15.8e
q4			15	%+15.8e

Total (including sep. spaces)	84	

5.2.4 SST_NOM_1b output products

5.2.4.1 SST_COV_DS sub-product format

Each data record has the following format, where all fields are separated by a space.

Fieldname	Description	Units	# Bytes	Format
ttGps	GPS time	Seconds	20	sssssssss.nnnnnnnnn
Pt_Row1P1	Elements of the covariance position/time matrix		17	%+017.6f
Pt_Row1P2			17	%+017.6f
Pt_Row1P3			17	%+017.6f
Pt_Row1P4			17	%+017.6f
Pt_Row2P1			17	%+017.6f
Pt_Row2P2			17	%+017.6f
Pt_Row2P3			17	%+017.6f
Pt_Row2P4			17	%+017.6f
Pt_Row3P1			17	%+017.6f
Pt_Row3P2			17	%+017.6f
Pt_Row3P3			17	%+017.6f
Pt_Row3P4			17	%+017.6f
Pt_Row4P1			17	%+017.6f
Pt_Row4P2			17	%+017.6f
Pt_Row4P3			17	%+017.6f
Pt_Row4P4			17	%+017.6f
V_Row1V1	Elements of the covariance velocity matrix		17	%+017.6f
V_Row1V2			17	%+017.6f
V_Row1V3			17	%+017.6f
V_Row2V1			17	%+017.6f
V_Row2V2			17	%+017.6f
V_Row2V3			17	%+017.6f
V_Row3V1			17	%+017.6f
V_Row3V2			17	%+017.6f
V_Row3V3			17	%+017.6f
Total (including sep. spaces)			470	

5.2.4.2 SST_PVT_DS sub-product format

Each data record has the following format, where all fields are separated by a space.

Fieldname	Description	Units	# Bytes	Format
ttGps	GPS time	Seconds	20	sssssssss.nnnnnnnnn
posX	Position of GOCE, output of the least-square adjustment	m	17	%+017.6f
posY		m	17	%+017.6f
posZ		m	17	%+017.6f
clockError	Receiver clock error	s	15	%+15.12lf

velX	Velocity of GOCE, output of the least-square adjustment	m/s	17	%+017.6f
velY		m/s	17	%+017.6f
velZ		m/s	17	%+017.6f
Total (including sep. spaces)			144	

5.2.4.3 STR_VC2_DS and STR_VC3_DS product format

Each data record has the following format, where all fields are separated by a space.

Fieldname	Description	Units	# Bytes	Format
ttGps	GPS time	Seconds	20	sssssssss.nnnnnnnnn
str_Attitude_Q1	Star Tracker attitude quaternions		15	%+15.8e
str_Attitude_Q2			15	%+15.8e
str_Attitude_Q3			15	%+15.8e
str_Attitude_Q4			15	%+15.8e
stId	Star tracker ID		1	%d
cId	Camera ID		1	%c
valFlag	Validity flag (attitude)		1	%d
locTime	Flag (time)		1	%d
bboFlag	Flag (Big Bright Objects)		1	%d
trsFlag	Flag (time reference signal)		1	%d
tempOutRangeFlag	Flag (temp-out-of-range)		1	%d
ascTcFlag	Flag (ASC time TC)		1	%d
orbCorFlag	Flag (orbit correction)		1	%d
seqFlag	Flag (fine tuning attitude)		1	%d
estConf	Flag (estimate confidence)		3	%3d
nrOfLocks	Number of locks		3	%3d
nrOfStars	Number of stars in image		3	%3d
Total (including sep. spaces)			116	

6 FORMAT DESCRIPTIONS – L2 PRODUCTS

6.1 L2 PRODUCTS AND THEIR FORMATS

Table 4-3 shows the final level 2 products which can be transformed using the GOCE XML Parser, including a short description and their output format. A more detailed description is included in the GOCE Level 2 Product Data Handbook [RD-35]

6.2 L2 OUTPUT FORMATS

6.2.1 General layout

The general layout of the output products consists of a header file and one (or more) data file(s). The layout of the header file will be the same for all level 2 products. The data files have a specific layout for each product, as described in this paragraph. Unless otherwise specified the output field separator is one space and the output record separator is one new line character.

6.2.2 Header format

See section 5.2.2 , for the header format description.

