

ROM SAF CDOP-3

Product Requirements Document

Version 3.4

26 January 2019

ROM SAF Consortium

Danish Meteorological Institute (DMI)
European Centre for Medium-Range Weather Forecasts (ECMWF)
Institut d'Estudis Espacials de Catalunya (IEEC)
Met Office (UKMO)

Ref: SAF/ROM/DMI/MGT/PRD/001

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



DOCUMENT AUTHOR TABLE

	Author(s)	Function	Date
Prepared by:	Kent B. Lauritsen	ROM SAF Project Manager	26/1 2019
Reviewed by (internal):			
Approved by:	Kent B. Lauritsen	ROM SAF Project Manager	26/1 2019

DOCUMENT CHANGE RECORD

Version	Date	Ву	Description
0.1	6/8/08	DO	First draft based on Lothar Schueller's template and CM-SAF PRD, for discussion within GRAS SAF Team
0.2	5/11/08	DO	Incorporated comments from DMI after discussion at CDOP-PT4
0.3	19/12/08	DO	Incorporated more comments from KBL
1.0	18/6/09	DO	Incorporated suggestions from Lothar Schueller. Typo in PRD-7-07 and pressure accuracy values corrected. Version submitted to SG for comment; including updates as agreed at CDOP SG5 on 18 June 2009 (KBL)
1.1	13/1/2012	KBL	Cf. CDOP SG7 Decision 3 & SG8 Decision 5: Included Rec. 6 from PCR2: GRM-20 0-20 km; Included Rec. 7 from PCR2: PRD-4-01 and PRD-4-02 are updated, PRD-7-08 added; This version 1.1: used as reference for ORR2. Approved as SG9-Dec-07 (wp Jan 2012);



2.0	3	KBL	First CDOP-2 version, based on the PRT table (Annex 1 from the CDOP-2 Proposal). GRAS SAF changed to ROM SAF, new chapters 2.10 & 2.11, new req. PRD-07-09, updates to req. PRD-03-01, 03-03, and 04-01, inclusion of CDOP-2 products in the product specification tables (Annex A); This version when approved will close SG actions SG9-A3, SG9-A4; for details see section 1.6; Sent to SG for approval; Approved as SG12-Dec-04 (wp April 2013)
2.1	8/5 2014	KBL	Version submitted for the ORR4 & ORR-B-backlog review; List of updates: i) Definitions updated in sec. 1.4 (OR6 action 12); ii) Format of accuracy figures in several GRM-nn tables adjusted; Detailed list of all changes related to actions and recommendations is included in section 1.7;
2.2	14/5 2014	KBL	Version submitted to RR4 review (after redefining scope of ORR4 & ORR-B-backlog and introducing a separate RR4 requirements review) and taking into account comments from P. Poli on May 14: (i) Clarified in PRD-02-03 and PRD-03-04 that the figures are for "1 day"; (ii) introduced the surface value requirement in GRM-04, 12, 43, 50. Approved as SG14-Dec-08 (wp May 2014)
2.3	30/11 2015	KBL	Version updated according to CDOP-2 SG15 and SG16 actions. Detailed list of all changes is included in section 1.8; Approved as SG17-Dec-04 (wp Dec 2015)
3.0draft	24/11 2017	KBL	First version of PRD for CDOP-3; based on the PRT tables from the CDOP-3 Proposal, Annex 1 (main changes: EPS-SG and Jason-CS requirements added throughout the document; GBGP software added; PBLH and Tdry products added; EPS-SG ionosphere products added); Approved as SG23-Dec-03 (wp 6 Feb 2019)



	T .	1	
3.1draft	3/9 2018	KBL	Updated version implementing the following changes from the DRR-RE1 & ORRs review: - Recommendation 001: GRM-33-R1 inserted - Recommendation 006: Offline Level 3 TPH products added (GRM-191, 192, 193, 194) - Recommendation 007: Time periods added to all GRM-nn-R2 products In addition the following changes were made: - All GRM-nn-R1 products have been reinserted (by mistake they were removed in the previous version) - Added Multimission offline Metop Level 3 products (GRM-83 to 89)
0.0-1	47/40	IZDI	Approved as SG23-Dec-03 (wp 6 Feb 2019)
3.2draft	17/10 2018	KBL	Updated version implementing the RIDs from the EPS-SG RR review: - 003: First paragraph in section 1.4 updated - 004: NRT definitions in section 1.4 updated - 005: PRD-02-03 updated (capability of system is captured in PRD-01-01 and 01-02) - 006: PRD-02-06 removed - 007: section A2 added in Annex A - 020: PRD-01-05, 01-06 updated - 021: PRD-02-01 updated - 022: PRD-02-02 updated - 023: PRD-02-05 updated - 024: PRD-03-01 updated - 025: PRD-03-01 updated - 026: PRD-03-03 updated - 027: PRD-03-05 updated - 029: PRD-04-03 updated - 029: PRD-05-01 updated - 030: PRD-05-07 updated - 031: PRD-05-07 updated - 033: PRD-11-02, 11-03, 11-04, 11-06, 11-08 updated Approved as SG23-Dec-03 (wp 6 Feb 2019)
3.3draft	26/10 2018	KBL	Updated version prepared for SG22: - Empty tables for Metop-SG (GRM-130 to 149, GRM-150 to 169) filled with similar product requirement values as used for Metop
			Approved as SG23-Dec-03 (wp 6 Feb 2019)



3.4	26/1 2019	KBL	Updated version implementing: - ICDR products GRM-29-I1, GRM-29-I2 in PRD requirements and in Annex A - Updated Sec. 1.4 Definitions
			Approved as SG23-Dec-03 (wp 6 Feb 2019)

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



ROM SAF

Radio Occultation Meteorology Satellite Application Facility (ROM SAF) is a decentralised processing centre under EUMETSAT which is responsible for operational processing of GRAS radio occultation (RO) data from the Metop satellites and radio occultation data from other missions. The ROM SAF delivers bending angle, refractivity, temperature, pressure, humidity, and other geophysical variables in near real-time for NWP users, as well as reprocessed Climate Data Records (CDRs) and Interim Climate Data Records (ICDRs) for users requiring a higher degree of homogeneity of the RO data sets. The CDRs and ICDRs are further processed into globally gridded monthly-mean data for use in climate monitoring and climate science applications.

The ROM SAF also maintains the Radio Occultation Processing Package (ROPP) which contains software modules that aid users wishing to process, quality-control and assimilate radio occultation data from any radio occultation mission into NWP and other models.

The ROM SAF Leading Entity is the Danish Meteorological Institute (DMI), with Cooperating Entities: i) European Centre for Medium-Range Weather Forecasts (ECMWF) in Reading, United Kingdom, ii) Institut D'Estudis Espacials de Catalunya (IEEC) in Barcelona, Spain, and iii) Met Office in Exeter, United Kingdom. To get access to our products or to read more about the ROM SAF please go to: http://www.romsaf.org

Intellectual Property Rights

All intellectual property rights of the ROM SAF products belong to EUMETSAT. The use of these products is granted to every interested user, free of charge. If you wish to use these products, EUMETSAT's copyright credit must be shown by displaying the words "copyright (year) EUMETSAT" on each of the products used.

Issue: 3.4 Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



List of Contents

EXECUI	IVE SUMMARY	8
1. INTRO	DUCTION	9
1.1	PURPOSE OF THE DOCUMENT	9
1.2	APPLICABLE AND REFERENCE DOCUMENTS	9
1.2.	1 Applicable Documents	9
1.2.		
1.3	ACRONYMS AND ABBREVIATIONS	
1.4	DEFINITIONS	
1.5	IDENTIFICATION OF REQUIREMENTS	
1.6	CHANGES IN VERSION 2.0	
1.7	CHANGES IN VERSION 2.1	
1.8	CHANGES IN VERSION 2.3	
1.9	OVERVIEW OF THIS DOCUMENT	16
2. REQUI	REMENTS	17
2.1	GENERAL	17
2.2	NEAR-REAL TIME SOUNDING PRODUCTS	18
2.3	OFFLINE AND ICDR SOUNDING PRODUCTS	18
2.4	GRIDDED PRODUCTS	19
2.5	NEAR-REAL TIME VALIDATION	19
2.6	OFFLINE AND ICDR VALIDATION	19
2.7	GRIDDED VALIDATION	20
2.8	SOFTWARE DELIVERABLES	
2.9	USER AND SUPPORTING SERVICES	
2.10	RE-ANALYSIS DATASET	
2.11	REPROCESSED DATA RECORDS	23
3. LIST O	F TBD'S AND TBC'S	24
ANNEX A	A PRODUCT SPECIFICATIONS	25

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



Executive Summary

This document presents the product requirements of the EUMETSAT Satellite Application Facility (SAF) on Radio Occultation Meteorology (ROM), hereinafter referred to as the ROM SAF.

The requirements expressed in this document represent the commitment of the ROM SAF Team for the development under the overall EPS, EPS-SG, and Jason-CS end-user requirements within the Third Continuous Development and Operations Phase (CDOP-3) based on the cooperation agreement between the Leading Entity (DMI) and EUMETSAT. This document is under the authority of the Steering Group, which approves changes and modifications. Any changes substantially changing the product list or other major commitments would need the approval by EUMETSAT Delegate Bodies.

The Product Requirements Document (PRD) is the main reference document for all development related reviews (Operational Readiness Reviews, Product Consolidation Reviews and Delivery Readiness Inspections) and provides the end users of the ROM SAF with a vision of what can be expected at the end of the current ROM SAF phase.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



1. Introduction

1.1 Purpose of the Document

This document presents the product requirements of the EUMETSAT Radio Occultation Meteorology (ROM) Satellite Application Facility (SAF), hereinafter referred to as the ROM SAF. The products requirements have been derived from appropriate user-based requirements as specified in the User requirements Document [RD.1].

The requirements expressed in this document represent the commitment of the ROM SAF Team for the development under the overall EPS, EPS-SG and Jason-CS end-user requirements [AD.1, AD.2, AD.3] and within the Third Continuous Development and Operations Phase (CDOP-3) [AD.4] based on the Cooperation Agreement between the Leading Entity (DMI) and EUMETSAT [AD.5]. This document is under the authority of the Steering Group, which approves changes and modifications. Any changes substantially changing the product list or other major commitments would need the approval by EUMETSAT Delegate Bodies.

The Product Requirements Document (PRD) is the main reference document for all development related reviews (Operational Readiness Reviews, Product Consolidation Reviews and Delivery Readiness Inspections) and provides the end users of the ROM SAF with a vision of what can be expected at the end of the current ROM SAF phase.

The requirements stated in this document apply to the nominal mode of operations of the ROM SAF and/or central EUMETSAT ground segment. The nominal mode is characterised by the following:

- The EPS/Metop, EPS-SG, Jason-CS satellites and the ground segment are successfully commissioned and are in an operational status;
- The satellites are outside the outage periods related to manoeuvre and decontamination within its operational tolerances;
- The RO instruments are correctly functioning to requirements and is in its nominal operational mode;
- No satellite and ground segment anomaly impacts on the on-ground processing;
- The intra- and inter-SAF data flow and data production operate at the planned capacity and efficiency;

1.2 Applicable and Reference Documents

1.2.1 Applicable Documents

The following list contains documents with a direct bearing on the contents of this document.

- [AD.1] EPS End-User Requirements Document; Ref: EPS/MIS/REQ/93001 Issue 4, Rev. 2, 13 October 1997 (also Annex I to EUM/C/36/97/DOC/54)
- [AD.2] EPS-SG End User Requirements Document, Ref: EUM/PEPS/REQ/09/0151

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



[AD.3] Jason-CS/Sentinel-6 End-User Requirements Document, Ref: EUM/LEO-JASCS/REQ/12/0013

- [AD.4] CDOP-3 Proposal: Proposal for the Third Continuous Development and Operations Phase (CDOP-3); Ref: SAF/ROM/DMI/MGT/CDOP3/001 Version 1.2 of 31 March 2016, Ref: EUM/C/85/16/DOC/15, approved by the EUMETSAT Council at its 85th meeting on on 28-29 June 2016
- [AD.5] CDOP-3 Cooperation Agreement: Agreement between EUMETSAT and DMI on the Third Continuous Development and Operations Phase (CDOP-3) of the Radio Occultation Meteorology Satellite Applications Facility (ROM SAF), Ref. EUM/C/85/16/DOC/19, approved by the EUMETSAT Council and signed at its 86th meeting on 7 December 2016

1.2.2 Reference Documents

The following documents provide supplementary or background information, and could be helpful in conjunction with this document.

[RD.1] User Requirement Document Ref: SAF/GRAS/METOFFICE/RQ/URD/001

1.3 Acronyms and Abbreviations

BUFR Binary Universal Format for the Representation of data (also FM94)

(WMO)

CDR Climate Data Record

CGS Core Ground Segment (EUMETSAT)

DMI Danish Meteorological Institute; ROM SAF Leading Entity

ECMWF The European Centre for Medium-range Weather Forecasts; ROM

SAF partner

EPS EUMETSAT Polar satellite System (EUMETSAT)

EPS-SG EUMETSAT Polar satellite System – Second Generation

(EUMETSAT)

EUMETSAT EUropean organisation for the exploitation of METeorological

SATellites

EURD End Users Requirements Document

FM94 Form Number 94. See BUFR

GBGP Ground Based GNSS Package (ROM SAF)

GLONASS Globalnaya Navigatsionnaya Sputnikovaya Sistema (GLObal

Navigation Satellite System, Russia)

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



GM Global Mission (EPS-SG)

GNSS Global Navigation Satellite Systems (generic name for GPS +

GLONASS)

GPAC GNSS Processing and Archiving Center (ROM SAF)

GPS Global Positioning System (USA)

GPS/MET Global Positioning System / Meteorology Experiment on Microlab-1

(US)

GRAS GNSS Receiver for Atmospheric Sounding (EPS/Metop)

GRIB Gridded Binary format

GTS Global Telecommunication System

IEEC Institut d'Estudis Espacials de Catalunya; ROM SAF partner

LEO Low Earth Orbit

Met Office United Kingdom Meteorological Office; ROM SAF Partner METOP METeorological Operational Polar satellite (EUMETSAT)

NetCDF Network Common Data Form

NRT Near-Real Time

NWP Numerical Weather Prediction POD Precise Orbit Determination

RO Radio Occultation

ROM SAF Radio Occultation Meteorology SAF (EUMETSAT), former GRAS

SAF

ROPP Radio Occultation Processing Package (ROM SAF)

RM Regional Mission (EPS-SG)

RMDCN Regional Meteorological Data Communications Network

SAF Satellite Application Facility (EUMETSAT)

TBC To Be Confirmed

TBD To Be Determined or To Be Decided

VAR VARiational analysis; 1D, 2D, 3D or 4D variants (NWP assimilation

technique)

WIS World Information System

WMO World Meteorological Organisation

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



1.4 Definitions

RO data products from the GRAS instrument onboard Metop and RO data from other missions are grouped in *data levels* (level 0, 1, 2, or 3) and *product types* (NRT, offline, CDR, or ICDR). The data levels and product types are defined below¹. The lists of variables should not be considered as the complete contents of a given data level, and not all data may be contained in a given data level.

Data levels:

<u>Level 0</u>: Raw sounding, tracking and ancillary data, and other GNSS data before clock correction and reconstruction;

<u>Level 1A</u>: Reconstructed full resolution excess phases, total phases, pseudo ranges, SNRs, orbit information, I, Q values, NCO (carrier) phases, navigation bits, and quality information;

<u>Level 1B</u>: Bending angles and impact parameters, tangent point location, and quality information;

<u>Level 2</u>: Refractivity, geopotential height, "dry" temperature profiles (Level 2A), pressure, temperature, specific humidity profiles (Level 2B), surface pressure, tropopause height, planetary boundary layer height (Level 2C), ECMWF model level coefficients (Level 2D), quality information;

<u>Level 3</u>: Gridded or resampled data that are processed from Level 1 or 2 data, and that are provided as, e.g., daily, monthly, or seasonal means on a spatiotemporal grid, including metadata, uncertainties and quality information.

Product types:

NRT product: Data product delivered less than: (i) 3 hours after measurement (SAF Level 2 for EPS); (ii) 80 min after measurement (SAF Level 2 for EPS-SG Global Mission); (iii) 40 min after measurement (SAF Level 2 for EPS-SG Regional Mission);

Offline product: Data product delivered from less than 5 days to up to 6 months after measurement, depending on the requirements. The evolution of this type of product is driven by new scientific developments and subsequent product upgrades;

<u>CDR</u>: Climate Data Record generated from a dedicated reprocessing activity using a fixed set of processing software². The data record covers an extended time period of several years (with a fixed end point) and constitutes a homogeneous data record appropriate for climate usage;

<u>ICDR</u>: An Interim Climate Data Record (ICDR) regularly extends in time a (Fundamental or Thematic) CDR using a system having optimum consistency with and lower latency than the system used to generate the CDR³.

¹Note that the level definitions differ partly from the WMO definitions:

http://www.wmo.int/pages/prog/sat/dataandproducts_en.php

² (i) GCOS 2016 Implementation Plan; (ii) http://climatemonitoring.info/home/terminology/

³ http://climatemonitoring.info/home/terminology/ (the ICDR definition was endorsed at the 9th session of the joint CEOS/CGMS Working Group Climate Meeting on 29 March 2018)

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



1.5 Identification of Requirements

The requirements in this document are uniquely identified as follows:

PRD-mm-nn

where *mm* represents the requirements group identifier (deliverables) and *nn* is the group requirement number. The following group identifiers are used:

- 01 General, covering all products and services.
- 02 Near-real time sounding product
- 03 Offline and ICDR sounding product
- 04 Gridded products
- 05 Near-real time validation
- 06 Offline and ICDR validation
- 07 Gridded validation
- 08 Software deliverables
- 09 User and supporting services
- 10 Re-analysis dataset
- 11 Reprocessed data records

1.6 Changes in version 2.0

This section contains a description of the actions and recommendations which have been incorporated in version 2.0 of the PRD.

1. Action CDOP-1 SG9-A3:

ORR2 Recommendation 1 on PRD update: Team to update the PRD according to points i, ii, iii, vi, vii.