6.2.3 GG format

There are two GG formats. One uses time as coordinate, the other uses time, latitude, longitude and height.

6.2.3.1 Time GG format

The **time GG format** contains:

- Product header
- Time, GG(6), sigma (6), flags(6), tidal corrections (4x6), non-tidal corrections (6), calibration corrections (6)

The product header consists of (all fields are separated by "|"):

Fieldname	Description	# Bytes	Fortran format
PRODUCT_TYPE	"quick_look" or "final"	10	A10
L1_INPUT	"fast", "consolidated" or "recomputed"	12	A12
L2_INPUT	"quick_look" or "precise"	10	A10
REFERENCE_SYSTEM	"GRF"	4	A4
TIDE_SYSTEM	"zero_tide", "tide_free" or "unknown"	9	A9
GRAVITY_MODEL	Reference gravity model used (e.g. GRACE model)	64	A64
ERRORS	"calibrated" or "formal"	10	A10

The FORTRAN format specifier for WRITE of the header could be:
FORMAT(A10,'|',A12,'|',A10,'|',A4,'|',A9,'|',A64,'|',A10)

Data records (all fields are separated by one space):

Fieldname	Description	Units	# Bytes	Fortran format
ttGps	GPS time	Seconds	20	F20.9
Vxx	Gravity gradient	$1/s^2$	15	SPES15.8
Vyy		$1/s^2$	15	SPES15.8
Vzz		$1/s^2$	15	SPES15.8
Vxy		$1/s^2$	15	SPES15.8
Vxz		$1/s^2$	15	SPES15.8
Vyz		$1/s^2$	15	SPES15.8
sigVxx	Sigmas	$1/s^2$	15	SPES15.8
sigVyy		$1/s^2$	15	SPES15.8
sigVzz		$1/s^2$	15	SPES15.8
sigVxy		$1/s^2$	15	SPES15.8
sigVxz		$1/s^2$	15	SPES15.8
sigVyz		$1/s^2$	15	SPES15.8
flVxx	Flags		1	I1
flVyy			1	I1
flVzz			1	I1
flVxy			1	I1
flVxz			1	I1
flVyz			1	I1
tidVxx1	Tidal correction Direct Tides (3^{rd} bodies)	$1/s^2$	15	SPES15.8
tidVyy1		$1/s^2$	15	SPES15.8
tidVzz1		$1/s^2$	15	SPES15.8
tidVxy1		$1/s^2$	15	SPES15.8
tidVxz1		$1/s^2$	15	SPES15.8
tidVyz1		$1/s^2$	15	SPES15.8
tidVxx2	Tidal correction Solid Earth	$1/s^2$	15	SPES15.8
tidVyy2		$1/s^2$	15	SPES15.8
tidVzz2		$1/s^2$	15	SPES15.8
tidVxy2		$1/s^2$	15	SPES15.8
tidVxz2		$1/s^2$	15	SPES15.8
tidVyz2		$1/s^2$	15	SPES15.8
tidVxx3	Tidal correction Ocean Tides	$1/s^2$	15	SPES15.8
tidVyy3		$1/s^2$	15	SPES15.8
tidVzz3		$1/s^2$	15	SPES15.8
tidVxy3		$1/s^2$	15	SPES15.8
tidVxz3		$1/s^2$	15	SPES15.8
tidVyz3		$1/s^2$	15	SPES15.8
tidVxx4	Tidal correction Pole Tides	$1/s^2$	15	SPES15.8
tidVyy4		$1/s^2$	15	SPES15.8
tidVzz4		$1/s^2$	15	SPES15.8
tidVxy4		$1/s^2$	15	SPES15.8
tidVxz4		$1/s^2$	15	SPES15.8
tidVyz4		$1/s^2$	15	SPES15.8
nontidVxx	Non-tidal temporal correction	$1/s^2$	15	SPES15.8
nontidVyy		$1/s^2$	15	SPES15.8
nontidVzz		$1/s^2$	15	SPES15.8
nontidVxy		$1/s^2$	15	SPES15.8

nontidVxz		$1/s^2$	15	SPES15.8
nontidVyz		$1/s^2$	15	SPES15.8
calVxx	Calibration correction	$1/s^2$	15	SPES15.8
calVyy		$1/s^2$	15	SPES15.8
calVzz		$1/s^2$	15	SPES15.8
calVxy		$1/s^2$	15	SPES15.8
calVxz		$1/s^2$	15	SPES15.8
calVyz		$1/s^2$	15	SPES15.8
q1	L1b inertial attitude quaternions (=EGG_IAQ_2C)		15	SPES15.8
q2			15	SPES15.8
q3			15	SPES15.8
q4			15	SPES15.8
Total (including sep. spaces)			864	

The FORTRAN format specifier for READ/WRITE of the data records could be:
FORMAT(F20.9,12(1X,ES15.8),6(1X,I1),40(1X,ES15.8))

The flags in the data records have the following meaning:

0. Original GG
1. As 0. with temporal corrections added
2. As 1, externally calibrated GG
3. Outlier suspected, fill-in provided
4. Outlier suspected, no fill-in, value is calibrated original value
5. Data gap, fill-in provided
6. Data gap, no fill-in

The temporal (tidal and non-tidal) and calibration corrections are the values subtracted from the level 1b gradients to produce these level 2 gradients.

6.2.3.2 Spatial GG format

The **spatial GG format** contains:

- Product header
- Time, phi, lambda, Radius_from_Geocenter, GG(6), sigma (6), flags(6)

The product header consists of (all fields are separated by "|"):

Fieldname	Description	# Bytes	Fortran format
PRODUCT_TYPE	"final"	10	A10
L1_INPUT	"consolidated" or "recomputed"	12	A12
L2_INPUT	"precise"	10	A10
REFERENCE_SYSTEM	"TRF"	4	A4
TIDE_SYSTEM	"zero_tide", "tide_free" or "unknown"	9	A9
GRAVITY_MODEL	Reference gravity model used (e.g. GRACE model)	64	A64
ERRORS	"calibrated" or "formal"	10	A10

The FORTRAN format specifier for WRITE of the header could be:
FORMAT(A10,'|',A12,'|',A10,'|',A4,'|',A9,'|',A64,'|',A10)

Data records (all fields are separated by one space):

Fieldname	Units	# Bytes	Fortran format
ttGps	Seconds	20	F20.9
phi	Deg	15	F15.9
lambda	Deg	15	F15.9
Radius_from_Geocenter	M	13	F13.4
Vxx	$1/s^2$	15	ES15.8
Vyy	$1/s^2$	15	ES15.8
Vzz	$1/s^2$	15	ES15.8
Vxy	$1/s^2$	15	ES15.8
Vxz	$1/s^2$	15	ES15.8
Vyz	$1/s^2$	15	ES15.8
sigVxx	$1/s^2$	15	ES15.8
sigVyy	$1/s^2$	15	ES15.8
sigVzz	$1/s^2$	15	ES15.8
sigVxy	$1/s^2$	15	ES15.8
sigVxz	$1/s^2$	15	ES15.8
sigVyz	$1/s^2$	15	ES15.8
flVxx		1	I1
flVyy		1	I1
flVzz		1	I1
flVxy		1	I1
flVxz		1	I1
flVyz		1	I1
Total (including sep. spaces)		270	

The FORTRAN format specifier for READ/WRITE of the data records could be:
FORMAT(F20.9,2(1X,ES15.9),1X,F13.4,12(1X,ES15.8) ,6(1X,I1))

The flags in the data records have the following meaning:

0. Original GG
1. As 0. with temporal corrections added
2. As 1, externally calibrated GG
3. As 2 but outlier suspected, fill-in provided
4. As 2 but outlier suspected, no fill-in
5. Data gap, fill-in provided
6. Data gap, no fill-in

6.2.4 SP3c format

The SP3c format is a standard format used for satellite orbits and clock corrections. A description of the SP3c format is available via internet at: ftp://igscb.jpl.nasa.gov/igscb/data/format/sp3c.txt

6.2.5 Covariance format

For the variance-covariance matrix the following GOCE file format has been selected:

> Each file begins with a header, followed by data records and ends with an end-of-file indicator. The header contains several lines, each header line begins with a header line indicator and the header ends with an end-of-header indicator.