Suggestion presented for SG11:

- i. We propose to make the Level 3 data products instrument-specific, i.e. to separate into COSMIC-only and Metop-only data products. They would have different GRM numbers, and as a consequence, different requirements. Initially the requirements will have the same numerical values. However, following studies in CDOP-2 we would be able to further constrain them.
- ii. We plan to assess the requirements, particularly the altitude dependence, prior to the first CDOP-2 reprocessing cycle planned for 2014. Until then, the requirements will remain unaltered.
- iii. The requirements for the humidity climate products will be restricted to below 15 kilometers (to be in line with the data product altitude coverage).
- vi. A requirement to generate time series for the web site will be added.
- vii. The ASCII format requirement will be removed.

Decision SG11-Dec-15:

The SG approved the suggestion in action SG9-A3 related to PRD updates for level 3 products. The update should take into account the related discussions at the SG11 meeting.

2. Action CDOP-1 SG9-A4:

ORR2 Recommendation 1 on PRD update: Team to assess points iv and v and suggest what can be done.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



Suggestion presented for SG11:

iv. We suggest changing the timeliness requirement from 30 days to 3-6 months. In the case of COSMIC data, this would allow us to use reprocessed data most of the time (estimated delay of the UCAR processing up to excess-phase data is around 6 weeks, although this cannot be considered a strict requirement).

v. We suggest continuing using ECMWF as a priori data from the up to the first CDOP-2 reprocessing cycle planned for 2014. For that reprocessing we will consider to use ERA-Interim instead of ECMWF.

Decision SG11-Dec-16:

The SG approved the suggestion in action SG9-A4 related to PRD updates for level 3 products based on COSMIC offline data and ECMWF a priori fields.

 Regarding ORR2 Recommendation 1 on PRD update: point ii (see 1 above), we have in the current version suggested an update of the bending angle requirement, and related to this made an adjustment of some of the refractivity requirements in order to have consistent bending angle and refractivity requirements (see GRM-17, 18 and 53, 54, 93, 94).

1.7 Changes in version 2.1

This section contains a description of the actions and recommendations which have been incorporated in version 2.1 of the PRD.

- 1. PRD-02-03 updated to be in line with SeSp version 2.3 (this closes OR5 actions 7 and 25; Ref: EUM/PPS/MIN/13/694051).
- 2. PRD-03-04 updated to be consistent with the updated formulation in PRD-02-03.
- 3. A wrong data level number in PRD-01-02, PRD-03-02, PRD-03-04, PRD-11-01 have been corrected (the offline processing is done from level 1a whereas NRT processing is done from level 1b).
- 4. Accuracy values for 1D-Var products (GRM-02,03,04,05; 10,11,12,13; 41,42,43,44; 48,49,50,51) have been re-assessed based on wave optics data and new values are suggested (Ref: SAF/ROM/DMI/MGT/DOC/010). This closes SG action SG5-A1 (Ref: SAF/GRAS/DMI/MGT/MIN/CSG5/001) and ORR-B Closeout Minutes, Recommendation 2 (Ref: EUM/PPS/MIN/11/0043). Verification method is based on comparing to analysis fields.
- 5. Added the product requirements for GRM-22,23, GRM-58,59, GRM-98,99 as recommended at the PCR5 Review for these products (Ref: EUM/PPS/MIN/13/700261) and endorsed at SG12 the decision SG12-Dec-06 (Ref: SAF/ROM/DMI/MGT/SG12/002).
- 6. ORR2 Closeout action 1 (point 11 [by P.P.] in Annex 2 of the Minutes from the ORR2 Closeout) closed by adding to the GRM-nn requirements tables the following note: "An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate".
- 7. In Annex A: removed the GRM-nn numbers and tables for the non-committed products: GRM-31, 34, 35, 36, 37, 38, 39 (which had been included as placeholders for possible future data sets).

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



1.8 Changes in version 2.3

This section contains a description of the actions and recommendations which have been incorporated in version 2.3 of the PRD.

- 1. Section 1.4: Minor update to text in the definition of Level 1a and added definition of CDR
- 2. TBD requirements on third party missions removed (SG15-Dec-14)
- 3. TBD requirements on EPS-SG removed (not applicable for CDOP-2 but addressed in the CDOP-3 proposal)
- 4. PRD-01-01 and PRD-01-02: GRM-07, 15, 45, 52 removed. These are Error-Covariance Matrices and are removed as formal products by CDOP-1 SG8-Dec-11 and transferred to requirement PRD-08-02 on ROPP
- PRD-01-02: Minor change to text to clarify that data and datasets for offline and reprocessed data includes level 1b, 2, and 3
- 6. PRD-05-01 and PRD-06-01: ROSA removed from list of other measurements (SG15-Dec-14)
- 7. PRD-08-01: Release of ROPP-10 (GRM-16_v10) removed (SG15-Dec-15)
- 8. PRD-08-02: References to formal product ids GRM-07, 15, 45, 52 (Error-Covariance Matrices) removed (CDOP-1 SG8-Dec-11)
- 9. PRD-11-01: GRM ids updated as agreed at the RR-RE1 review (SG15-Dec-18)
- 10. PRD-11-02: Text updated to clarify the climate data records covers level 1b, 2, and 3
- 11. PRD-11-09: Text updated to clarify offline means climate data records
- 12. PRD-11-12: New requirement as agreed at RR-RE1 review (SG15-Dec-19)
- 13. PRD-11-13: New requirement as agreed at RR-RE1 review (SG15-Dec-19)
- 14. Annex A: Updated product tables for GRM-08, 09, 17 23, 24, 28-R1 32-R1, 46,47, 53-59, 93-93 as agreed at RR-RE1 review (SG15-Dec-19)
- 15. SG15-Act-09: Implemented through above points 12, 13, and 14 (SG15-Dec-19)
- 16. SG16-Act-04: Implemented through updated product ids GRM-28-R1 32-R1 (SG16-Dec-09)
- 17. SG15-Act-01: GRM-07, 15, 45, 51 deleted noting these requirements have previously been reclassified as PRD requirements PRD-08-02 on ROPP (CDOP-1 SG8-Dec-11)
- 18. SG15-Act-05: Implemented through deleting GRM-16_v10 (ROPP-10) (SG15-Dec-15), GRM-26 (PBLH) (SG15-Dec-16) and GRM-27 (RO Reanalysis) (SG15-Dec-17)
- 19. SG15-Act-08: Section 2.10 updated to reflect that the RO reanalysis product GRM-27 is deleted but that a similar product is planned to be produced with the ERA-5 system at ECMWF (SG15-Dec-17)

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



1.9 Overview of this document

The structure of the chapters of this document is as follows:

Chapter 1 contains the introduction. It also contains detailed lists of changes to some of the previous versions of the document.

Chapter 2 contains the list of all product requirements.

Chapter 3 contains the list of TBCs and TBDs.

Annex A contains tables with detailed product requirements for all products.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



2. Requirements

2.1 General

- PRD-01-01 The ROM SAF shall have an operational capability to process EUMETSAT Secretariat CGS Level 1B data in near-real time from the RO instruments on Metop and Metop-SG to Level 2 products according to specifications in Annex A, Tables GRM-01 to 05, 24, 26, 40-44, 60-64, 130-135, 150-155.
- PRD-01-02 The ROM SAF shall have an offline capability to process EUMETSAT Secretariat CGS Level 1A data from the RO instruments on Metop, Metop-SG and Jason-CS to Level 1B and Level 2 products according to specifications in Annex A, Tables GRM-08 to 13, 24, 26, 46-51, 66-71, 136-142, 156-162. This capability shall be used to regularly generate offline products and at certain key points, to re-process the complete Level 1B, 2, and 3 dataset up to that point to a common best-practice standard.
- PRD-01-03 The ROM SAF shall have a capability to generate offline gridded products from data from the RO instruments on Metop, Metop-SG, Jason-CS, COSMIC-1 and COSMIC-2 for climate applications, according to the product specifications in Annex A, Tables GRM-17 to 23, 53-59, 73-79, 83-89, 93-99, 107-113, 123-129, 143-149, 163-169, 191-194, 29-I1, 29-I2.
- PRD-01-04 The ROM SAF shall develop and maintain a software package ("ROPP") to support user-assimilation of RO data in NWP models, according to specifications in Annex A, Table GRM-16, 16_v10, 16_v11.
- PRD-01-05 ROM SAF near-real time, offline and climate data record products shall conform to netCDF standards for file formatting.
- PRD-01-06 ROM SAF Level 2 products shall be made available to users within the timeliness requirements specified in the EPS and EPS-SG EURDs and via GTS and EUMETCast dissemination for NRT and via HTTP for offline.
- PRD-01-07 All ROM SAF deliverables (products, datasets and software) shall be available to users according to EUMETSAT data policy.
- PRD-01-08 An on-line catalogue of ROM SAF products shall be maintained as part of the EUMETSAT Data Centre to enable offline bulk data ordering.
- PRD-01-09 ROM SAF shall archive its products for a period of no less than 10 years after the end of the EPS/Metop mission.
- PRD-01-10 Archived products shall be capable of extraction, with no degradation to the original product quality, on user request, ordered via the EUMETSAT Data Centre.
- PRD-01-11 Archived products shall be capable of extraction, with no degradation to the original product quality, on user request, ordered via the ROM SAF Product Archive.
- PRD-01-12 Archived products shall be available to users in the same file formats as used for the original data.
- PRD-01-13 The ROM SAF shall develop and maintain a software package ("GBGP") containing tools for formatting of GNSS ground-based data, according to specifications in Annex A, Table GRM-92.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



2.2 Near-Real Time Sounding Products

- PRD-02-01 NRT Sounding products shall contain all required Level 2 parameters (including date, time and geodetic location, error estimates and quality control flagging). Level 2 NRT product parameter specifications are as presented in Annex A, Tables GRM-01 to 05, 40-44, 60-64, 130-135, 150-155.
- PRD-02-02 NRT Sounding products shall contain a sub-set of required Level 1 parameters selected from EUMETSAT Secretariat CGS NRT products (from which the Level 2 product are derived), including: thinned profiles of bending angle, impact parameters, geographical location, position and velocity data.
- PRD-02-03 Of those Level 1B NRT products with correct instrument operation and available to the ROM SAF within: (i) 2h 15 min (EPS), (ii) 70 min (EPS-SG GM; 95% availability), (iii) 30 min (EPS-SG RM; 95% availability), more than (i) 500, (ii) 2000, (iii) 500, shall daily be processed to Level 2 products and disseminated to users within the following SAF Level 2 breakthrough values calculated from end of sensing time: (i) 3 hours, (ii) 80 min, (iii) 40 min. This availability rate shall be calculated over a 1 month period.
- PRD-02-04 NRT sounding products shall be disseminated via GTS, RMDCN and EUMETCast.
- PRD-02-05 NRT sounding products disseminated via GTS or RMDCN shall use WMO FM94 (BUFR) encoded format. Dissemination over EUMETCast shall use BUFR or netCDF.
- PRD-02-07 The near real-time sounding products shall be archived within the ROM SAF leading entity.

2.3 Offline and ICDR Sounding Products

- PRD-03-01 Offline and ICDR products shall be generated to take advantage of RO NRT data not meeting the timeliness requirements for NRT products and with the offline and ICDR products fulfilling Level 1B and 2 product parameter specifications as presented in Annex A, Tables GRM-08 to 13, 24, 26, 46-51, 66-71, 136-142, 156-162, 29-I1, 29-I2.
- PRD-03-02 The ROM SAF shall have the capability to process data from RO instruments other than onboard EUMETSAT missions (COSMIC, COSMIC-2A) in order to generate offline and ICDR Level 1B and Level 2 products to the same specification (within the limits of the available data) as the EUMETSAT missions RO products.
- PRD-03-03 Offline and ICDR products shall at least contain identical parameters to the near-real time products.
- PRD-03-04 More than (i) 500 (EPS), (ii) 1000 (EPS-SG GM), (iii) TBD (EPS-SG RM), of all available occultation events with correct instrument operation shall daily be processed to Level 1B and Level 2 sounding products and shall be available to users within 30 days of observation time. This availability rate shall be calculated over a 1 month period.
- PRD-03-05 Offline and ICDR products shall be made available to users via HTTP using the file formats netCDF and BUFR.
- PRD-03-06 The offline and ICDR sounding products shall be archived within the ROM SAF leading entity.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



2.4 Gridded Products

- PRD-04-01 Gridded products shall be generated from best-quality offline products from Metop/GRAS, Metop-SG, Jason-CS, COSMIC-1, COSMIC-2 and other RO receivers that are readily available and have high enough quality. Gridded product parameter specifications are as presented in Annex A, Tables GRM-17 to 23, 53-59, 73-79, 83-89, 93-99, 107-113, 123-129, 143-149, 163-169, 191-194, 29-I1, 29-I2.
- PRD-04-02 Gridded products shall contain gridded monthly means together with estimates of corresponding errors and contain meta-data providing traceability to the individual occultations and software versions.
- PRD-04-03 Gridded products shall be made available to users via HTTP using the file format netCDF.
- PRD-04-04 The gridded products shall be archived within the ROM SAF leading entity.

2.5 Near-Real Time Validation

- PRD-05-01 The ROM SAF shall generate, and make publicly available, validation information supporting available RO NRT sounding products using information obtained from Met Office and ECMWF NWP fields and RO measurements from Metop, COSMIC, COSMIC-2, CHAMP, GRACE, TanDEM-X, TerraSAR-X, GNOS, ROSA/Megha-Tropiques.
- PRD-05-02 The ROM SAF shall generate (for use only by team members and EUMETSAT) validation and monitoring information on the GPAC NRT product processing.
- PRD-05-03 Validation shall include statistics on the quantity of products.
- PRD-05-04 The validation domain shall be global and over the full vertical domain of the NRT products.
- PRD-05-05 Validation statistics shall be generated with a time resolution of 1 day and 1 month, including Metop commissioning periods.
- PRD-05-06 Metop/GRAS and Metop-SG NRT product validation information shall be made publicly available via the project's website.
- PRD-05-07 The ROM SAF shall also validate data available in NRT from RO instruments on COSMIC, COSMIC-2, GRACE, TanDEM-X, TerraSAR-X, GNOS and present the same information, and in the same way, as for Metop/GRAS.
- PRD-05-08 The NRT product validation information shall be archived within the ROM SAF leading entity.

2.6 Offline and ICDR Validation

PRD-06-01 The ROM SAF shall generate, and make publicly available, validation information supporting available RO offline and ICDR sounding products using information obtained from NWP fields and other measurements (COSMIC, COSMIC-2,

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



CHAMP, GNOS, GRACE, TanDEM-X, TerraSAR-X)

- PRD-06-02 The ROM SAF shall generate (for use only by team members and EUMETSAT) validation and monitoring information on the GPAC offline and ICDR product processing.
- PRD-06-03 Validation shall include statistics on the quantity of products.
- PRD-06-04 The validation domain shall be global and over the full vertical domain of the offline and ICDR products.
- PRD-06-05 Validation statistics shall be generated with a time resolution of 1 calendar month, excluding Metop commissioning periods.
- PRD-06-06 Offline and ICDR product validation information shall be made available via the project's website.
- PRD-06-07 The offline and ICDR product validation information shall be archived within the ROM SAF leading entity.

2.7 Gridded Validation

- PRD-07-01 The ROM SAF shall generate, and make publicly available, validation information supporting gridded products.
- PRD-07-02 The ROM SAF shall generate (for use only by team members and EUMETSAT) validation and monitoring information on the GPAC gridded product processing.
- PRD-07-03 Validation shall include statistics on the quantity of products.
- PRD-07-04 The validation domain shall be global and over the full vertical domain of the gridded products.
- PRD-07-05 Validation statistics shall be generated with a time resolution of 1 calendar month and based on full length of data sets.
- PRD-07-06 Gridded product validation information shall be made available via the project's website.
- PRD-07-07 The gridded product validation information shall be archived within the ROM SAF leading entity.
- PRD-07-08 The ROM SAF shall generate metrics to monitor the stability of gridded data in time.
- PRD-07-09 The ROM SAF shall generate time series for the whole length of the data set and make it available at the web site.

2.8 Software Deliverables

ROM SAF deliverables include software to support user applications, such as 1D-Var code and RO observation operators for NWP assimilation, pre-processing algorithms and supporting code for interfacing with various standard file formats. Collectively, this deliverable is known as the 'Radio Occultation processing Package' (ROPP). The software deliverables also include tools for

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



formatting Ground-based GNSS data; this deliverable is known as the "Ground Based GNSS Package" (GBGP).

- PRD-08-01 The ROM SAF shall make available the ROPP software deliverable according to the specifications in Annex A, Table GRM-16, 16_v10, 16_v11. This package shall include key user documentation describing the software deliverable, and shall include: Release notes, User Guide and Reference Manual(s).
- PRD-08-02 The ROM SAF shall support user assimilation in NWP models by the provision of associated observation error covariance matrices appropriate to the ROM SAF Level 2 products.
- PRD-08-03 Software deliverables shall be coded in ISO-standard high-level languages (principally Fortran-95) and shall follow programming standards guidelines. The code shall be designed to be portable so as to be capable of being built, installed and run on a variety of different POSIX-compliant platforms and compilers.
- PRD-08-04 The ROM SAF shall make the software deliverable and associated supporting documentation and datasets available (to registered users) for download from the project website.
- PRD-08-05 The ROPP software deliverable shall continue to be developed and maintained by the ROM SAF. Maintenance activity shall include fixes to programming errors, improvements to code efficiency, and developments supporting improved scientific processing in response to evolving Product Requirements. Updates resulting from development & maintenance shall be released to users according to plans.
- PRD-08-06 The ROM SAF shall make available the GBGP software deliverable according to the specifications in Annex A, Table GRM-92. This package shall include key user documentation describing the software deliverable, and shall include: Release notes, User Guide and Reference Manual(s).
- PRD-08-07 The GBGP software deliverable shall continue to be maintained by the ROM SAF. Maintenance activity shall include fixes to programming errors..