The header format is as follows:

Header line indicator (a33)	content	format
# VARIANCE-COVARIANCE MATRIX:	filename	a62
# Corresponding kinematic orbit:	filename	a30
# Program that created the file:	program name	a30
# Date of creation:	yyyy-mm-dd hh:mm:ss	i4-i2-i2 i2:i2:i2
# First epoch:	yyyy-mm-dd hh:mm:ss GPS	i4-i2-i2 i2:i2:i2 a3
# Time step size (seconds):	value	i6
# RMS of unit weight:	value	f10.4
# Parameters:	X, Y, Z and optionally clock	a30
# End of header		

The record format is as follows:

Field#	content	format
1	index, index, value	i7,i7,es14.7

The file ends with the following end-of-file indicator:

EOF

The two indices included in the data block describe the matrix element of the corresponding value (row and column). They are both constructed in the following way:

index = 4 * (iepo-1) + icomp

where 'iepo' is the epoch index that allows to compute the epoch of the matrix element from the first epoch 'Tfirst' and time step size 'delta' specified in the file header by (in proper units)

epoch = Tfirst + (iepo-1) * delta

and 'icomp' is the component index:

icomp = 1: X-component
= 2: Y-component
= 3: Z-component
= 4: receiver time

Starting from 'index' the two indices 'iepo' and 'icomp' may be computed in the following way:

iepo = 1 + INT ((index-1)/4) for index > 0
= 1 – INT ((4-index)/4) for index ≤ 0

icomp = index – 4 * INT ((index-1)/4) for index > 0
= index + 4 * INT ((4-index)/4) for index ≤ 0

Negative indices refer to epochs that are earlier than the reference epoch. Epochs have to be interpreted as 'nominal epochs', i.e., measurement epochs rounded to the nearest second. The corresponding SSTI measurement epochs are given in the kinematic orbit file. The COV file may list only a selection of matrix elements. Typically it provides a band-limited submatrix of the full covariance matrix. Covariance information with respect to receiver time may not be included. An example variance-covariance matrix file:

```
# VARIANCE-COVARIANCE MATRIX:   filename
# Corresponding kinematic orbit:   filename
# Program that created the file:   BERNESE/GPSEST
# Date of creation:   2004-08-05 16:09:00
# First epoch:   2004-08-05 00:00:00
# Time step size (seconds):   1
# RMS of unit weight:   0.0021
# Parameters :   X, Y, Z
# End of header
 1    1   1.3973981D+02
 2    1 -1.2144511D+03
…
# EOF
```

6.2.6 Rotation matrix format

The ECF to ECI rotation information will be given with 4 quaternions instead of with 9 rotation matrix elements.

The quaternions can be converted to a rotation matrix R that relates the position $\underline{x}_{ecf} = (x_{ecf}; y_{ecf}; z_{ecf})$ in an Earth-Centered, Earth-Fixed reference (ECF) frame to the position $\underline{x}_{j2000} = (x_{j2000}; y_{j2000}; z_{j2000})$ in the J2000 reference frame:

$$\underline{x}_{j2000} = R\underline{x}_{ecf}$$

The elements of the rotation matrix R are computed as follows from the quaternions $\underline{q}=(q_1; q_2; q_3; q_4)$:

$$R(1,1) = 1 - 2q_2^2 - 2q_3^2$$
$$R(1,2) = 2d_0\,(q_1q_2 + q_3q_4)$$
$$R(1,3) = 2d_0\,(q_1q_3 + q_2q_4)$$
$$R(2,1) = 2d_0\,(q_1q_2 - q_3q_4)$$
$$R(2,2) = 1 - 2q_1^2 - 2q_3^2$$
$$R(2,3) = 2d_0\,(q_2q_3 + q_1q_4)$$
$$R(3,1) = 2d_0\,(q_1q_3 - q_2q_4)$$
$$R(3,2) = 2d_0\,(q_2q_3 - q_1q_4)$$
$$R(3,3) = 1 - 2q_1^2 - 2q_2^2$$

The following relations can be used:

$$x_{j2000} = R(1,1)\, x_{ecf} + R(1,2)\, y_{ecf} + R(1,3)\, z_{ecf}$$
$$y_{j2000} = R(2,1)\, x_{ecf} + R(2,2)\, y_{ecf} + R(2,3)\, z_{ecf}$$
$$z_{j2000} = R(3,1)\, x_{ecf} + R(3,2)\, y_{ecf} + R(3,3)\, z_{ecf}$$

The following GOCE file format has been selected:

Each file begins with a header, followed by data records and ends with an end-of-file indicator. The header contains several lines, each line begins with a header line indicator and the header ends with an end-of-header indicator. Quaternions always refer to the epoch annotated in the file. Interpolation is required in order to get the transformation information for the (SSTI or SGG) measurement epochs.

The header format is as follows:

Header line indicator (a33)	content	format
# TRANSFORMATION:	filename	a62
# Program that created the file	program name	a30
# Date of creation:	yyyy-mm-dd hh:mm:ss	i4-i2-i2 i2:i2:i2
# Reference epoch:	yyyy-mm-dd hh:mm:ss GPS	i4-i2-i2 i2:i2:i2 a3
# First epoch:	yyyy-mm-dd hh:mm:ss GPS	i4-i2-i2 i2:i2:i2 a3
# Transformation direction:	Earth-fixed to inertial	a30
# Pole file:	name	a30
# Nutation model:	name	a30
# Nutation offsets:	name (if applied)	a30
# Subdaily model:	name (if applied)	a30
# End of header		

Optional comment lines can be included in the header as follows:

# Comment	content

The record format is as follows:

Field#	content	format
1	time in integer seconds since reference epoch	i9
2	quaternions (q1, q2, q3, q4=scalar)	4(x,f19.16)

The file ends with the following end-of-file indicator:

EOF

An example rotation matrix file:

```
# TRANSFORMATION:            filename
# Program that created the file  BERNESE/GPSEST
# Date of creation:          2004-08-05 16:09:00
# Reference epoch:           2004-08-05 00:00:00 GPS
# First epoch:               2004-08-05 00:13:20 GPS
# Transformation direction:  Earth-fixed to inertial
# Pole file:                 C04_2004
# Nutation model:            IAU2000
# Nutation offsets:          not applied
# Subdaily model:            IERS2000
# End of header
    800 -0.1992644842049184  0.1925081246128347  0.7185713145787377  0.0000082194227265
    805 -0.1992644842078932  0.1925081245456331  0.7189889342320022  0.0000022726543212
...
# EOF
```

6.2.7 ICGEM format

The ICGEM format accommodates

- Earth Gravity Field models in terms of spherical harmonic coefficients and
- Ocean and Atmosphere Tides.

Each individual data file consists of two sections:

1. The **header** containing parameters which do not depend on degree l and order m. The end of the header is marked by the keyword "end_of_head" (as a separator between header and data section)
2. The **data section** with the list of degree- and order-dependent parameters

The records have the following basic structure:

- The basic structure of the record lines is unformatted, i.e. separators are blanks and/or tabs
- Each record consists of one keyword followed by one or more parameters (numbers or characters), which are separated by one or an arbitrary number of blanks and/or tabs,
- The number of parameters depends on the corresponding keyword as defined below,
- There are mandatory and optional records,
- All lines led by non-defined keywords are comments,
- In any line, additional characters and/or numbers beyond the last parameter are allowed as comments.
- Leading and trailing blanks are ignored.

Specific feature for the GOCE project:
For data files created within the **GOCE** project, the header keywords and the header parameters should have a length of 30 and 70 characters respectively including blanks.

Earth Gravity Field Models

Header section:

keyword (mandatory records)	number of parameters	meaning of parameters
product_type	1	"gravity_field"
modelname	1	name of the model
earth_gravity_constant	1	gravitational constant times mass of the earth [m^3/s^2]
radius	1	reference radius of the spherical harmonic development [m]
max_degree	1	maximum degree of the spherical harmonic development
errors	1	either "no", "calibrated" or "formal" or "calibrated_and_formal" errors included
norm	1	either "fully_normalized" or "unnormalized"
tide_system	1	either "zero_tide", "tide_free" or "unknown"
end_of_head	0	Position of keyword defines the end of the header