2.9 User and Supporting Services

ROM SAF deliverables include information services such as user documentation, education and Helpdesk and other web-based resources for SAF products, plus supporting users through holding workshops and providing opportunities under the SAF Visiting Scientist programme.

- PRD-09-01 The ROM SAF shall establish and maintain a project website as a service to users. This user service shall include (but not be limited to) news and announcements about, and information and documentation on, ROM SAF products, validation, software and data sets; technical and scientific reports; announcements of seminars, workshops, and visiting scientist opportunities; information on how to contact the SAF; and shall allow a user to search the product catalogue for quick-view and to order products and data sets.
- PRD-09-02 The ROM SAF website shall be hosted by the leading entity and shall be an operational element of the ROM SAF, with a maximum of one interruption per week and with an interruption time of one working day as a maximum.
- PRD-09-03 The website shall implement a user interface function (Helpdesk) for users to report problems, request help or give other feedback. The Helpdesk facility shall

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



track user interactions, and shall acknowledge receipt of a new contact by automated response. Helpdesk shall answer at least 90% of requests within 3 working days. Resolution of an issue depends on its complexity, and is thus not guaranteed.

- PRD-09-04 Access to ROM SAF products (data, software) shall require the user to first register their details.
- PRD-09-05 User Services shall include a User Notification service as an option for registered users to be notified by email of changes to operational or offline products, software or data sets or on their availability via the website, GTS/RMDCN or EUMETCast as appropriate to the user.
- PRD-09-06 Access to ROM SAF software deliverables shall require the user to agree to a User Licence.
- PRD-09-07 Information on the availability, quality and web access statistics, of ROM SAF deliverables shall be reported in a ROM SAF half-yearly Operations Report.
- PRD-09-08 The ROM SAF shall organise and hold ROM SAF User and Training Workshop(s).
- PRD-09-09 The ROM SAF shall encourage and conduct Visiting Scientist activities aimed at improving the information exchange between the ROM SAF team and the scientific community, and at improving the science in, and promoting the use of, ROM SAF deliverables.

2.10 Re-Analysis Dataset

- PRD-10-01 With the ERA5 system, ECMWF plan to generate a GNSS-RO global reanalysis dataset for the 2007-2015 period by assimilating reprocessed GNSS-RO measurements and conventional measurements that do not require bias correction. The reprocessed measurements will be provided by ECMWF as part of the ERA CLIM project.
- PRD-10-02 The processing will use the ECMWF reanalysis system run at T159 resolution, to produce daily, gridded reanalyses at 00Z and 12Z. The daily reanalyses and the corresponding departure statistics of both active and passive observations will be archived.
- PRD-10-03 The quality of the dataset will be monitored using the departure statistics with respect to both active and passive observations, and by comparison with other global reanalyses.
- PRD-10-04 Three dimensional and zonally averaged Monthly Mean Climatologies (MMCs) of various variables, including temperature, humidity and geopotential height, will be derived from the daily reanalyses. Time-series of climate indicators will be computed, stored and made available to users.
- PRD-10-05 The dataset and derived data will be archived at ECMWF.
- PRD-10-06 The dataset and derived data will be made available to users in standard formats, such as GRIB fields, via appropriate links such as at the ROM SAF web site.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



2.11 Reprocessed Data Records

- PRD-11-01 Reprocessed climate data records shall be generated to take advantage of improved algorithms not available at the original time of processing. Original products are the ROM SAF Offline Level 1B, 2 and 3 products. Product parameter specifications for reprocessed data records are as presented in Annex A, Tables GRM-28-R1, 29-R1, 30-R1, 32-R1, 33-R1; GRM-28-R2, 29-R2, 30-R2, 33-R2.
- PRD-11-02 The ROM SAF shall have the capability to reprocess data from RO instruments from COSMIC, COSMIC-2, GRACE, CHAMP to generate reprocessed Level 1B, 2, and 3 climate data records to the same specification (within the limits of the available data) as the Metop/GRAS products.
- PRD-11-03 Reprocessed climate data records shall contain identical parameters to the original products.
- PRD-11-04 Reprocessed climate data records shall be made available to users via appropriate links, channels or media using standard file formats such as netCDF and BUFR.
- PRD-11-05 Reprocessed climate data records shall be archived within the ROM SAF leading entity.
- PRD-11-06 Reprocessed climate data records shall be made available to users via HTTP using the file formats netCDF and BUFR.
- PRD-11-07 The ROM SAF shall generate (for use only by team members and EUMETSAT) validation and monitoring information on the GPAC reprocessing.
- PRD-11-08 Validation shall include statistics on the quantity of products and on their improvement with respect to the original products.
- PRD-11-09 The validation domain shall be global and over the full vertical domain of the reprocessed climate data records.
- PRD-11-10 Reprocessed climate data records validation information shall be made available via the project's website.
- PRD-11-11 Reprocessed climate data records validation information shall be archived within the ROM SAF leading entity.
- PRD-11-12 Validation statistics for reprocessed climate data records shall be generated with a time resolution of 1 calendar month and based on full length of data sets.
- PRD-11-13 The ROM SAF shall generate reprocessed time series for the whole length of the climate data records and make it available at the web site.

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



3. List of TBD's and TBC's

PRD-03-04 More than (i) 500 (EPS), (ii) 1000 (EPS-SG GM), (iii) TBD (EPS-SG RM), of all available occultation events with correct instrument operation shall daily be processed to Level 1B and Level 2 sounding products and shall be available to users within 30 days of observation time. This availability rate shall be calculated over a 1 month period.

Annex A, table GRM-26: PBLH requirements (TBD)

Annex A, table GRM-170 to 173: Ionosphere products for EPS-SG (TBD)

Issue: 3.4

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



ANNEX A. Product Specifications

The following tables summarize the specifications for each ROM SAF deliverable product.

A1. Definitions:

Threshold Accuracy	The minimum accuracy limit which is needed, so that the product is considered being useful for some user groups		
Target Accuracy	The product accuracy that is targeted in the development and the reference in product quality before the (pre-) operational product generation and dissemination.		
Optimal Accuracy	The accuracy that can be reached under optimal conditions.		

The interpretation, definition and validation approach of accuracy for a given product is described under the verification and validation method in the following tables.

A2. Product Levels and Groups:

ROM SAF products are divided into the following groups:

- Level 1B Bending Angle (GRM-08, 46, 66, 136, 116, 156)
- Level 2A Refractivity (GRM-01, 09, 40, 47, 60, 67, 117, 130, 137, 150, 157)
- Level 2B, 2C Temperature, Pressure, and Humidity (GRM-02 to 05, 10-13, 41-44, 48-51, 61-64, 68-71, 118-121, 131-134, 138-141, 151-154, 158-161)
- Level 2C Tropopause Height (GRM-24)
- Level 2C Planetary Boundary Layer Height (GRM-26)
- Level 3 Gridded Data (GRM-17 to 23, 53-59, 73-79, 83-89, 93-99, 107-113, 123-129, 143-149, 163-169, 191-194)Reprocessed Data Records (Climate Data Records) (GRM-28-R1, 29-R1, 30-R1, 32-R1, 33-R1; GRM-28-R2, 29-R2, 30-R2, 31-R2, 32-R2, 33-R2)
- ICDR products (GRM-29-I1, 29-I2)
- ROPP Software (GRM-16, 16_v10, 16_v11)
- GBGP Software (GRM-92)
- Ionosphere Products (GRM-170 to 173)

A2. Product Sizes:

EPS: BUFR files over EUMETCast:

- one file is about 15 KB
- total for Metop-A and B: 20 MB/day

EPS-SG: estimated size of BUFR files over EUMETCast:

- one file is about 15 KB
- total for two satellites with GPS and Galileo: 40 MB/day
- total for two satellites with GPS, Galileo, Beidou, GLONASS: 80 MB/day

Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



A3. Overview list of all GRM-ids for reprocessed data records:

Product ID	Product Name	Product Acronym
GRM-28-R1	Reprocessed Multi-Mission climate data record (Metop, COSMIC, CHAMP, GRACE L3)	REPMUL
GRM-28-L3-B-R1	Reprocessed Bending Angle Grid	RBGMUL
GRM-28-L3-R-R1	Reprocessed Refractivity Grid	RRGMUL
GRM-28-L3-D-R1	Reprocessed Dry Temperature Grid	RDGMUL
GRM-28-L3-Y-R1	Reprocessed Dry Pressure Grid	RYGMUL
GRM-28-L3-Z-R1	Reprocessed Dry Geopotential Height Grid	RZGMUL
GRM-28-L3-T-R1	Reprocessed Temperature Grid	RTGMUL
GRM-28-L3-H-R1	Reprocessed Specific Humidity Grid	RHGMUL
GRM-28-L3-C-R1	Reprocessed Tropopause Height Grid	RCGMUL
GRM-29-R1	Reprocessed Metop climate data record (Metop-A/B L1, L2, L3)	REPMET
GRM-29-L1-B-R1	Reprocessed Bending Angle	RBAMET
GRM-29-L2-R-R1	Reprocessed Refractivity Profile	RRPMET
GRM-29-L2-D-R1	Reprocessed Dry Temperature Profile	RDPMET
GRM-29-L2-T-R1	Reprocessed Temperature Profile	RTPMET
GRM-29-L2-H-R1	Reprocessed Specific Humidity Profile	RHPMET
GRM-29-L2-P-R1	Reprocessed Pressure Profile	RPPMET
GRM-29-L2-S-R1	Reprocessed Surface Pressure	RSPMET
GRM-29-L2-C-R1	Reprocessed Tropopause Height	RCHMET
GRM-29-L3-B-R1	Reprocessed Bending Angle Grid	RBGMET
GRM-29-L3-R-R1	Reprocessed Refractivity Grid	RRGMET
GRM-29-L3-D-R1	Reprocessed Dry Temperature Grid	RDGMET
GRM-29-L3-Y-R1	Reprocessed Dry Pressure Grid	RYGMET
GRM-29-L3-Z-R1	Reprocessed Dry Geopotential Height Grid	RZGMET
GRM-29-L3-T-R1	Reprocessed Temperature Grid	RTGMET
GRM-29-L3-H-R1	Reprocessed Specific Humidity Grid	RHGMET
GRM-29-L3-C-R1	Reprocessed Tropopause Height Grid	RCGMET
GRM-30-R1	Reprocessed COSMIC climate data record (COSMIC L1, L2, L3)	REPCO1
GRM-30-L1-B-R1	Reprocessed Bending Angle	RBACO1
GRM-30-L2-R-R1	Reprocessed Refractivity Profile	RRPCO1
GRM-30-L2-D-R1	Reprocessed Dry Temperature Profile	RDPCO1
GRM-30-L2-T-R1	Reprocessed Temperature Profile	RTPCO1
GRM-30-L2-H-R1	Reprocessed Specific Humidity Profile	RHPCO1
GRM-30-L2-P-R1	Reprocessed Pressure Profile	RPPCO1
GRM-30-L2-S-R1	Reprocessed Surface Pressure	RSPCO1



Product ID	Product Name	Product Acronym
GRM-30-L2-C-R1	Reprocessed Tropopause Height	RCHCO1
GRM-30-L3-B-R1	Reprocessed Bending Angle Grid	RBGCO1
GRM-30-L3-R-R1	Reprocessed Refractivity Grid	RRGCO1
GRM-30-L3-D-R1	Reprocessed Dry Temperature Grid	RDGCO1
GRM-30-L3-Y-R1	Reprocessed Dry Pressure Grid	RYGCO1
GRM-30-L3-Z-R1	Reprocessed Dry Geopotential Height Grid	RZGCO1
GRM-30-L3-T-R1	Reprocessed Temperature Grid	RTGCO1
GRM-30-L3-H-R1	Reprocessed Specific Humidity Grid	RHGCO1
GRM-30-L3-C-R1	Reprocessed Tropopause Height Grid	RCGCO1
GRM-32-R1	Reprocessed CHAMP climate data record (CHAMP L1, L2, L3)	REPCHA
GRM-32-L1-B-R1	Reprocessed Bending Angle	RBACHA
GRM-32-L2-R-R1	Reprocessed Refractivity Profile	RRPCHA
GRM-32-L2-D-R1	Reprocessed Dry Temperature Profile	RDPCHA
GRM-32-L2-T-R1	Reprocessed Temperature Profile	RTPCHA
GRM-32-L2-H-R1	Reprocessed Specific Humidity Profile	RHPCHA
GRM-32-L2-P-R1	Reprocessed Pressure Profile	RPPCHA
GRM-32-L2-S-R1	Reprocessed Surface Pressure	RSPCHA
GRM-32-L2-C-R1	Reprocessed Tropopause Height	RCHCHA
GRM-32-L3-B-R1	Reprocessed Bending Angle Grid	RBGCHA
GRM-32-L3-R-R1	Reprocessed Refractivity Grid	RRGCHA
GRM-32-L3-D-R1	Reprocessed Dry Temperature Grid	RDGCHA
GRM-32-L3-Y-R1	Reprocessed Dry Pressure Grid	RYGCHA
GRM-32-L3-Z-R1	Reprocessed Dry Geopotential Height Grid	RZGCHA
GRM-32-L3-T-R1	Reprocessed Temperature Grid	RTGCHA
GRM-32-L3-H-R1	Reprocessed Specific Humidity Grid	RHGCHA
GRM-32-L3-C-R1	Reprocessed Tropopause Height Grid	RCGCHA
GRM-33-R1	Reprocessed GRACE climate data record (CHAMP L1, L2, L3)	REPGRA
GRM-33-L1-B-R1	Reprocessed Bending Angle	RBAGRA
GRM-33-L2-R-R1	Reprocessed Refractivity Profile	RRPGRA
GRM-33-L2-D-R1	Reprocessed Dry Temperature Profile	RDPGRA
GRM-33-L2-T-R1	Reprocessed Temperature Profile	RTPGRA
GRM-33-L2-H-R1	Reprocessed Specific Humidity Profile	RHPGRA
GRM-33-L2-P-R1	Reprocessed Pressure Profile	RPPGRA
GRM-33-L2-S-R1	Reprocessed Surface Pressure	RSPGRA
GRM-33-L2-C-R1	Reprocessed Tropopause Height	RCHGRA
GRM-33-L3-B-R1	Reprocessed Bending Angle Grid	RBGGRA
GRM-33-L3-R-R1	Reprocessed Refractivity Grid	RRGGRA
GRM-33-L3-D-R1	Reprocessed Dry Temperature Grid	RDGGRA
GRM-33-L3-Y-R1	Reprocessed Dry Pressure Grid	RYGGRA



Product ID	Product Name	Product Acronym
GRM-33-L3-Z-R1	Reprocessed Dry Geopotential Height Grid	RZGGRA
GRM-33-L3-T-R1	Reprocessed Temperature Grid	RTGGRA
GRM-33-L3-H-R1	Reprocessed Specific Humidity Grid	RHGGRA
GRM-33-L3-C-R1	Reprocessed Tropopause Height Grid	RCGGRA

Product ID	Product Name	Product Acronym
GRM-28-R2	Reprocessed Multi-Mission climate data record (Metop, COSMIC, CHAMP, GRACE L3)	REPMUL
GRM-28-L3-B-R2	Reprocessed Bending Angle Grid	RBGMUL
GRM-28-L3-R-R2	Reprocessed Refractivity Grid	RRGMUL
GRM-28-L3-D-R2	Reprocessed Dry Temperature Grid	RDGMUL
GRM-28-L3-Y-R2	Reprocessed Dry Pressure Grid	RYGMUL
GRM-28-L3-Z-R2	Reprocessed Dry Geopotential Height Grid	RZGMUL
GRM-28-L3-T-R2	Reprocessed Temperature Grid	RTGMUL
GRM-28-L3-H-R2	Reprocessed Specific Humidity Grid	RHGMUL
GRM-28-L3-C-R2	Reprocessed Tropopause Height Grid	RCGMUL
GRM-28-L3-L-R2	Reprocessed Planetary Boundary Layer Height Grid	RLGMUL
GRM-29-R2	Reprocessed Metop dataset climate data record (Metop-A/B L1, L2, L3)	REPMET
GRM-29-L1-B-R2	Reprocessed Bending Angle	RBAMET
GRM-29-L2-R-R2	Reprocessed Refractivity Profile	RRPMET
GRM-29-L2-D-R2	Reprocessed Dry Temperature Profile	RDPMET
GRM-29-L2-T-R2	Reprocessed Temperature Profile	RTPMET
GRM-29-L2-H-R2	Reprocessed Specific Humidity Profile	RHPMET
GRM-29-L2-P-R2	Reprocessed Pressure Profile	RPPMET
GRM-29-L2-S-R2	Reprocessed Surface Pressure	RSPMET
GRM-29-L2-C-R2	Reprocessed Tropopause Height	RCHMET
GRM-29-L2-L-R2	Reprocessed Planetary Boundary Layer Height	RLHMET
GRM-29-L3-B-R2	Reprocessed Bending Angle Grid	RBGMET
GRM-29-L3-R-R2	Reprocessed Refractivity Grid	RRGMET
GRM-29-L3-D-R2	Reprocessed Dry Temperature Grid	RDGMET
GRM-29-L3-Y-R2	Reprocessed Dry Pressure Grid	RYGMET
GRM-29-L3-Z-R2	Reprocessed Dry Geopotential Height Grid	RZGMET
GRM-29-L3-T-R2	Reprocessed Temperature Grid	RTGMET
GRM-29-L3-H-R2	Reprocessed Specific Humidity Grid	RHGMET
GRM-29-L3-C-R2	Reprocessed Tropopause Height Grid	RCGMET
GRM-29-L3-L-R2	Reprocessed Planetary Boundary Layer Height Grid	RLGMET