Data section:

keyword (optional records)	number of parameters	meaning of the parameters
gfc	6(*)	degree, order, Clm, Slm, sigmaC sigmaS
gfc	8(**)	degree, order, Clm, Slm, sigmaC_cal, sigmaS_cal, sigmaC_formal, sigmaS_formal
gfc	4(***)	degree, order, Clm, Slm
gfct	7(*)	degree, order, Clm, Slm, sigmaC, sigmaS, time (yyyymmdd)
gfct	9(**)	degree, order, Clm, Slm, sigmaC_cal, sigmaS_cal, sigmaC_formal, sigmaS_formal, time (yyyymmdd)
gfct	5(***)	degree, order, Clm, Slm, time (yyyymmdd)
dot	6(*)	degree, order, dClm/dt, dSlm/dt, sigmaCdot, sigmaSdot
dot	8(**)	degree, order, dClm/dt, dSlm/dt, sigmaCdot_cal, sigmaSdot_cal, sigmaCdot_formal, sigmaSdot_formal,
dot	4(***)	degree, order, dClm/dt, dSlm/dt

(*) = in the case of errors = "calibrated" or "formal" in the header
(**) = in the case of errors = "calibrated_and_formal" in the header
(***) = in the case of errors = "no" in the header

Example:

```
product_type                gravity_field
modelname                   example-model
earth_gravity_constant      0.39860044150000D+15
```

```
radius                          6378136.3000
max_degree                      99
errors                          formal
norm                            fully_normalized
tide_system                     tide_free
end_of_head
key     L     M         C                   S           sigma C   sigma S    time
end_of_head ===================================================================
gfc     0     0 0.999999999874D+00 0.000000000000D+00 0.3162D-10 0.0000D+00
gfc     1     0 0.000000000000D+00 0.000000000000D+00 0.0000D+00 0.0000D+00
gfct    2     0 -.484165115509D-03 0.000000000000D+00 0.4096D-11 0.0000D+00 19970101
dot     2     0 0.136375909757D-10 0.000000000000D+00 0.2878D-12 0.0000D+00
gfct    3     0 0.958574917402D-06 0.000000000000D+00 0.2595D-10 0.0000D+00 19970101
dot     3     0 0.281757002657D-11 0.000000000000D+00 0.9929D-13 0.0000D+00
gfct    4     0 0.539787841808D-06 0.000000000000D+00 0.1529D-10 0.0000D+00 19970101
dot     4     0 0.122491499575D-10 0.000000000000D+00 0.2598D-12 0.0000D+00
gfct    5     0 0.656243329790D-07 0.000000000000D+00 0.4442D-09 0.0000D+00 20000101
gfct    5     0 0.681084383151D-07 0.000000000000D+00 0.3950D-09 0.0000D+00 20000131
gfct    5     0 0.680886351414D-07 0.000000000000D+00 0.3774D-09 0.0000D+00 20000301
gfct    5     0 0.674522327854D-07 0.000000000000D+00 0.3201D-09 0.0000D+00 20000331
gfct    6     0 -.151387863517D-06 0.000000000000D+00 0.4826D-09 0.0000D+00 20000101
gfct    6     0 -.151047338230D-06 0.000000000000D+00 0.3676D-09 0.0000D+00 20000131
gfct    6     0 -.150062466972D-06 0.000000000000D+00 0.5020D-09 0.0000D+00 20000301
gfct    6     0 -.150450345396D-06 0.000000000000D+00 0.2850D-09 0.0000D+00 20000331
gfct    7     0 0.932891368668D-07 0.000000000000D+00 0.4761D-09 0.0000D+00 20000101
gfct    7     0 0.909622149314D-07 0.000000000000D+00 0.4059D-09 0.0000D+00 20000131
gfct    7     0 0.913272281584D-07 0.000000000000D+00 0.4183D-09 0.0000D+00 20000301
.
.
.
.
gfc    97    95 0.189944302212D-15 -.329637980180D-15 0.9821D-10 0.9821D-10
gfc    98    95 0.380508739299D-15 0.704946172153D-15 0.9621D-10 0.9621D-10
gfc    99    95 0.888165168730D-15 -.115549525123D-14 0.9428D-10 0.9428D-10
```

Ocean/Atmosphere Tides

Header section:

keyword (mandatory records)	number of parameters	meaning of parameters
product_type	1	"ocean_tides"
modelname	1	name of the model
earth_gravity_constant	1	gravitational constant times mass of the earth [m^3/s^2]
radius	1	reference radius of the spherical harmonic development [m]
max_degree	1	maximum degree of the spherical harmonic development
errors	1	either "no", "calibrated" or "formal" errors given

keyword (optional records)	number of parameters	meaning of parameters
norm	1	either "fully_normalized" (=default) or "unnormalized"
water_density	1	density of sea water [kg/m3] (default = 1025.0)

keyword (mandatory records)	number of parameters	meaning
end_of_head	0	Position of keyword defines the end of the header