Product ID	Product Name	Product Acronym
GRM-30-R2	Reprocessed COSMIC-1 climate data record (COSMIC-1 L1, L2, L3)	REPCO1
GRM-30-L1-B-R2	Reprocessed Bending Angle	RBACO1
GRM-30-L2-R-R2	Reprocessed Refractivity Profile	RRPCO1
GRM-30-L2-D-R2	Reprocessed Dry Temperature Profile	RDPCO1
GRM-30-L2-T-R2	Reprocessed Temperature Profile	RTPCO1
GRM-30-L2-H-R2	Reprocessed Specific Humidity Profile	RHPCO1
GRM-30-L2-P-R2	Reprocessed Pressure Profile	RPPCO1
GRM-30-L2-S-R2	Reprocessed Surface Pressure	RSPCO1
GRM-30-L2-C-R2	Reprocessed Tropopause Height	RCHCO1
GRM-30-L2-L-R2	Reprocessed Planetary Boundary Layer Height	RLHCO1
GRM-30-L3-B-R2	Reprocessed Bending Angle Grid	RBGCO1
GRM-30-L3-R-R2	Reprocessed Refractivity Grid	RRGCO1
GRM-30-L3-D-R2	Reprocessed Dry Temperature Grid	RDGCO1
GRM-30-L3-Y-R2	Reprocessed Dry Pressure Grid	RYGCO1
GRM-30-L3-Z-R2	Reprocessed Dry Geopotential Height Grid	RZGCO1
GRM-30-L3-T-R2	Reprocessed Temperature Grid	RTGCO1
GRM-30-L3-H-R2	Reprocessed Specific Humidity Grid	RHGCO1
GRM-30-L3-C-R2	Reprocessed Tropopause Height Grid	RCGCO1
GRM-30-L3-L-R2	Reprocessed Planetary Boundary Layer Height Grid	RLGCO1
GRM-31-R2	Reprocessed COSMIC-2 climate data record (COSMIC-2 L1, L2, L3)	REPCO2
GRM-31-L1-B-R2	Reprocessed Bending Angle	RBACO2
GRM-31-L2-R-R2	Reprocessed Refractivity Profile	RRPCO2
GRM-31-L2-D-R2	Reprocessed Dry Temperature Profile	RDPCO2
GRM-31-L2-T-R2	Reprocessed Temperature Profile	RTPCO2
GRM-31-L2-H-R2	Reprocessed Specific Humidity Profile	RHPCO2
GRM-31-L2-P-R2	Reprocessed Pressure Profile	RPPCO2
GRM-31-L2-S-R2	Reprocessed Surface Pressure	RSPCO2
GRM-31-L2-C-R2	Reprocessed Tropopause Height	RCHCO2
GRM-31-L2-L-R2	Reprocessed Planetary Boundary Layer Height	RLHCO2
GRM-31-L3-B-R2	Reprocessed Bending Angle Grid	RBGCO2
GRM-31-L3-R-R2	Reprocessed Refractivity Grid	RRGCO2
GRM-31-L3-D-R2	Reprocessed Dry Temperature Grid	RDGCO2
GRM-31-L3-Y-R2	Reprocessed Dry Pressure Grid	RYGCO2
GRM-31-L3-Z-R2	Reprocessed Dry Geopotential Height Grid	RZGCO2
GRM-31-L3-T-R2	Reprocessed Temperature Grid	RTGCO2
GRM-31-L3-H-R2	Reprocessed Specific Humidity Grid	RHGCO2
GRM-31-L3-C-R2	Reprocessed Tropopause Height Grid	RCGCO2
GRM-31-L3-L-R2	Reprocessed Planetary Boundary Layer Height Grid	RLGCO2
GRM-32-R2	Reprocessed CHAMP climate data record	REPCHA



Product ID	D Product Name		
	(CHAMP L1, L2, L3)		
GRM-32-L1-B-R2	Reprocessed Bending Angle	RBACHA	
GRM-32-L2-R-R2	Reprocessed Refractivity Profile	RRPCHA	
GRM-32-L2-D-R2	Reprocessed Dry Temperature Profile	RDPCHA	
GRM-32-L2-T-R2	Reprocessed Temperature Profile	RTPCHA	
GRM-32-L2-H-R2	Reprocessed Specific Humidity Profile	RHPCHA	
GRM-32-L2-P-R2	Reprocessed Pressure Profile	RPPCHA	
GRM-32-L2-S-R2	Reprocessed Surface Pressure	RSPCHA	
GRM-32-L2-C-R2	Reprocessed Tropopause Height	RCHCHA	
GRM-32-L2-L-R2	Reprocessed Planetary Boundary Layer Height	RLGCHA	
GRM-32-L3-B-R2	Reprocessed Bending Angle Grid	RBGCHA	
GRM-32-L3-R-R2	Reprocessed Refractivity Grid	RRGCHA	
GRM-32-L3-D-R2	Reprocessed Dry Temperature Grid	RDGCHA	
GRM-32-L3-Y-R2	Reprocessed Dry Pressure Grid	RYGCHA	
GRM-32-L3-Z-R2	Reprocessed Dry Geopotential Height Grid	RZGCHA	
GRM-32-L3-T-R2	Reprocessed Temperature Grid	RTGCHA	
GRM-32-L3-H-R2	Reprocessed Specific Humidity Grid	RHGCHA	
GRM-32-L3-C-R2	Reprocessed Tropopause Height Grid	RCGCHA	
GRM-32-L3-L-R2	Reprocessed Planetary Boundary Layer Height Grid	RLGCHA	
GRM-33-R2	Reprocessed GRACE climate data record (GRACE L1, L2, L3)	REPGRA	
GRM-33-L1-B-R2	Reprocessed Bending Angle	RBAGRA	
GRM-33-L2-R-R2	Reprocessed Refractivity Profile	RRPGRA	
GRM-33-L2-D-R2	Reprocessed Dry Temperature Profile	RDPGRA	
GRM-33-L2-T-R2	Reprocessed Temperature Profile	RTPGRA	
GRM-33-L2-H-R2	Reprocessed Specific Humidity Profile	RHPGRA	
GRM-33-L2-P-R2	Reprocessed Pressure Profile	RPPGRA	
GRM-33-L2-S-R2	Reprocessed Surface Pressure	RSPGRA	
GRM-33-L2-C-R2	Reprocessed Tropopause Height	RCHGRA	
GRM-33-L2-L-R2	Reprocessed Planetary Boundary Layer Height	RLGGRA	
GRM-33-L3-B-R2	Reprocessed Bending Angle Grid	RBGGRA	
GRM-33-L3-R-R2	Reprocessed Refractivity Grid	RRGGRA	
GRM-33-L3-D-R2	Reprocessed Dry Temperature Grid	RDGGRA	
GRM-33-L3-Y-R2	Reprocessed Dry Pressure Grid	RYGGRA	
GRM-33-L3-Z-R2	Reprocessed Dry Geopotential Height Grid	RZGGRA	
GRM-33-L3-T-R2	Reprocessed Temperature Grid	RTGGRA	
GRM-33-L3-H-R2	Reprocessed Specific Humidity Grid	RHGGRA	
GRM-33-L3-C-R2	Reprocessed Tropopause Height Grid	RCGGRA	
GRM-33-L3-L-R2	Reprocessed Planetary Boundary Layer Height Grid	RLGGRA	

Issue: 3.4 Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



A3. Overview list of all GRM-ids for ICDRs:

Product ID	Product Name	Product Acronym			
GRM-29-I1	Metop Interim Climate Data Record (Data Levels L1B, L2, L3)	ICDRMET			
GRM-29-L1-B-I1	ICDR Bending Angle	IBAMET			
GRM-29-L2-R-I1	ICDR Refractivity Profile	IRPMET			
GRM-29-L2-D-I1	ICDR Dry Temperature Profile	IDPMET			
GRM-29-L2-T-I1	ICDR Temperature Profile	ITPMET			
GRM-29-L2-H-I1	ICDR Specific Humidity Profile	IHPMET			
GRM-29-L2-P-I1	ICDR Pressure Profile	IPPMET			
GRM-29-L2-S-I1	ICDR Surface Pressure	ISPMET			
GRM-29-L2-C-I1	ICDR Tropopause Height	ICHMET			
GRM-29-L3-B-I1	ICDR Bending Angle Grid	IBGMET			
GRM-29-L3-R-I1	ICDR Refractivity Grid	IRGMET			
GRM-29-L3-D-I1	ICDR Dry Temperature Grid	IDGMET			
GRM-29-L3-Y-I1	ICDR Dry Pressure Grid	IYGMET			
GRM-29-L3-Z-I1	ICDR Dry Geopotential Height Grid	IZGMET			
GRM-29-L3-T-I1	ICDR Temperature Grid	ITGMET			
GRM-29-L3-H-I1	ICDR Specific Humidity Grid	IHGMET			
GRM-29-L3-C-I1	ICDR Tropopause Height Grid	ICGMET			
GRM-29-I2	Metop Interim Climate Data Record (Data Levels L1B, L2, L3)	ICDRMET			
GRM-29-L1-B-I2	ICDR Bending Angle	IBAMET			
GRM-29-L2-R-I2	ICDR Refractivity Profile	IRPMET			
GRM-29-L2-D-I2	ICDR Dry Temperature Profile	IDPMET			
GRM-29-L2-T-I2	ICDR Temperature Profile	ITPMET			
GRM-29-L2-H-I2	ICDR Specific Humidity Profile	IHPMET			
GRM-29-L2-P-I2	ICDR Pressure Profile	IPPMET			
GRM-29-L2-S-I2	ICDR Surface Pressure	ISPMET			
GRM-29-L2-C-I2	ICDR Tropopause Height	ICHMET			
GRM-29-L3-B-I2	ICDR Bending Angle Grid	IBGMET			
GRM-29-L3-R-I2	ICDR Refractivity Grid	IRGMET			
GRM-29-L3-D-I2	ICDR Dry Temperature Grid	IDGMET			
GRM-29-L3-Y-I2	ICDR Dry Pressure Grid	IYGMET			
GRM-29-L3-Z-I2	ICDR Dry Geopotential Height Grid	IZGMET			
GRM-29-L3-T-I2	ICDR Temperature Grid	ITGMET			
GRM-29-L3-H-I2	ICDR Specific Humidity Grid	IHGMET			
GRM-29-L3-C-I2	ICDR Tropopause Height Grid	ICGMET			

Issue: 3.4 Date: 26 January 2019

ROM SAF CDOP-3 Product Requirements Document



A4. Product Requirements Tables

(On the following pages)



GRM-01 N	RT Refractiv	ity Pı	rofile		NRPMEA		PRD_v3.4
Type			NRT Product				
Applications and Users		NWP					
Characteristics and	d Methods		hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellit	te Input Data		Metop-A/GRAS				
Other Operational	Input Data		GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination			_				
Format		Ме	Means		Timeliness		
E		EU	GTS EUMETCast Web		3 h		
Accuracy		•					
Threshold Ta		Tai	Target		Optimal		
5 – 30 km: 1.8%		5	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		
Notes An accuracy intervious over the given vertical expression of the contract of the contrac		val means a linearly changing quantity between the two values tical coordinate					
Verification/Validation Methods Sta		Standard deviation of (Product – ECMWF forecasts)					
Coverage, Resolution							
Spatial Coverage	Horiz	orizontal Resolution		Vertical Resolution		Temporal Re	solution
Global	GRAS resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ition	



GRM-02	RM-02 NRT Temperature Profile				NTPMEA		PRD_v3.4	
Туре			NRT Product	NRT Product				
Applications and Users		NWP	NWP					
Characteristics ar	nd Method	ds		model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satel	lite Input	Data	Metop-A/GRA	Metop-A/GRAS				
Other Operationa	l Input Da	ata	Metop orbits (F	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination			-					
Format			Means		Timeliness			
E		GTS EUMETCast Web		3 h				
Accuracy					-			
Threshold			Target		Optimal			
5 – 30 km: 3 K		30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K				
Notes An accuracy inter- over the given ver		val means a linearly changing quantity between the two values rtical coordinate						
Verification/Validation Methods Sta		Standard deviation of (1D-Var solution – ECMWF analysis)						
Coverage, Resolution								
Spatial Coverage		Horizontal Resolution		Vertical Resolution		Temporal Re	solution	
Global GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ition			



GRM-03 NRT Spe	umidity Profile		NHPMEA		PRD_v3.4		
Type NRT Produc							
Applications and Users		NWP	NWP				
Characteristics and Metho	ods		model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-A/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination		-					
Format		Means		Timeliness			
E		GTS EUMETCast Web		3 h			
Accuracy							
Threshold		Target		Optimal			
0 0		0.6 g/kg 10% *		0.3 g/kg 10% *			
Notes		* whichever is grea The interval 0 – 12					
Verification/Validation Methods Sta		Standard deviation of (1D-Var solution – ECMWF analysis)					
Coverage, Resolution							
Spatial Coverage Horizontal Resolution		Vertical Resolution		Temporal Re	solution		
Global GRAS resolution		resolution	model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ition	



GRM-04 NRT Pressure Profile				NPPMEA	PRD_v3.4		
Type NRT Product							
Applications and Users		NWP	NWP				
Characteristics and Metho	ods	,	model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-A/GRAS	Metop-A/GRAS				
Other Operational Input Data		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		<u>.</u>					
Format		Means		Timeliness			
EL		GTS EUMETCast Web		3 h			
Accuracy							
Threshold		Target		Optimal			
b) 0.75% b)		a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *			
Notes			eatest of (a) and (b) but not greater than (c); 0 km is considered				
Verification/Validation Methods Sta		Standard deviation of (1D-Var solution – ECMWF analysis)					
Coverage, Resolution							
Spatial Coverage	Horizontal Resolution		Vertical Resolution		Temporal Resolution		
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution		



GRM-05	NRT Sur	face Pr	essure		NSPMEA	PRD_v3.4		
Туре	-		NRT Product					
Applications and	d Users		NWP	NWP				
Characteristics	and Metho	ods	Scalar at surf	ace				
Operational Sat	ellite Input	Data	Metop-A/GRA	AS .				
Other Operational Input Data			Metop orbits	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination								
Format			Means		Timeliness			
BUFR/netCDF	EL		GTS EUMETCast Web	UMETCast		3 h		
Accuracy								
Threshold			Target		Optimal			
2.4 hPa			0.8 hPa		0.7 hPa			
Notes								
Verification/Validation Methods Sta			Standard deviation	andard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Res	olution							
Spatial Coverage	Spatial Coverage Horizontal Resolution		Vertical Resoluti	on	Temporal Resolution			
Global		GRAS	resolution	Scalar at surface)	GRAS resolution		



GRM-08 Offline E	Bending	Angle		OBAMEA		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	Climate and atmosphere researchers			
Characteristics and Metho	ods	hi-res wave opt	ics sampling; 247 fixed levels			
Operational Satellite Input	t Data	Metop-A/GRAS	3			
Other Operational Input D	ata	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN			
Dissemination						
Format		Means		Timeliness		
netCDF BUFR	,	Web		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
35 – 60 km: 4 murad 8 – 35 km: 4% 2 – 8 km: 20% - 4%	:	35 – 60 km: 2 murad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 murad 8 – 35 km: 1% 2 – 8 km: 5% - 1%		
Notes		An accuracy interva over the given verti BA noise above 60	ical coordinate			
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Resolution						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	pbal RO resolution		hi-res wave optic sampling; interpolated to 24 levels		GRAS resolu	ition



GRM-09 Offline	Refractiv	rity Profile		ORPMEA		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	ate and atmosphere researchers				
Characteristics and Meth	•	hi-res wave optics sampling; interpolated to 247 fixed levels					
Operational Satellite Inpu	ıt Data	Metop-A/GRAS	3				
Other Operational Input [Data	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format		Means		Timeliness			
netCDF BUFR		Web	5 - 30 d				
Accuracy							
Threshold		Target O		Optimal	Optimal		
30 – 50 km: 0.06 N-units 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%			
Notes		An accuracy interva		y changing	quantity betwe	een the two values	
Verification/Validation Me	ethods	Standard deviation	of (Product – ECI	MWF foreca	asts)		
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global RO resolution		olution	hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ution	



GRM-10 Offline T	empera	ature Profile		ОТРМЕА		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	tmosphere researchers			
			with interpolation); 247 fixed levels			
Operational Satellite Input	Data	Metop-A/GRAS	3			
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-				
Format		Means		Timeliness		
netCDF BUFR		Web		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K		
Notes		An accuracy intervented over the given vert		y changing	quantity betwe	een the two values
Verification/Validation Me	thods	Standard deviation	on of (1D-Var solution – ECMWF analysis)			
Coverage, Resolution						
Spatial Coverage	Horizon	ntal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	GRAS resolution		model levels (wit interpolation); interpolated to 24 levels		GRAS resolu	ition



GRM-11	Offline S	pecific	Hui	midity Profile		ОНРМЕА		PRD_v3.4
Туре				Offline Product				
Applications and	Users			Climate and atmosphere researchers				
				model levels (with interpolation); interpolated to 247 fixed levels				
Operational Sate	ellite Input	Data		Metop-A/GRAS	3			
Other Operational Input Data				GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination								
Format			Me	Means Ti		Timeliness		
netCDF BUFR			We	Neb 5 - 30 d		5 - 30 d		
Accuracy								
Threshold			Tar	Target		Optimal		
1.8 g/kg 30% *			0.6 10%	g/kg % *		0.3 g/kg 10% *		
Notes				hichever is grea e interval 0 – 12	iter; km is considered			
Verification/Valid	lation Met	hods	Sta	ndard deviation	of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Reso	olution							
Spatial Coverage	Э	Horizor	ntal I	Resolution	Vertical Resolution	on	Temporal Re	solution
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ition		



GRM-12 Offline F	Pressure	Profile		ОРРМЕА		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	atmosphere researchers				
			(with interpolation); to 247 fixed levels				
Operational Satellite Input	t Data	Metop-A/GRAS	3				
Other Operational Input D	ata	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		<u>-</u>					
Format		Means		Timeliness			
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *			
Notes			whichever is greatest of (a) and (b) but not greater than (c); ne interval 0 – 50 km is considered				
Verification/Validation Me	thods	Standard deviation	eviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Reso	olution	
Global	-		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution	on	



GRM-13	Offline S	Surface	Pressure		OSPMEA		PRD_v3.4	
Туре			Offline Produ	ct				
Applications and Users			Climate and a	Climate and atmosphere researchers				
Characteristics	and Metho	ods	Scalar at surf	ace				
Operational Sa	itellite Input	t Data	Metop-A/GRA	AS				
Other Operational Input Data			Metop orbits	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination	n							
Format			Means	Means		Timeliness		
netCDF BUFR			Web	Veb		5 - 30 d		
Accuracy								
Threshold			Target		Optimal			
2.4 hPa			0.8 hPa		0.7 hPa			
Notes					•			
Verification/Validation Methods Sta			Standard deviation	Standard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Re	solution							
Spatial Coverage Horizontal F		ntal Resolution	Vertical Resolution	on Temporal Re		solution		
Global		GRAS	resolution	Scalar at surface	Scalar at surface		tion	



GRM-16 Radio O	ccultati	on Processing Pa	ackage	ROPP		PRD_v3.4	
Туре		Software Prod	luct				
Applications and Users		NWP, RO data	a suppliers, scientif	fic users			
Characteristics and Metho	ods		andling RO data (in		, pre-processir	ng, forward	
Operational Satellite Inpu	Metop-A/GRA Metop-SG COSMIC COSMIC-2 CHAMP GPS/MET GRACE TerraSAR-X TanDEM-X Oceansat-2/R Megha-Tropiq PAZ GNOS	OSA					
Other Operational Input D	ata	N/A	N/A				
Dissemination							
Format		Means		Timeliness	3		
tarballs		Web		N/A			
Accuracy							
Threshold		Target		Optimal			
N/A		N/A		N/A			
Notes							
Verification/Validation Me	Test Folder	est Folder					
Coverage, Resolution							
Spatial Coverage	Horizontal Resolution		Vertical Resolution		Temporal Resolution		
N/A	N/A		N/A	N/A		N/A	



GRM-16_v7 Radio O	ccultation	on Processing Pa	ckage	ROPP_v7		PRD_v3.4	
Туре		Software Produ	uct				
Applications and Users		NWP, RO data	suppliers, scientif	ic users			
Characteristics and Metho	ods	See GRM-16					
Operational Satellite Inpu	t Data	See GRM-16					
Other Operational Input D	ata	N/A					
Dissemination		<u>.</u>					
Format		Means	Timeliness				
tarballs		Web	N/A				
Accuracy							
Threshold		Target	arget		Optimal		
N/A		N/A	A		N/A		
Notes							
Verification/Validation Me	Test Folder	st Folder					
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution		Temporal Re	solution	
N/A	N/A		N/A		N/A		



GRM-16_v8 Radio O	ccultatio	on Processing Pac	ckage	ROPP_v8		PRD_v3.4	
Туре		Software Produ	ıct				
Applications and Users		NWP, RO data	suppliers, scientif	ic users			
Characteristics and Metho	ods	See GRM-16					
Operational Satellite Input	Data	See GRM-16					
Other Operational Input D	ata	N/A					
Dissemination							
Format		Means	Timeliness				
tarballs	,	Web	N/A				
Accuracy							
Threshold	-	Target	arget		Optimal		
N/A		N/A	A		N/A		
Notes							
Verification/Validation Me	Test Folder	st Folder					
Coverage, Resolution							
Spatial Coverage	Horizont	tal Resolution	Vertical Resolution		Temporal Re	solution	
N/A	N/A		N/A		N/A		



GRM-16_v9 Radio O	ccultatio	on Processing Pag	ckage	ROPP_v9		PRD_v3.4	
Туре		Software Produ	ıct				
Applications and Users		NWP, RO data	suppliers, scientif	ic users			
Characteristics and Metho	ods	See GRM-16					
Operational Satellite Input	Data	See GRM-16					
Other Operational Input D	ata	N/A					
Dissemination							
Format		Means	Timeliness				
tarballs	,	Web	N/A				
Accuracy							
Threshold	-	Target	arget		Optimal		
N/A		N/A		N/A			
Notes							
Verification/Validation Me	Test Folder	st Folder					
Coverage, Resolution							
Spatial Coverage	Horizont	tal Resolution	Vertical Resolution		Temporal Re	solution	
N/A	N/A		N/A		N/A		



GRM-16_v10 Radio C	ccultati	on Processing Pa	ackage	ROPP_v1	0	PRD_v3.4	
Туре		Software Prod	luct				
Applications and Users		NWP, RO data	NWP, RO data suppliers, scientific users				
Characteristics and Meth-	ods	See GRM-16					
Operational Satellite Inpu	t Data	See GRM-16					
Other Operational Input D	Data	N/A					
Dissemination		•					
Format		Means	eans Time		i		
tarballs		Web	N/A				
Accuracy							
Threshold		Target	ırget		Optimal		
N/A		N/A		N/A			
Notes							
Verification/Validation Me	thods	Test Folder	st Folder				
Coverage, Resolution							
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution		Temporal Re	solution	
N/A	N/A		N/A		N/A		



GRM-16_v11 Radio O	ccultatio	on Processing Pa	ckage	ROPP_v1	1	PRD_v3.4	
Туре		Software Produ	uct				
Applications and Users	NWP, RO data	NWP, RO data suppliers, scientific users					
Characteristics and Metho	See GRM-16						
Operational Satellite Input	See GRM-16						
Other Operational Input D	N/A						
Dissemination		-					
Format	Format Me		Means		Timeliness		
tarballs		Web	Veb				
Accuracy							
Threshold		Target	arget		Optimal		
N/A		N/A	i/A		N/A		
Notes							
Verification/Validation Me	thods	Test Folder	est Folder				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution		Temporal Re	solution	
N/A	N/A		N/A		N/A		



GRM-17 Offline Ber	nding An	gle Grid		OBGCO1		PRD_v3.4
Туре		Offline Product	Offline Product			
Applications and Users		Climate and atmosphere researchers				
Characteristics and Methods	3	Zonal monthly r	means on 200 m x	5 deg grid	S	
Operational Satellite Input D	ata	COSMIC Post-	processed data			
Other Operational Input Data	a	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)
Dissemination						
Format	Ме	ans		Timeliness	i	
netCDF	We	eb	30 - 180 d			
Accuracy						
Threshold	Ta	Target		Optimal		
25 – 50 km: 0.4 % or 0.8 murad*) 8 – 25 km: 0.4 % 0 – 8 km: 4 – 0.4 %	8	25 – 50 km: 0.2 % or 0.4 murad*) 8 – 25 km: 0.2 % 0 – 8 km: 2.0– 0.20 %		25 – 50 km: 0.10 % or 0.2 murad*) 8 – 25 km: 0.10 % 0 – 8 km: 1.0 – 0.10 %		
Notes	An	* whichever is greater; An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate				
Verification/Validation Metho		Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.				
Coverage, Resolution						
Spatial Coverage He	orizontal	Resolution	Vertical Resolution		Temporal Resolution	
Global 5	deg latitu	ıde	200 m		1 month	



GRM-18 Offline Re	efractivity	Grid		ORGC01		PRD_v3.4
Туре		Offline Product	Offline Product			
Applications and Users		Climate and atmosphere researchers				
Characteristics and Method	ls	Zonal monthly r	means on 200 m >	5 deg grid	S	
Operational Satellite Input [Data	COSMIC Post-	processed data			
Other Operational Input Da	ta	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)
Dissemination						
Format	Me	eans		Timeliness		
netCDF	We	eb 30 - 180 d		30 - 180 d		
Accuracy						
Threshold	Та	Target		Optimal		
25 – 50 km: 0.16 % or 0.00 units*) 8 – 25 km: 0.16 % 0 – 8 km: 1.6 – 0.16 %	uni 8	25 – 50 km: 0.08 % or 0.004 N- units*) 8 – 25 km: 0.08 % 0 – 8 km: 0.8 – 0.08 %		25 – 50 km: 0.04 % or 0.002 N-units*) 8 – 25 km: 0.04 % 0 – 8 km: 0.4 – 0.04 %		
Notes	An	* whichever is greater; An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate;				
Verification/Validation Meth		Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.				
Coverage, Resolution						
Spatial Coverage	Spatial Coverage Horizontal R		Vertical Resolution		Temporal Resolution	
Global 5	5 deg latitu	ıde	200 m		1 month	



GRM-19 Offline T	empera	ture Grid		OTGCO1		PRD_v3.4
Туре		Offline Product				
Applications and Users	Climate and atr	mosphere researc	hers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S	
Operational Satellite Input	Data	COSMIC Post-	processed data			
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination						
Format	I	Means		Timeliness		
netCDF	,	Web		30 - 180 d		
Accuracy						
Threshold	-	Target	Optimal			
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: 2.0 – 0.4 K		25 – 50 km: 0.2 – 2 K 8 – 25 km: 0.2 K 0 – 8 km: 1.0 – 0.2 K		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: 0.50 – 0.10 K		
Notes		An accuracy intervance the given verti		y changing	quantity betwe	een the two values
			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.			
Coverage, Resolution						
Spatial Coverage	e Horizontal Resolution		Vertical Resolution		Temporal Resolution	
Global	5 deg la	titude	200 m 1 month			



GRM-20	Offline S	Specific	Humidity Grid		OHGCO1		PRD_v3.4	
Туре	-		Offline Product					
Applications and	d Users		Climate and at	mosphere researc	hers			
Characteristics and Methods			Zonal monthly	means on 200 m	x 5 deg grid	s		
Operational Sat	ellite Inpu	t Data	COSMIC Post-	processed data				
Other Operational Input Data			ECMWF ERA	Interim (validation,	sampling e	rror estimatio	n)	
Dissemination			<u>.</u>					
Format			Means		Timeliness	Timeliness		
netCDF \		Web		30 - 180 d				
Accuracy								
Threshold			Target		Optimal			
8 – 12 km: 6.0 % 0 – 8 km: 6.0	•		8 – 12 km: 3.0 % 0 – 8 km: 3.0 %		8 – 12 km: 1.5 % 0 – 8 km: 1.5 %			
Notes			An accuracy interv		nearly changing quantity between the two values te			
				Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.				
Coverage, Res	olution							
Spatial Coverag	е	Horizontal Resolution		Vertical Resolution		Temporal Resolution		
Global		5 deg la	titude	200 m		1 month		



GRM-21 Climate	Dry Geo	potential Height		OZGCO1		PRD_v3.4	
Туре		Offline Product					
Applications and Users	Climate and atr	mosphere researc	hers				
Characteristics and Metho	Zonal monthly	means on 200 m >	k 5 deg grid	S			
Operational Satellite Input	t Data	COSMIC Post-	processed data				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)	
Dissemination							
Format		Means		Timeliness			
netCDF		Web		30 - 180 d			
Accuracy							
Threshold		Target	Optimal				
25 – 50 km: 8 – 80 m 8 – 25 km: 8 m 0 - 8 km: –		25 – 50 km: 4 – 40 m 8 – 25 km: 4 m 0 – 8 km: –		25 – 50 km: 2 – 20 m 8 – 25 km: 2 m 0 – 8 km: –			
Notes			acy interval means a linearly changing quantity between the two values given vertical coordinate				
Verification/Validation Me			Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg la	titude	200 m		1 month		



GRM-22 Offline D	ry Temp	erature Grid		ODGCO1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	mosphere researc	hers		
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S	
Operational Satellite Input	Data	COSMIC Post-	processed data			
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination		<u>:</u>				
Format	N	Means		Timeliness		
netCDF	١	Web		30 - 180 d		
Accuracy						
Threshold	1	Target		Optimal		
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: –	2	25 – 50 km: 0.2 – 2 K 8 – 25 km: 0.2 K 0 – 8 km: –		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: –		
Notes		An accuracy intervented the given vertices and the control of the		y changing	quantity betwe	een the two values
Verification/Validation Met			of differences relative to ECMWF ERA Interim.Resampling statistics: arison of RO data subsets.			
Coverage, Resolution	•					
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg lat	itude	200 m		1 month	



GRM-23 Offline I	Ory Press	ure Grid		OYGC01		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researc	hers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S		
Operational Satellite Input	t Data	COSMIC Post-	processed data				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination		-					
Format	N	/leans		Timeliness			
netCDF	V	Web		30 - 180 d			
Accuracy							
Threshold	Т	Target		Optimal			
25 – 50 km: 0.16 – 0.80 % 8 – 25 km: 0.16 % 0 – 8 km –		25 – 50 km: 0.08 – 0.40 % 8 – 25 km: 0.08 % 0 – 8 km: –		25 – 50 km: 0.04 – 0.20 % 8 – 25 km: 0.04 % 0 – 8 km: –			
Notes		An accuracy interva		early changing quantity between the two values			
Verification/Validation Me			stics of differences relative to ECMWF ERA Interim.Resampling statistics: -comparison of RO data subsets.				
Coverage, Resolution	<u> </u>						
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude	200 m 1		1 month		



GRM-24	Tropopa	use He	ight		ТРН		PRD_v3.4	
Туре				NRT Product Offline Product Reprocessed Product				
Applications ar	d Users		NWP, Climate	and atmosphere r	esearchers			
Characteristics and Methods			One scalar val	ue based on the d	ry temperat	ure lapse rate		
Operational Satellite Input Data			All ROM SAF I	RO products				
Other Operational Input Data			ECMWF fields					
Dissemination	1							
Format			Means	leans		Timeliness		
netCDF			Web			NRT: 80 min - 3 h Offline: 5 - 30 d		
Accuracy								
Threshold			Target	arget		Optimal		
2 km			1 km		0.5 km			
Notes								
Verification/Va	idation Me	thods	Standard deviation	Standard deviation of (TPH product ERA Interim analysis)				
Coverage, Re	solution							
Spatial Covera	ge	Horizontal Resolution		Vertical Resolution		Temporal Resolution		
Global		RO res	olution	Scalar		RO resolution		



GRM-26	Planetar	y Boun	dary Layer Heigh	t	PBLH		PRD_v3.4	
Туре	Туре			NRT Product Offline Product Reprocessed Product				
Applications and Users			NWP, Climate	NWP, Climate and atmosphere researchers				
Characteristics a	and Metho	ds	TBD					
Operational Satellite Input Data			All ROM SAF	RO products				
Other Operational Input Data			ECMWF fields	3				
Dissemination								
Format			Means	leans		Timeliness		
netCDF			Web	Veb		NRT: 80 min - 3 h Offline: 5 - 30 d		
Accuracy								
Threshold			Target	arget		Optimal		
TBD			TBD		TBD			
Notes								
Verification/Valid	dation Met	hods	TBD	BD				
Coverage, Reso	olution							
Spatial Coverage	е	Horizontal Resolution		Vertical Resolution		Temporal Resolution		
Global		RO res	olution	Scalar		RO resolution		



GRM-28-L3-R-R1 Reprocest R	ssed (ssed (ssed (ssed (ssed (ssed (pending angle grid refractivity grid dry temperature grid dry pressure grid dry geopotential height grid dry geopotential height grid demperature grid specific humidity grid dropopause height grid	RBGMUL RRGMUL RDGMUL RYGMUL RZGMUL RTGMUL RHGMUL RCGMUL	PRD_v3.4	
Туре		Reprocessed Data Set			
Applications and Users		Climate and atmosphere rese	archers		
Characteristics and Methods		Zonal monthly means on 200	m x 5 deg grids		
Operational Satellite Input Data	a	Reprocessed level 1a Metop, CHAMP, GRACE, COSMIC from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-002: GRAS L1 R1: 01/ 2007 – 05/2014; WG-DRG Plan CF-016: CHAMP L1 R1: 09/2001 - 09/2008; WG-DRG Plan CF-017: GRACE L1 R1: 01/2005 - 12/2014; WG-DRG Plan CF-018: COSMIC L1 R1: 07/2006 - 12/2014;			
Other Operational Input Data		ECMWF ERA Interim (validati	on, sampling error e	estimation)	
Dissemination					
Format	M	eans	Timeliness		
netCDF	W	eb	n/a		
Accuracy					
Threshold	Ta	arget	Optimal		
Bending angle					
25 – 50 km: 0.4 % or 0.8 μrad* 8 – 25 km: 0.4 % 0 – 8 km: 4 – 0.4 %	´ 8	5 – 50 km: 0.2 % or 0.4 μrad*) 3 – 25 km: 0.2 % 0 – 8 km: 2.0– 0.20 %	25 – 50 km: 0.10 % or 0.2 μrad*) 8 – 25 km: 0.10 % 0 – 8 km: 1.0 – 0.10 %		
Refractivity					
25 – 50 km: 0.16 % or 0.008 N units*) 8 – 25 km: 0.16 % 0 – 8 km: 1.6 – 0.16 %	8	5 – 50 km: 0.08 % or 0.004 Nunits*) 8 – 25 km: 0.08 % 0 – 8 km: 0.8 – 0.08 %	25 – 50 km: 0.04 % or 0.002 N- units*) 8 – 25 km: 0.04 % 0 – 8 km: 0.4 – 0.04 %		
Dry temperature					
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: –	8	5 – 50 km: 0.2 – 2 K 3 – 25 km: 0.2 K 0 – 8 km: –	25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: –		
Dry pressure					
8 – 25 km: 0.16 %		5 – 50 km: 0.08 – 0.40 % 5 – 25 km: 0.08 % 0 – 8 km: –	25 – 50 km: 0.04 – 0.20 % 8 – 25 km: 0.04 % 0 – 8 km: –		
Dry geopotential height					
25 – 50 km: 8 – 80 m 8 – 25 km: 8 m 0 - 8 km: –	8	5 – 50 km: 4 – 40 m 3 – 25 km: 4 m 0 – 8 km: –	25 – 50 km: 2 – 20 m 8 – 25 km: 2 m 0 – 8 km: –		



Temperature						
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: 2.0 – 0.4 K	25 km: 0.4 K		25 – 50 km: 0.2 – 2 K 8 – 25 km: 0.2 K 0 – 8 km: 1.0 – 0.2 K		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: 0.50 – 0.10 K	
Specific humidity						
8 – 12 km: 6.0 % 0 – 8 km: 6.0 %		8 – 12 km: 3.0 % 0 – 8 km: 3.0 %		8 – 12 km: 1.5 % 0 – 8 km: 1.5 %		
Tropopause Height						
0.2 km			0.1 km		0.05 km	
Notes		two v	accuracy interval means a linearly changing quantity between the values over the given vertical coordinate.			
Verification/Validation Methods			atistics of differences relative to ECMWF ERA Interim. sampling statistics: inter-comparison of RO data subsets.			
Coverage, Resolution						
Spatial Coverage	Horizontal		Resolution Vertical Resolut		ion	Temporal Resolution
global	5 de	g latit	ude	200 m		1 month