Data section:

keyword (optional records)	number of parameters	meaning of parameters
lovnr	2	degree, load love number
ocs	8(*)	degree, order, "pro" or "retro", Doodson number, Clm-coefficient, Slm-coefficient, sigmaC, sigmaS
ocs	6(**)	degree, order, "pro" or "retro", Doodson number, Clm-coefficient, Slm-coefficient
acs	8(*) / 6(**)	(dto. for atmosphere tide coefficients)
ccs	8(*) / 6(**)	(dto. for combined ocean/atmosphere tide coefficients)
oap	8(*)	degree, order, "pro" or "retro", Doodson number, Alm (amplitude), Plm (phase), sigmaA, sigmaP
oap	6(**)	degree, order, "pro" or "retro", Doodson number, Alm (amplitude), Plm (phase)
aap	8(*) / 6(**)	(dto. for atmosphere tide amplitude/phase)
cap	8(*) / 6(**)	(dto. for combined ocean/atmosphere tide amplitude/phase)

(*) = in the case of errors = "calibrated" or "formal" in the header
(**) = in the case of errors = "no" in the header

Example:

```
product_type                ocean_tides
modelname                   EXAMPLE-MODEL
earth_gravity_constant      0.3986030000E+15
radius                      0.6378160000E+07
water_density               1025.0
max_degree                  6
errors                      formal
norm                        fully_normalized

end_of_head
=======================================
lovnr 0    0.0000
lovnr 1   -0.3075
lovnr 2   -0.1950
lovnr 3   -0.1320
lovnr 4   -0.1032
lovnr 5   -0.0892
lovnr 6   -0.0820
ocs   2   1 pro   +135.655  -.699279379E+00  0.616931102E+00 0.1048E+00 0.1035E+00
```

```
oap   2   1 pro   +135.655   .933000000E+00  0.311400000E+03 0.0210E+00 0.1200E+01
.
.
.
.
.
ocs   6   2 pro   +275.555  -.102235651E+00  0.489852820E-02 0.3575E-02 0.3308E-02
oap   6   2 pro   +275.5552  .102240000E+00  0.272700000E+03 0.1000E-03 0.4000E+00
```

6.2.8 Grid format

The grid format is cut into two parts: The Header Section and the Data Section. Each keyword and the corresponding value are written in one line.

Header Section

Keyword [30 characters fixed length, filled with blanks]	**Meaning of parameters** [<70 characters]
data_set_name	Name of the data set.
northern_latitude	Northern border of grid in geographical coordinates, given in sdd.mmss (e.g. +81.30 means 81 degree 30 minutes on northern hemisphere).
southern_latitude	Southern border of grid in geographical coordinates, given in sdd.mmss (e.g. -81.30 means 81 degree 30 minutes on southern hemisphere).
western_logitude	Western border of grid in geographical coordinates, given in sddd.mmss (e.g. -030.30 means 30 degree 30 minutes west of Greenwich meridian).
eastern_longitude	Eastern border of grid in geographical coordinates, given in sddd.mmss (e.g. +120.30 means 120 degree 30 minutes east of Greenwich meridian).
latitude_cell_size	Grid cell size in latitude direction, given in dd.mmss (e.g. 1.30 means 2 grid lines are separated by 1 an a half degree in latitude direction).
longitude_cell_size	Grid cell size in longitude direction, given in dd.mmss (e.g. 3.00 means 2 grid lines are separated by 3 degree in longitude direction).
number_of_cells_latitude_dir	Number of grid cells in latitude direction within the grid.
number_of_cells_longitude_dir	Number of grid cells in longitude direction within the grid.
mean_(0)_or_point_(1)_values	0 = mean-values, the most north west corner of one grid identifies this grid. 1 = point-values
geocentric(0)_geodetic(1)_lat	0 = geocentric latitudes 1 = geodetic latitudes

reference_ellipsoid	e.g. grs80
format_of_data	Format of data records in FORTRAN notation. Data can be read by using this format statement (e.g. 10f8.2 means each complete record contains 10 values written with f8.2 format).
gap_value	Free definable value for unknown values. The format must correspond with the format_of_data format (e.g. format_of_data = f8.2, possible gap_value = 99999.99).
description_of_data	Description for the data records.
unit	E.g. m for meters.
Any comments	Space for any comments, undefined.
end_of_header	End of header

Data Section

The Data Section is also cut into two parts: The Row Leader Record and the Data Record.