GRM-29-L1-B-R1 R	eproc	esse	d bending an	gle	RBAMET		PRD_v3.4		
Туре			Reprocessed	Reprocessed Data Set					
Applications and Users			Climate and a	Climate and atmosphere researchers					
Characteristics and Me	thods		Hi-res wave optics retrieval						
Operational Satellite In	put Da	ata	CSDP WP23	Reprocessed level 1a Metop from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-002: GRAS L1 R1: 01/ 2007 – 05/2014;					
Other Operational Inpu	t Data		ECMWF ERA	Interim fields					
Dissemination									
Format		Me	eans		Timeliness	3			
netCDF BUFR		We	eb	n/a					
Accuracy									
Threshold		Та	rget	Optimal					
35 – 60 km: 4 μrad 8 – 35 km: 4% 2 – 8 km: 20% - 4%		8	– 60 km: 2 μr – 35 km: 2% – 8 km: 10%	35 – 60 km: 1 μrad 8 – 35 km: 1% 2 – 8 km: 5% - 1%					
Notes	tv	wo va	alues over the	l means a linea given vertical c km is expected	coordinate	•			
Verification/Validation Methods				of (Product – El IETSAT reproc					
Coverage, Resolution	1								
Spatial Coverage	Spatia	al Re	solution	Vertical Resolu	ution	Tempora	al resolution		
Global	RO r	esolu	ution	Hi-res wave op sampling; interpolated to levels		RO reso	lution		



			ed refractivity ed dry tempera		RRPMET RDPMET		PRD_v3.4	
Туре			Reprocessed	Data Set				
Applications and Users			Climate and a	Climate and atmosphere researchers				
Characteristics and Me	thods		Hi-res wave o	ptics retrieval				
Operational Satellite Input Data			CSDP WP230	Reprocessed level 1a Metop from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-002: GRAS L1 R1: 01/ 2007 – 05/2014;				
Other Operational Inpu	t Data		ECMWF ERA	Interim fields				
Dissemination								
Format		M	eans		Timeliness			
netCDF BUFR			eb		n/a			
Accuracy		-						
Threshold Ta			arget		Optimal			
Refractivity profile								
30 – 50 km: 0.06 N-unit 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		5	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%			
Dry temperature profi	le							
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K – 2 K		5	0 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K – 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K – 0.5 K			
Notes			ccuracy interva		early changing quantity between the coordinate			
Verification/Validation Methods	S	tand	dard deviation of	of (Product – E	RA Interim	forecasts	5)	
Coverage, Resolution								
Spatial Coverage	Spatia	al R	esolution	Vertical Resol	ution	Tempor	al resolution	
global	RO resolution		ution	Hi-res wave optics sampling; interpolated to 247 fixed levels		RO reso	blution	



GRM-29-L2-H-R1 R GRM-29-L2-P-R1 R	eproce eproce	ssed	d temperature d specific hui d pressure pr d surface pre	midity profile ofile	RTPME RHPME RPPME RSPME	T T	PRD_v3.4	
Туре			Reprocessed	Data Set				
Applications and Users	3		Climate and a	tmosphere resea	rchers			
Characteristics and Me	ethods		1D-Var algorit background	hm on model leve	els, ERA	Interim f	orecast as	
Operational Satellite In	put Dat	(CSDP WP230	level 1a Metop fro 0 (EUM/STG/65/19 n CF-002: GRAS	4/DOC/18	8);		
Other Operational Inpu	ıt Data		ECMWF ERA	Interim fields.				
Dissemination		=						
Format		Mea	ans		Timeline	ess		
netCDF BUFR					n/a			
Accuracy								
Threshold			get	Optimal				
Temperature profile								
30 – 50 km: 3 K – 6 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		5	30 – 50 km: 1 K – 2 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K			km: 0.5 km: 0.5 km: 1 K	K	
Specific humidity pro	file							
0 – 12 km: 1.8 g/kg or	30% *)	0 -	0 – 12 km: 0.6 g/kg or 10% *)		0 – 12 km: 0.3 g/kg or 10% *)			
Pressure profile								
0 – 50 km: a) 0.03 hPa 0 – 50 km: b) 0.75% 0 – 50 km: c) 2.4 hPa		0 -	0 – 50 km: a) 0.01 hPa 0 – 50 km: b) 0.25% 0 – 50 km: c) 0.8 hPa **)		0 – 50 km: a) 0.005 hPa 0 – 50 km: b) 0.1% 0 – 50 km: c) 0.7 hPa **)			
Surface pressure								
2.4 hPa		0.8	hPa		0.7 hPa	7 hPa		
Notes	tw *)	o va Whi	alues over the chever is grea	I means a linearly given vertical cod ater eatest of (a) and (ordinate			
Verification/Validation Methods	Si	tanda	ndard deviation of (1D-Var solution – ERA Interim analysis)					
Coverage, Resolution	1							
Spatial Coverage	Spatia	l Re	esolution Vertical Resolution		on Temporal resolution		ral resolution	
global	RO re	solut	tion	model levels		RO res	olution	



GRM-29-L2-C-R1 R	eproc	cesse	ed tropopause	height	RCHMI	ET	PRD_v3.4		
Туре			Reprocessed	Reprocessed Data Set					
Applications and Users	Applications and Users			Climate and atmosphere researchers					
Characteristics and Me	thods	;	Dry temperate	ure lapse rate					
Operational Satellite Input Data			CSDP WP23	Reprocessed level 1a Metop from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-002: GRAS L1 R1: 01/ 2007 – 05/2014;					
Other Operational Input Data			ECMWF ERA	Interim fields					
Dissemination									
Format	at M			eans			Timeliness		
netCDF BUFR		W	Veb		n/a				
Accuracy									
Threshold		Та	arget		Optimal				
2 km		1 I	km		0.5 km				
Notes									
Verification/Validation Methods				dard deviation of (Product - ERA Interim analysis)					
Coverage, Resolution	1								
Spatial Coverage	Spat	ial Re	esolution	Vertical Resolu	ution	Tempora	al resolution		
global	RO r	esolu	ıtion	scalar		RO reso	lution		



GRM-29-L3-R-R1 Reprocessor Rep	ed red of ed	pending angle grid refractivity grid dry temperature grid dry pressure grid dry geopotential height grid remperature grid specific humidity grid cropopause height grid	RBGMET RRGMET RDGMET RYGMET RZGMET RTGMET RHGMET RCGMET	PRD_v3.4	
Туре		Reprocessed Data Set			
Applications and Users		Climate and atmosphere research	archers		
Characteristics and Methods		Zonal monthly means on 200	m x 5 deg grids		
Operational Satellite Input Data		Reprocessed level 1a Metop f CSDP WP230 (EUM/STG/65/ WG-DRG Plan CF-002: GRAS	14/DOC/18);		
Other Operational Input Data		ECMWF ERA Interim (validation	on, sampling error e	estimation)	
Dissemination		•			
Format	Me	eans	Timeliness		
netCDF	W	eb	n/a		
Accuracy					
Threshold	Та	arget	Optimal		
Bending angle					
25 – 50 km: 0.6 % or 1.2 μrad*) 8 – 25 km: 0.6 % 0 – 8 km: 6 – 0.6 %		5 – 50 km: 0.3 % or 0.6 μrad*) 3 – 25 km: 0.3 % 0 – 8 km: 3 – 0.3 %	25 – 50 km: 0.15 % or 0.3 μrad*) 8 – 25 km: 0.15 % 0 – 8 km: 1.5 – 0.15 %		
Refractivity					
25 – 50 km: 0.24 % or 0.012 N- units*) 8 – 25 km: 0.24 % 0 – 8 km: 2.4 – 0.24 %	25 – 50 km: 0.12 % or 0.006 N- units*) 8 – 25 km: 0.12 % 0 – 8 km: 1.2 – 0.12 %		25 – 50 km: 0.06 % or 0.003 N- units*) 8 – 25 km: 0.06 % 0 – 8 km: 0.6 – 0.06 %		
Dry temperature					
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: –	8	5 – 50 km: 0.3 – 3 K 3 – 25 km: 0.3 K 0 – 8 km: –	25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: –		
Dry pressure					
25 – 50 km: 0.24 – 1.20 % 8 – 25 km: 0.24 % 0 – 8 km –	8	5 – 50 km: 0.12 – 0.60 % 5 – 25 km: 0.12 % 0 – 8 km: –	25 – 50 km: 0.06 – 0.30 % 8 – 25 km: 0.06 % 0 – 8 km: –		
Dry geopotential height					
8 – 25 km: 12 m		5 – 50 km: 6 – 60 m 3 – 25 km: 6 m 0 – 8 km: –	25 – 50 km: 3 – 30 m 8 – 25 km: 3 m 0 – 8 km: –		
Temperature					
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: 2.0 – 0.6 K	8	5 – 50 km: 0.3 – 3 K 3 – 25 km: 0.3 K 0 – 8 km: 1.0 – 0.3 K	25 – 50 km: 0.15 – 8 – 25 km: 0.15 K 0 – 8 km: 0.50 –		



Specific humidity					
8 – 12 km: 8.0 % 0 – 8 km: 8.0 %		8 – 12 km: 4.0 ° 0 – 8 km: 4.0 °	. •	8 – 12 km 0 – 8 km	/.
Tropopause height					
0.4 km).4 km			0.1 km	
Notes	two	ccuracy interval m values over the givenichever is greater	en vertical coord		antity between the
Verification/Validation Methods		tatistics of differences relative to ECMWF ERA Interim. esampling statistics: inter-comparison of RO data subsets.			
Coverage, Resolution					
Spatial Coverage	Horizont	al Resolution	Vertical Resolut	tion	Temporal Resolution
global	5 deg lat	itude	200 m		1 month



GRM-30-L1-B-R1 R	eproce	esse	d bending an	gle	RBAC01		PRD_v3.4
Туре			Reprocessed Data Set				
Applications and Users			Climate and atmosphere researchers				
Characteristics and Me	thods		Hi-res wave o	ptics retrieval			
Operational Satellite Inp	put Dat		Reprocessed level 1a COSMIC from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-018: COSMIC L1 R1: 07/2006 -12/2014				
Other Operational Input	t Data		ECMWF ERA	Interim fields			
Dissemination							
Format		Ме	ans		Timeliness	3	
netCDF BUFR		We	eb		n/a		
Accuracy		•					
Threshold		Tar	rget		Optimal		
35 – 60 km: 4 μrad 8 – 35 km: 4% 2 – 8 km: 20% - 4%		8	5 – 60 km: 2 μrad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 μrad 8 – 35 km: 1% 2 – 8 km: 5% - 1%		%
Notes	tw	vo va	alues over the	I means a linea given vertical c km is expected	coordinate	•	
Verification/Validation Methods				of (Product – E IETSAT reproc			
Coverage, Resolution							
Spatial Coverage	Spatia	l Re	solution	Vertical Resolu	ution	Tempora	al resolution
Global	RO resolu		Hi-res wave op sampling; interpolated to levels			RO reso	lution



			ed refractivity		RRPC01 RDPC01		PRD_v3.4	
Туре			Reprocessed	Data Set				
Applications and Users	Applications and Users			Climate and atmosphere researchers				
Characteristics and Me	thods		Hi-res wave o	ptics retrieval				
Operational Satellite In	put Da	a	CSDP WP230	Reprocessed level 1a COSMIC from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-018: COSMIC L1 R1: 07/2006 -12/2014				
Other Operational Inpu	t Data		ECMWF ERA	Interim fields				
Dissemination								
Format		Me	eans		Timeliness			
netCDF BUFR					n/a			
Accuracy		•						
Threshold T			rget	Optimal				
Refractivity Profile								
30 – 50 km: 0.06 N-uni 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		5	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%			
Dry temperature Prof	ile							
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K – 2 K		5	0 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K – 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K – 0.5 K			
Notes				l means a linea given vertical d	early changing quantity between the			
Verification/Validation Methods	S	tanc	dard deviation	of (Product – E	RA Interim	forecast	5)	
Coverage, Resolution	1							
Spatial Coverage	Spatia	l Re	esolution	Vertical Resol	ution	Tempor	al resolution	
global	RO resolution		ution	Hi-res wave optics sampling; interpolated to 247 fixed levels		RO reso	blution	



GRM-30-L2-H-R1 R GRM-30-L2-P-R1 R	eproce	essed temperature essed specific hu essed pressure pressed surface pre	midity profile ofile	RTPCO1 RHPCO1 RPPCO1 RSPCO1		PRD_v3.4			
Туре		Reprocessed	Reprocessed Data Set						
Applications and Users	;	Climate and a	tmosphere res	earchers					
Characteristics and Me	thods	1D-Var algorit background	hm on model le	evels, ERA l	nterim f	orecast as			
Operational Satellite In	put Dat	CSDP WP230	level 1a COSM) (EUM/STG/65 n CF-018: COS	5/14/DOC/18	3);	T CF, cf. Refs.: 6 -12/2014			
Other Operational Inpu	t Data	ECMWF ERA	Interim fields						
Dissemination									
Format		Means		Timeliness					
netCDF BUFR		Web		n/a					
Accuracy									
Threshold		Target	arget						
Temperature Profile									
30 – 50 km: 3 K – 6 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K	5 – 30 km: 3 K		30 – 50 km: 1 K – 2 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K			- 1 K 0.5 K			
Specific Humidity Pro	file								
0 – 12 km: 1.8 g/kg or	30% *)	0 – 12 km: 0.6 g	0 – 12 km: 0.3 g/kg or 10% *)						
Pressure Profile									
0 – 50 km: a) 0.03 hPa 0 – 50 km: b) 0.75% 0 – 50 km: c) 2.4 hPa		0 – 50 km: b) 0.2	0 – 50 km: a) 0.01 hPa 0 – 50 km: b) 0.25% 0 – 50 km: c) 0.8 hPa **)			0 – 50 km: a) 0.005 hPa 0 – 50 km: b) 0.1% 0 – 50 km: c) 0.7 hPa **)			
Surface Pressure									
2.4 hPa		0.8 hPa		0.7 hPa					
Notes	two v. *) Wh			accuracy interval means a linearly changing quantity between the values over the given vertical coordinate /hichever is greater Whichever is greatest of (a) and (b) but not greater than (c);					
Verification/Validation Methods	S	tandard deviation	andard deviation of (1D-Var solution – ERA Interim analysis)						
Coverage, Resolution	١								
Spatial Coverage	Spatia	al Resolution	esolution Vertical Resolu		ution Temporal resolution				
global	RO re	solution	model levels		RO res	olution			



GRM-30-L2-C-R1 R	eproc	esse	ed tropopause	height	RCHC01		PRD_v3.4	
Туре			Reprocessed	Reprocessed Data Set				
Applications and Users			Climate and a	Climate and atmosphere researchers				
Characteristics and Me	thods		Dry temperate	ure lapse rate				
Operational Satellite Input Data			CSDP WP23	Reprocessed level 1a COSMIC from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-018: COSMIC L1 R1: 07/2006 -12/2014				
Other Operational Input Data			ECMWF ERA	Interim fields				
Dissemination			-					
Format		Me	leans		Timeliness			
netCDF BUFR	W		Veb		n/a			
Accuracy								
Threshold		Та	arget		Optimal			
2 km		1	km		0.5 km			
Notes								
Verification/Validation Stand Methods			dard deviation of (Product - ERA Interim Analysis)					
Coverage, Resolution)							
Spatial Coverage	Spat	ial Re	esolution	Vertical Resolution		Tempora	al resolution	
global	RO r	esolu	ıtion	scalar		RO reso	lution	



GRM-30-L3-R-R1 Reprocesse Reproce	ed i ed o ed o ed o ed t	pending angle grid refractivity grid dry temperature grid dry pressure grid dry geopotential height grid remperature grid specific humidity grid ropopause height grid Reprocessed Data Set Climate and atmosphere rese Zonal monthly means on 200 Reprocessed level 1a COSMI Refs.: CSDP WP230 (EUM/STG/65/ WG-DRG Plan CF-018: COSM	m x 5 deg grids C from EUMETSAT 14/DOC/18);	
Other Operational Input Data		ECMWF ERA Interim (validati	on, sampling error e	estimation)
Dissemination				
Format	-	eans	Timeliness	
netCDF	W	eb	n/a	
Accuracy				
Threshold	Ta	arget	Optimal	
Bending angle				
25 – 50 km: 0.4 % or 0.8 μrad*) 8 – 25 km: 0.4 % 0 – 8 km: 4 – 0.4 %	8	5 – 50 km: 0.2 % or 0.4 μrad*) 5 – 25 km: 0.2 % 0 – 8 km: 2.0– 0.20 %	25 – 50 km: 0.10 % or 0.2 μrad*) 8 – 25 km: 0.10 % 0 – 8 km: 1.0 – 0.10 %	
Refractivity				
25 – 50 km: 0.16 % or 0.008 N- units*) 8 – 25 km: 0.16 % 0 – 8 km: 1.6 – 0.16 %	8	5 – 50 km: 0.08 % or 0.004 N- units*) 5 – 25 km: 0.08 % 0 – 8 km: 0.8 – 0.08 %	25 – 50 km: 0.04 % units*) 8 – 25 km: 0.04 % 0 – 8 km: 0.4 –	ó
Dry temperature				
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: –	8	5 – 50 km: 0.2 – 2 K 5 – 25 km: 0.2 K 9 – 8 km: –		
Dry pressure				
25 – 50 km: 0.16 – 0.80 % 8 – 25 km: 0.16 % 0 – 8 km –	25 – 50 km: 0.16 – 0.80 % 8 – 25 km: 0.16 %		25 – 50 km: 0.04 – 8 – 25 km: 0.04 % 0 – 8 km: –	
Dry geopotential height				
8 – 25 km: 8 m		5 – 50 km: 4 – 40 m 5 – 25 km: 4 m 0 – 8 km: –	25 km: 4 m 8 – 25 km: 2 m	
Temperature				
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K		5 – 50 km: 0.2 – 2 K 5 – 25 km: 0.2 K	25 – 50 km: 0.10 – 8 – 25 km: 0.10 K	



				•		
0 – 8 km: 2.0 – 0.4 K		0 – 8 km: 1.0	– 0.2 K	0 – 8 km	n: 0.50 – 0.10 K	
Specific humidity						
8 – 12 km: 6.0 % 0 – 8 km: 6.0 %		8 – 12 km: 3.0 ° 0 – 8 km: 3.0 °		8 – 12 km 0 – 8 km		
Tropopause Height						
0.2 km	.2 km		0.1 km			
Notes	two v	An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate. *) whichever is greater				
Verification/Validation Methods		stics of differences impling statistics:				
Coverage, Resolution						
Spatial Coverage	Horizonta	l Resolution	Vertical Resolu	tion	Temporal Resolution	
global	5 deg latit	tude	200 m		1 month	



GRM-32-L1-B-R1 Re	eproces	ssed bending ar	ngle	RBACHA		PRD_v3.4	
Туре		Reprocessed	l Data Set				
Applications and Users		Climate and	Climate and atmosphere researchers				
Characteristics and Met	thods	Hi-res wave	optics retrieval				
Operational Satellite Inp	CSDP WP23	Reprocessed level 1a CHAMP from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-016: CHAMP L1 R1: 09/2001-09/2008					
Other Operational Input	Data	ECMWF ERA	A Interim fields				
Dissemination							
Format		Means		Timeliness	;		
netCDF BUFR				n/a			
Accuracy							
Threshold		Target	arget				
35 – 60 km: 4 μrad 8 – 35 km: 4% 2 – 8 km: 20% - 4%		8 – 35 km: 2%			35 – 60 km: 1 μrad 8 – 35 km: 1% 2 – 8 km: 5% - 1%		
Notes	two BA Pro	o values over the noise above 60 oduct may have	curacy interval means a linearly changing quantity between the alues over the given vertical coordinate; sise above 60 km is expected to be about 4 μrad; ct may have reduced information content below 8–10 km due to ions in the CHAMP closed loop data;				
Verification/Validation Methods		andard deviation imparison to EUN					
Coverage, Resolution							
Spatial Coverage	Spatial	Resolution	Vertical Resolu	ution	Tempora	al resolution	
Global	RO resolu		ution Hi-res wave or sampling; interpolated to levels		RO reso	olution	



		essed refractivity		RRPCHA RDPCHA		PRD_v3.4	
Туре		Reprocesse	d Data Set				
Applications and Users	;	Climate and	Climate and atmosphere researchers				
Characteristics and Me	thods	Hi-res wave	optics retrieval				
Operational Satellite In	CSDP WP23	d level 1a CHAM 30 (EUM/STG/65 an CF-016: CHA	5/14/DOC/1	8);			
Other Operational Inpu	t Data	ECMWF ER	A Interim fields				
Dissemination							
Format		Means		Timeliness			
netCDF BUFR		Web		n/a			
Accuracy							
Threshold		Target	Target		Optimal		
Refractivity Profile							
30 – 50 km: 0.06 N-uni 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		5 – 30 km: 0.6	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		
Dry temperature Profi	ile						
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K – 2 K		5 – 20 km: 1 k	20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K – 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K – 0.5 K		
Notes	tw Pi	o values over the roduct may have	accuracy interval means a linearly changing quantity between the values over the given vertical coordinate; aduct may have reduced information content below 8–10 km due to tations in the CHAMP closed loop data;				
Verification/Validation Methods	St	tandard deviatior	of (Product – E	RA Interim	forecasts	s)	
Coverage, Resolution)						
Spatial Coverage	Spatia	l Resolution	Vertical Resol	ution	Tempor	al resolution	
global	RO res	solution	Hi-res wave o sampling; interpolated to levels		RO reso	blution	



GRM-32-L2-H-R1 R6 GRM-32-L2-P-R1 R6	eproce eproce	ssed temperatu ssed specific hu ssed pressure ssed surface pro	umidity	RTPCHA RHPCHA RPPCHA RSPCHA		PRD_v3.4		
Туре		Reprocessed	l Data Set					
Applications and Users		Climate and	atmosphere res	earchers				
Characteristics and Me	thods	1D-Var algor background	ithm on model le	evels, ERA I	nterim f	orecast as		
Operational Satellite Inp	put Dat	CSDP WP23	l level 1a CHAM 0 (EUM/STG/68 an CF-016: CHA	5/14/DOC/18	3);			
Other Operational Input	t Data	ECMWF ERA	A Interim fields					
Dissemination								
Format		Means		Timeliness				
netCDF BUFR		Web		n/a				
Accuracy								
Threshold		Target	Target					
Temperature Profile								
30 – 50 km: 3 K – 6 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K 5 – 30 km: 1 K 0 – 5 km: 2 K	30 – 50 km: 5 – 30 km: 0 – 5 km:	0.5 K				
Specific Humidity Pro	file							
0 – 12 km: 1.8 g/kg or	30% *)	0 – 12 km: 0.6	0 – 12 km: 0.6 g/kg or 10% *)			g or 10% *)		
Pressure Profile								
0 – 50 km: a) 0.03 hPa 0 – 50 km: b) 0.75% 0 – 50 km: c) 2.4 hPa *		0 – 50 km: b) 0	0 – 50 km: a) 0.01 hPa 0 – 50 km: b) 0.25% 0 – 50 km: c) 0.8 hPa **)			0 – 50 km: a) 0.005 hPa 0 – 50 km: b) 0.1% 0 – 50 km: c) 0.7 hPa **)		
Surface Pressure								
2.4 hPa		0.8 hPa		0.7 hPa				
Notes	tw Pi lin *)	o values over the roduct may have nitations in the Cl Whichever is gre	accuracy interval means a linearly changing quantity between the covalues over the given vertical coordinate; adduct may have reduced information content below 8–10 km due to itations in the CHAMP closed loop data; Whichever is greater Whichever is greatest of (a) and (b) but not greater than (c);					
Verification/Validation Methods	St	andard deviation of (1D-Var solution – ERA Interim analysis)						
Coverage, Resolution	1							
Spatial Coverage	Spatia	l Resolution	Resolution Vertical Resol			ral resolution		
global	RO re	solution	model levels	RO resolution				



GRM-32-L2-C-R1 R	eproc	esse	ed tropopause	height	RCHCHA		PRD_v3.4	
Туре			Reprocessed	Data Set				
Applications and Users	;		Climate and a	Climate and atmosphere researchers				
Characteristics and Me	thods		Dry temperat	ure lapse rate				
Operational Satellite Input Data			CSDP WP23	Reprocessed level 1a CHAMP from EUMETSAT CF, cf. Refs.: CSDP WP230 (EUM/STG/65/14/DOC/18); WG-DRG Plan CF-016: CHAMP L1 R1: 09/2001-09/2008				
Other Operational Inpu	t Data	1	ECMWF ERA	Interim fields				
Dissemination			-					
Format	Format Me			eans		Timeliness		
netCDF BUFR		W	Veb		n/a			
Accuracy								
Threshold		Та	ırget		Optimal			
2 km		1 I	km		0.5 km			
Notes								
Verification/Validation Stand Methods			dard deviation of (Product - ERA Interim Analysis)					
Coverage, Resolution	1							
Spatial Coverage	l Coverage Spatial Re		esolution Vertical Resolu		ution	Temporal resolution		
global	RO r	esolu	ition	scalar		RO resolution		



GRM-32-L3-R-R1 Reprocess R	ed (ed (ed (ed (ed (pending angle grid refractivity grid dry temperature grid dry pressure grid dry geopotential height grid emperature grid numidity grid ropopause height grid Reprocessed Data Set Climate and atmosphere researchers Zonal monthly means on 200 m x 5 deg grids Reprocessed level 1a CHAMP from EUMETSAT CF, cf. R				
Other Operational Input Data		CSDP WP230 (EUM/STG/65/WG-DRG Plan CF-016: CHAN	14/DOC/18); MP L1 R1: 09/2001-	09/2008		
Dissemination			· ·	·		
Format netCDF Accuracy		eans	Timeliness n/a			
Threshold	Та	arget	Optimal			
Bending angle						
25 – 40 km: 0.8 % or 1.6 μrad*) 8 – 25 km: 0.8 % 0 – 8 km: –		5 – 40 km: 0.4 % or 0.8 μrad*) 3 – 25 km: 0.4 % 0 – 8 km: –	25 – 40 km: 0.20 % or 0.4 μrad*) 8 – 25 km: 0.20 % 0 – 8 km: –			
Refractivity						
25 – 40 km: 0.4 % or 0.016 N- units*) 8 – 25 km: 0.4 % 0 – 8 km: –	8	5 – 40 km: 0.20 % or 0.008 N- units*) 3 – 25 km: 0.20 % 0 – 8 km: –	25 – 40 km: 0.10 % or 0.004 N- units*) 8 – 25 km: 0.10 % 0 – 8 km: –			
Dry temperature						
25 – 40 km: 0.8 – 8 K 8 – 25 km: 0.8 K 0 – 8 km: –	8	5 – 40 km: 0.4 – 4 K 3 – 25 km: 0.4 K 0 – 8 km: –	25 – 40 km: 0.20 – 8 – 25 km: 0.20 K 0 – 8 km: –			
Dry pressure						
25 – 40 km: 0.4 – 2.0 % 8 – 25 km: 0.4 % 0 – 8 km –	8	5 – 40 km: 0.2 – 1.0 % 3 – 25 km: 0.2 % 0 – 8 km: –	25 – 40 km: 0.10 – 8 – 25 km: 0.10 % 0 – 8 km: –			
Dry geopotential height						
8 – 25 km: 16 m		5 – 40 km: 8 – 80 m 3 – 25 km: 8 m) – 8 km: –	25 – 40 km: 4– 40 m 8 – 25 km: 4 m 0 – 8 km: –			
Temperature						
25 – 40 km: 0.8 – 8 K 8 – 25 km: 0.8 K 0 – 8 km: –	8	5 – 40 km: 0.4 – 4 K 3 – 25 km: 0.4 K 0 – 8 km: –	25 – 40 km: 0.20 – 2.0 K 8 – 25 km: 0.20 K 0 – 8 km: –			



Specific humidity						
8 – 12 km: 12 % 0 – 8 km: –		8 – 12 km: 6.0 0 – 8 km: –	%	8 – 12 km 0 – 8 km	/ .	
Tropopause Height						
0.6 km		0.3 km		0.15 km		
Notes	two Prod limit	n accuracy interval means a linearly changing quantity between the ro values over the given vertical coordinate; roduct may have reduced information content below 8–10 km due to nitations in the CHAMP closed loop data; whichever is greater				
Verification/Validation Methods		atistics of differences relative to ECMWF ERA Interim.				
Coverage, Resolution	1					
Spatial Coverage	Horizont	al Resolution	Vertical Resolut	tion	Temporal Resolution	
global	5 deg lat	itude	200 m		1 month	



			i-Mission climat CHAMP, GRACE		REPMUL		PRD_v3.4		
Туре			Climate Data R	tecord					
Applications and Us	sers		Climate and atr	mosphere researc	hers				
Characteristics and	Methods		(1)						
Operational Satellit	e Input Data	1	(a) Reprocessed level 1A Metop, CHAMP, GRACE, COSMIC from EUMETSAT Secretariat (CSDP: WP230, WP230C3S); (b) Reprocessed Level 1A data from CDAAC; CHAMP: 09/2001 – 10/2008 GRACE: 03/2007 – 12/2018 COSMIC: 07/2006 – 12/2018 COSMIC-2: TBD Metop: 10/2006 – 12/2018						
Other Operational I	Input Data		(1)						
Dissemination			'						
Format		Мє	eans		Timeliness				
netCDF		We	Web		n/a				
Accuracy									
Threshold		Та	rget		Optimal				
(1)		(1)			(1)				
Notes) ROM SAF CDOP-2 RR-RE1 Review Board Report (Ref: UM/TSS/DOC/14/784725, 9 Dec 2014)						
Verification/Validati	ion Methods	(1))						
Coverage, Resolu	ition	•							
Spatial Coverage	ige Horizontal		al Resolution Vertical Resolution		ion Temporal Resolut		solution		
(1)	(1)			(1)	(1)				



GRM-29-R2	Reproce L1, L2, L		letop climate data	record (Metop	REPMET		PRD_v3.4			
Туре			Climate Data F	Record						
Applications an	d Users		Climate and at	mosphere researc	hers					
Characteristics	and Metho	ods	(1)	(1)						
Operational Sa	tellite Input	Data	WP230, WP23 (b) Reprocess	(a) Reprocessed level 1A Metop from EUMETSAT Secretariat (CSDP: WP230, WP230C3S); (b) Reprocessed Level 1A data from CDAAC; Metop: 10/2006 – 12/2018						
Other Operatio	nal Input D	ata	(1)	(1)						
Dissemination										
Format			Means		Timeliness	i				
netCDF BUFR			Web		n/a					
Accuracy			-		-					
Threshold			Target		Optimal					
(1)			(1)		(1)					
Notes				ROM SAF CDOP-2 RR-RE1 Review Board Report (Ref: //TSS/DOC/14/784725, 9 Dec 2014)						
Verification/Val	idation Me	thods	(1)							
Coverage, Res	solution									
Spatial Coverage	ge	Horizoi	ntal Resolution	Vertical Resolution	on	Temporal Resolution				
(1)		(1)		(1)	(1)					



	process OSMIC-1		OSMIC-1 climate o	lata record	REPCO1		PRD_v3.4			
Туре			Climate Data R	ecord						
Applications and Us	ers		Climate and at	Climate and atmosphere researchers						
Characteristics and	Methods	3	(1)	(1)						
Operational Satellite	e Input D	ata	WP230, WP23	ed Level 1A data f			ecretariat (CSDP:			
Other Operational In	nput Data	а	(1)							
Dissemination										
Format			Means	Timeliness						
netCDF BUFR			Web		n/a					
Accuracy					•					
Threshold			Target		Optimal					
(1)			(1)		(1)					
Notes				1) ROM SAF CDOP-2 RR-RE1 Review Board Report (Ref: EUM/TSS/DOC/14/784725, 9 Dec 2014)						
Verification/Validation	on Metho	ods	(1)	1)						
Coverage, Resolut	Coverage, Resolution									
Spatial Coverage	Н	orizon	tal Resolution	Al Resolution Vertical Resolution		ion Temporal Resolution				
(1)	(1)		(1)		(1)				



	Reproce COSMIC			IIC-2 climate d .3)	ata record	REPCO2		PRD_v3.4		
Туре				Climate Data R	ecord					
Applications and U	Jsers			Climate and atmosphere researchers						
Characteristics and Methods				(1)						
Operational Satellite Input Data				WP230, WP230	d Level 1A data f			ecretariat (CSDP:		
Other Operational Input Data				(1)						
Dissemination										
Format			Mea	Means		Timeliness	;			
netCDF BUFR			Web	Web		n/a				
Accuracy						<u> </u>				
Threshold			Targ	get		Optimal				
(1)			(1)			(1)				
Notes) ROM SAF CDOP-2 RR-RE1 Review Board Report (Ref: UM/TSS/DOC/14/784725, 9 Dec 2014)						
Verification/Valida	tion Met	hods	(1)	(1)						
Coverage, Resol	ution									
Spatial Coverage	erage Horizontal I			l Resolution Vertical Resolution		ion Temporal Re		solution		
(1)		(1)			(1)		(1)			



	eproces			IP climate data	record	REPCHA		PRD_v3.4		
Туре			(Climate Data R	ecord					
Applications and U	sers		(Climate and atmosphere researchers						
Characteristics and	Characteristics and Methods									
Operational Satellite Input Data			((a) Reprocessed level 1A CHAMP from EUMETSAT Secretariat (CSDP: WP230, WP230C3S); (b) Reprocessed Level 1A data from CDAAC; CHAMP: 09/2001 – 10/2008						
Other Operational Input Data				(1)						
Dissemination										
Format			Mea	Means			3			
netCDF BUFR			Web			n/a				
Accuracy						-				
Threshold			Targ	get		Optimal				
(1)			(1)			(1)				
Notes				1) ROM SAF CDOP-2 RR-RE1 Review Board Report (Ref: EUM/TSS/DOC/14/784725, 9 Dec 2014)						
Verification/Validati	ion Meth	nods	(1)	(1)						
Coverage, Resolu	ıtion									
Spatial Coverage	patial Coverage Horizontal			al Resolution Vertical Resolution		ion Temporal Resolution		solution		
(1)	((1)			(1)		(1)			



	essed G E L1, L2		E climate data	record	REPGHA		PRD_v3.4	
Туре		(Climate Data R	ecord				
Applications and Users		(Climate and atmosphere researchers					
Characteristics and Meth	nods	((1)					
Operational Satellite Inp	ut Data	(WP230, WP230	d Level 1A data fi			etariat (CSDP:	
Other Operational Input Data			(1)					
Dissemination								
Format		Mea	Means		Timeliness	;		
netCDF BUFR		Web	Web		n/a			
Accuracy					-			
Threshold		Targ	get		Optimal			
(1)		(1)			(1)			
Notes			1) ROM SAF CDOP-2 RR-RE1 Review Board Report (Ref: EUM/TSS/DOC/14/784725, 9 Dec 2014)					
Verification/Validation M	ethods	(1)	(1)					
Coverage, Resolution		_						
Spatial Coverage	overage Horizontal			l Resolution Vertical Resolution		Temporal Re	solution	
(1)	(1)			(1)		(1)		



GRM-40 NRT Ref	ractivity	/ Profile		NRPMEB		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP	NWP				
		· ·	hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-B/GRAS	3				
		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format		Means		Timeliness			
EL		GTS EUMETCast Web		3 h			
Accuracy							
Threshold		Target		Optimal			
30 – 50 km: 0.09 N-units 5 – 30 km: 1.8% 0 – 5 km: 6% – 1.8%		30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		3	
Notes		An accuracy interva		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	on of (Product – ECMWF forecasts)				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global	GRAS resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ution	