Row Leader Record

Keyword [30 characters fixed length, filled with blanks]	**Meaning of parameters** [<70 characters]
latitude	Latitude of this row in [dd.mmss].
number_of_data_values	The number of data values (e.g. this number depends from mean_(0)_or_point_(1)_values flag. If the flag 0 is set and there are 120 cells in longitude direction, 120 values will follow. If the flag 1 is set, 121 values will follow.

Data Record

The Data Record is defined as follow:

- Each record is written from west to east.
- The rows are written from north to south
- Separator is a blank

Example:

```
data_set_name                egm96_180p_psd
northern_latitude            +90.00
southern_latitude            -90.00
western_logitude             0.00
eastern_longitude            0.00
latitude_cell_size           3.00
longitude_cell_size          3.00
number_of_cells_latitude_dir 60
number_of_cells_longitude_dir 120
mean_(0)_or_point_(1)_values 1
geocentric(0)_geodetic(1)_lat 0
reference_ellipsoid          GRS80
format_of_data               8f7.3
```

```
gap_value                         999.999
description_of_data               undulation
unit                              m
Here is place for comments in any format.
end_of_header
latitude                          90
number_of_data_values             121
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354  13.354
13.354
latitude                          87.00
number_of_data_values             121
20.265  20.269  20.252  20.212  20.146  20.053  19.934  19.787  19.615  19.419  19.201  18.965
18.713  18.449  18.176  17.897  17.616  17.333  17.052  16.774  16.499  16.227  15.959  15.694
15.432  15.171  14.910  14.649  14.386  14.122  13.857  13.589  13.320  13.049  12.778  12.508
12.238  11.970  11.704  11.442  11.184  10.932  10.685  10.446  10.216   9.995   9.787   9.593
 9.415   9.257   9.120   9.008   8.923   8.868   8.845   8.855
 8.900   8.979   9.093   9.241   9.421   9.630   9.866  10.124  10.400  10.691  10.990  11.292
11.593  11.888  12.172  12.441  12.693  12.925  13.136  13.327  13.498  13.652  13.794  13.926
.
.
```

7 FILENAME CONVENTIONS

7.1 GENERAL FILENAME FORMAT

The general format that has to apply to all input and output filenames comes from [RD-31] and is as follows:

MM_CCCC_TTTTTTTTTT_----------instance-ID----------.XXX

where

MM is the mission identifier, GO for GOCE

CCCC is the file class (i.e.: OPER for operational products, CONS for consolidated products, TEST for testing or TDxx (xx being 00...99) for test data sets).

TTTTTTTTTT is the file type. It is composed by the file category and the product file acronym. The following file categories are applied in the GOCE XML Parser, both for input and output files: EGG, SST or EGM.

----------instance-ID---------- is the instance ID that uniquely identifies one instance of a product. The last four characters (digits) of the instance ID always indicate the version number of the product ***(vvvv).***

XXX is the extension (see paragraph 4.4)

The GOCE level 1b and 2 products can be related to a certain validity period, i.e. contain data related to a certain satellite measurement period. All the file names follow the recommendation shown in [RD-31], that is[9]:

MM_CCCC_TTTTTTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_vvvv.XXX

This means that the instance ID in this case is:

yyyymmddThhmmss_YYYYMMDDTHHMMSS_vvvv

where

yyyymmddThhmmss is the validity start time in UTC. This can have the special value 00000000T000000 for beginning of mission, or if a validity period is not applicable.

YYYYMMDDTHHMMSS is the validity stop time in UTC. This can have the special value 99999999T999999 for end of mission, or if a validity period is not applicable.

vvvv is the version number.

[9] The only reason to use both capitals and small letters in the validity periods is to distinguish between validity start time and validity stop time