GRM-41 NRT Ter	nperatu	re Profile		NTPMEB		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP	NWP				
		· ·	model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-B/GRAS	3				
		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means		Timeliness			
EU		GTS EUMETCast Web		3 h			
Accuracy				-			
Threshold		Target		Optimal			
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K			
Notes		An accuracy interva		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution							
Spatial Coverage	Horizon	ital Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ution	



GRM-42 NRT Spe	ecific H	umidity Profile		NHPMEB	PRD_v3.4	
Туре		NRT Product				
Applications and Users	Applications and Users		NWP			
Characteristics and Metho	,	model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-B/GRAS	S			
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination						
Format		Means		Timeliness		
BUFR/netCDF	EUN		GTS EUMETCast Web			
Accuracy						
Threshold		Target		Optimal		
1.8 g/kg 30% *		0.6 g/kg 10% *		0.3 g/kg 10% *		
Notes		* whichever is great The interval 0 – 12	ater; 2 km is considered			
Verification/Validation Me	thods	Standard deviation	n of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Resolution						
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Resolution	
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution	



GRM-43	NRT Press	sure Pro	ofile		NPPMEB	PRD_v3.4		
Туре			NRT Product					
Applications and	Users		NWP	NWP				
Characteristics and Methods			,	model levels (with interpolation); interpolated to 247 fixed levels				
Operational Sate	ellite Input D	ata	Metop-B/GRAS	3				
Other Operational Input Data			Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination								
Format		N	leans		Timeliness			
E		GTS EUMETCast Web		3 h				
Accuracy								
Threshold		Т	Target		Optimal			
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		b	a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *			
Notes				reatest of (a) and (b) but not greater than (c); 50 km is considered				
Verification/Valid	ation Metho	ods S	tandard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Reso	olution							
Spatial Coverage	е Н	orizonta	al Resolution	Vertical Resolution	on	Temporal Resolution		
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution			



GRM-44 NRT Surfa	ice Press	sure		NSPMEB		PRD_v3.4
Туре		NRT Product				
Applications and Users	NWP					
Characteristics and Methods	S	Scalar at surface	ce			
Operational Satellite Input D	ata	Metop-B/GRAS	3			
Other Operational Input Date	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination						
Format	Me	Means		Timeliness		
BUFR/netCDF	EU	GTS EUMETCast Web		3 h		
Accuracy						
Threshold	Та	rget		Optimal		
2.4 hPa	0.8	3 hPa		0.7 hPa		
Notes						
Verification/Validation Metho	andard deviation	dard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution						
Spatial Coverage H	lorizontal Resolution		Vertical Resolution		Temporal Res	olution
Global	RAS res	olution	Scalar at surface		GRAS resoluti	on



GRM-46 Offline E	Bending	Angle		ОВАМЕВ		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	atmosphere researchers				
			ics sampling; 247 fixed levels				
Operational Satellite Input	Data	Metop-B/GRAS	3				
·		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means		Timeliness			
netCDF BUFR			eb 5 - 30 d				
Accuracy							
Threshold		Target	Optimal				
35 – 60 km: 4 murad 8 – 35 km: 4% 2 – 8 km: 20% - 4%		35 – 60 km: 2 murad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 murad 8 – 35 km: 1% 2 – 8 km: 5% - 1%			
Notes		An accuracy interva over the given verti BA noise above 60	ical coordinate				
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)		
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ition	



GRM-47 Offline F	Refractivit	ty Profile		ORPMEB		PRD_v3.4	
Туре		Offline Product	Offline Product				
Applications and Users		Climate and atr	Climate and atmosphere researchers				
Characteristics and Metho		hi-res wave optics sampling; interpolated to 247 fixed levels					
Operational Satellite Input	t Data	Metop-B/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination	Dissemination						
Format	N	leans		Timeliness			
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold	Т	Target		Optimal			
30 – 50 km: 0.06 N-units 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		3	
Notes		n accuracy intervater the given verti		y changing o	quantity betwe	een the two values	
Verification/Validation Me	thods S	tandard deviation	of (Product – ECI	MWF foreca	ists)		
Coverage, Resolution	Ė						
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution	on	Temporal Re	solution	
Global			hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ıtion	



GRM-48 Offline T	empera	ature Profile		ОТРМЕВ		PRD_v3.4	
Туре		Offline Product	Offline Product				
Applications and Users		Climate and at	Climate and atmosphere researchers				
Characteristics and Metho	,	model levels (with interpolation); interpolated to 247 fixed levels					
Operational Satellite Input	Data	Metop-B/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination							
Format		Means		Timeliness			
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K – 5 – 30 km: 1 K 0 – 5 km: 2 K –		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K			
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values	
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution					_		
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	tion	



GRM-49 OffI	ine Specific	Humidity Profile		ОНРМЕВ	PRD_v3.4		
Туре		Offline Produc	t				
Applications and Use	rs	Climate and at	mosphere researc	hers			
Characteristics and M	,	with interpolation); 247 fixed levels					
Operational Satellite	Input Data	Metop-B/GRA	S				
Other Operational Inp	out Data	Metop orbits (GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means		Timeliness			
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
1.8 g/kg 30% *		0.6 g/kg 10% *		0.3 g/kg 10% *			
Notes		* whichever is great The interval 0 – 12	ater; 2 km is considered				
Verification/Validation	n Methods	Standard deviation	of (1D-Var solution	on – ECMW	F analysis)		
Coverage, Resolution	on						
Spatial Coverage	Horizoi	ntal Resolution	Vertical Resolution	on	Temporal Resolution		
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution		



GRM-50 Offline F	Pressure	Profile		ОРРМЕВ		PRD_v3.4	
Туре		Offline Product	ct				
Applications and Users	Climate and at	Climate and atmosphere researchers					
Characteristics and Metho	ods	·	vith interpolation); 247 fixed levels				
Operational Satellite Input	Data	Metop-B/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) CCMWF FC, AN					
Dissemination		-					
Format		Means		Timeliness	Timeliness		
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		b) 0.25%		a) 0.005 hPa b) 0.1% c) 0.7 hPa *			
Notes		* whichever is great The interval 0 – 50	. , , , ,	•	ater than (c);		
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	on – ECMW	F analysis)		
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ution		



GRM-51	Offline S	Surface	Pressure		OSPMEB		PRD_v3.4	
Туре	Туре			Offline Product				
Applications and	Users		Climate and at	mosphere researc	hers			
Characteristics a	and Metho	ds	Scalar at surfa	ice				
Operational Sate	ellite Input	Data	Metop-B/GRAS	S				
Other Operational Input Data			Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination								
Format			Means		Timeliness			
netCDF BUFR			Web		5 - 30 d			
Accuracy								
Threshold			Target		Optimal			
2.4 hPa			0.8 hPa	0.8 hPa		0.7 hPa		
Notes								
Verification/Validation Methods Sta			Standard deviation of (1D-Var solution – ECMWF analysis)					
Coverage, Resolution								
Spatial Coverage Horizontal Resolu			ntal Resolution	Vertical Resolution		Temporal Resolution		
Global		GRAS	resolution	Scalar at surface		GRAS resolu	tion	



GRM-53 Offlir	ne Bending	Angle Grid		ОВСМЕВ		PRD_v3.4
Туре		Offline Product				
Applications and Users	S	Climate and atr	mosphere researc	hers		
Characteristics and Me	ethods	Zonal monthly	means on 200 m	k 5 deg grid	S	
Operational Satellite In	nput Data	Metop-B/GRAS	3			
Other Operational Inpu	ut Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)
Dissemination						
Format		Means		Timeliness		
netCDF		Web		30 d		
Accuracy						
Threshold		Target		Optimal		
25 – 50 km: 0.6 % or 1 *) 8 – 25 km: 0.6 % 0 – 8 km: 6 – 0.6 %	I.2 murad	25 – 50 km: 0.3 % or 0.6 murad*) 8 – 25 km: 0.3 % 0 – 8 km: 3 – 0.3 %		25 – 50 km: 0.15 % or 0.3 murad*) 8 – 25 km: 0.15 % 0 – 8 km: 1.5 – 0.15 %		
An accuracy			chever is greater ccuracy interval means a linearly changing quantity between the two values the given vertical coordinate			
Verification/Validation	Methods		tics of differences relative to ECMWF ERA Interim.Resampling statistics: comparison of RO data subsets.			
Coverage, Resolution	n					
Spatial Coverage Horizontal Resolution			Vertical Resolution Temporal Resolution			solution
Global	5 deg l	atitude	200 m 1 month			



GRM-54 Offline F	Refractivit	y Grid		ORGMEB		PRD_v3.4		
Туре		Offline Product						
Applications and Users		Climate and atmosphere researchers						
Characteristics and Metho	Zonal monthly r	means on 200 m >	5 deg grid	S				
Operational Satellite Input	Data	Metop-B/GRAS	3					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)		
Dissemination		-						
Format	М	eans		Timeliness				
netCDF	W	/eb		30 d				
Accuracy								
Threshold	Та	Target Optin		Optimal				
25 – 50 km: 0.24 % or 0.0 units*) 8 – 25 km: 0.24 % 0 – 8 km: 2.4 – 0.24 %	ur 8	25 – 50 km: 0.12 % or 0.006 N- units*) 8 – 25 km: 0.12 % 0 – 8 km: 1.2 – 0.12 %		25 – 50 km: 0.06 % or 0.003 N-units*) 8 – 25 km: 0.06 % 0 – 8 km: 0.6 – 0.06 %				
An accurac			ichever is greater; accuracy interval means a linearly changing quantity between the two values the given vertical coordinate					
Verification/Validation Met	Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.							
Coverage, Resolution	Coverage, Resolution							
Spatial Coverage	Horizontal Resolution		Vertical Resolution		Temporal Resolution			
Global	5 deg latit	ude	200 m		1 month			



GRM-55 Offline 7	Temperat	ure Grid		OTGMEB		PRD_v3.4		
Туре		Offline Product						
Applications and Users		Climate and atr	mosphere researc	hers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S			
Operational Satellite Inpu	t Data	Metop-B/GRAS	3					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)		
Dissemination		<u>.</u>						
Format	N	Means		Timeliness				
netCDF	\	Veb		30 d				
Accuracy								
Threshold	1	Target		Optimal				
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: 2.0 – 0.6 K	2	25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: 1.0 – 0.3 K		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: 0.50 – 0.15 K				
Notes		An accuracy intervented the second control of the second control o		y changing	quantity betwe	een the two values		
			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.					
Coverage, Resolution	Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution			
Global	5 deg lat	itude	200 m	1 month				



GRM-56	Offline S	Specific	Humidity Grid		ОНСМЕВ		PRD_v3.4	
Туре	-		Offline Product	1				
Applications an	d Users		Climate and at	Climate and atmosphere researchers				
Characteristics	and Metho	ods	Zonal monthly	means on 200 m	x 5 deg grid	S		
Operational Sa	tellite Inpu	t Data	Metop-B/GRAS	3				
Other Operation	nal Input D	ata	ECMWF ERA	Interim (validation,	sampling e	rror estimatio	n)	
Dissemination								
Format			Means		Timeliness			
netCDF V			Web	30 d				
Accuracy								
Threshold			Target		Optimal			
8 – 12 km: 8.0 ° 0 – 8 km: 8.0	. •		8 – 12 km: 4.0 % 0 – 8 km: 4.0 %		8 – 12 km: 2.0 % 0 – 8 km: 2.0 %			
Notes			An accuracy interv		y changing	quantity betwe	een the two values	
				ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.				
Coverage, Resolution								
Spatial Coverage	ge	Horizon	tal Resolution	Vertical Resolution	Resolution Temporal Resolution		solution	
Global		5 deg la	atitude	200 m	1 month			



GRM-57 Climate	Dry Geop	ootential Height		OZGMEB		PRD_v3.4		
Туре		Offline Product						
Applications and Users		Climate and atr	mosphere researc	hers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S			
Operational Satellite Input	t Data	Metop-B/GRAS	3					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)		
Dissemination		-						
Format	٨	/leans		Timeliness				
netCDF	V	Veb	30 d					
Accuracy								
Threshold	Т	Target		Optimal				
25 – 50 km: 12 – 120 m 8 – 25 km: 12 m 0 - 8 km: –		25 – 50 km: 6 – 60 m 8 – 25 km: 6 m 0 – 8 km: –		25 – 50 km: 3 – 30 m 8 – 25 km: 3 m 0 – 8 km: –				
Notes		An accuracy intervativer the given verti		y changing	quantity betwe	een the two values		
			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.					
Coverage, Resolution	Coverage, Resolution							
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution			
Global	5 deg lat	itude	200 m	1 month				



GRM-58 Offlin	ne Dry Tem	perature Grid		ODGMEB		PRD_v3.4
Туре		Offline Product	t			
Applications and User	S	Climate and at	mosphere researc	hers		
Characteristics and M	ethods	Zonal monthly	means on 200 m	k 5 deg grids	S	
Operational Satellite II	nput Data	Metop-B/GRAS	3			
Other Operational Inp	ut Data	ECMWF ERA	Interim (validation,	sampling e	rror estimation	า)
Dissemination						
Format		Means		Timeliness		
netCDF		Web	30 d			
Accuracy						
Threshold		Target		Optimal		
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: –		25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: –		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: –		
Notes		An accuracy intervover the given vert		y changing o	quantity betwe	en the two values
Verification/Validation	Methods		istics of differences relative to ECMWF ERA Interim.Resampling statistics: -comparison of RO data subsets.			
Coverage, Resolutio	n					
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg la	atitude	200 m 1 month		1 month	



GRM-59 Offline I	ry Press	sure Grid		OYGMEB		PRD_v3.4		
Туре		Offline Product						
Applications and Users		Climate and atr	Climate and atmosphere researchers					
Characteristics and Metho	Zonal monthly	means on 200 m	k 5 deg grid	S				
Operational Satellite Input	Data	Metop-B/GRAS	3					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)		
Dissemination								
Format	N	Means		Timeliness	1			
netCDF	\	Veb	30 d					
Accuracy								
Threshold	1	Target		Optimal				
25 – 50 km: 0.24 – 1.20 % 8 – 25 km: 0.24 % 0 – 8 km –	2	25 – 50 km: 0.12 – 0.60 % 8 – 25 km: 0.12 % 0 – 8 km: –		25 – 50 km: 0.06 – 0.30 % 8 – 25 km: 0.06 % 0 – 8 km: –				
Notes		An accuracy intervented the second control of the given verting the second control of th		y changing	quantity betwe	een the two values		
			rences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.					
Coverage, Resolution	Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution			
Global	5 deg lat	itude	200 m 1 month					



GRM-60 NRT Ref	ractivity	Profile		NRPMEC		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
Characteristics and Metho		hi-res wave optics sampling; interpolated to 247 fixed levels					
Operational Satellite Input	Data	Metop-C/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination							
Format		Means		Timeliness	Timeliness		
E		GTS EUMETCast Web		3 h			
Accuracy							
Threshold		Target		Optimal			
30 – 50 km: 0.09 N-units 5 – 30 km: 1.8% 0 – 5 km: 6% – 1.8%		30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		s	
Notes		An accuracy interva		y changing	quantity betw	een the two values	
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)		
Coverage, Resolution	<u> </u>						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global	GRAS resolution		hi-res wave optic sampling; interpolated to 2 ⁴ levels		GRAS resolu	ution	



GRM-61 NRT Ter	nperatu	re Profile		NTPMEC		PRD_v3.4
Туре		NRT Product				
Applications and Users		NWP				
Characteristics and Methods		· ·	model levels (with interpolation); interpolated to 247 fixed levels			
Operational Satellite Input	Data	Metop-C/GRAS	3			
Other Operational Input Data		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN			
Dissemination		<u>.</u>				
Format		Means		Timeliness		
E		GTS EUMETCast Web		3 h		
Accuracy	-			-		
Threshold		Target		Optimal		
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K		
Notes		An accuracy interval over the given verti		y changing	quantity betwe	een the two values
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Resolution						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	GRAS I	resolution	model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	tion



GRM-62 NRT Spe	ecific H	umidity Profile		NHPMEC		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP	NWP				
Characteristics and Metho		model levels (with interpolation); interpolated to 247 fixed levels					
Operational Satellite Input	Data	Metop-C/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination		-					
Format		Means		Timeliness	s		
BUFR/netCDF	EU		GTS EUMETCast Web		3 h		
Accuracy							
Threshold		Target		Optimal			
1.8 g/kg 30% *		0.6 g/kg 10% *			0.3 g/kg 10% *		
Notes		* whichever is grea The interval 0 – 12	•				
Verification/Validation Me	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution							
Spatial Coverage	Horizor	tal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	GRAS	resolution	model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ıtion	



GRM-63	NRT Pres	sure Pi	rofile		NPPMEC	PRD_v3.4	
Туре			NRT Product				
Applications and	Users		NWP	NWP			
Characteristics and Methods			· ·	model levels (with interpolation); interpolated to 247 fixed levels			
Operational Sate	ellite Input [Data	Metop-C/GRAS	S			
Other Operational Input Data			Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN			
Dissemination							
Format		ı	Means		Timeliness		
E		GTS EUMETCast Web		3 h			
Accuracy							
Threshold		-	Target		Optimal		
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		I	a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *		
Notes			* whichever is grea The interval 0 – 50	atest of (a) and (b) km is considered	but not grea	ater than (c);	
Verification/Valid	lation Meth	ods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Reso	olution	-					
Spatial Coverage	e H	Horizontal Resolution		Vertical Resolution	on	Temporal Resolution	
Global	C	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution	



GRM-64 NRT	Surface Pr	essure		NSPMEC		PRD_v3.4	
Туре		NRT Product					
Applications and Users	3	NWP	NWP				
Characteristics and Me	ethods	Scalar at surfa	ice				
Operational Satellite In	put Data	Metop-C/GRA	S				
Other Operational Inpu	it Data	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means	eans		Timeliness		
BUFR/netCDF	EU		GTS EUMETCast Veb		3 h		
Accuracy							
Threshold		Target		Optimal			
2.4 hPa		0.8 hPa).8 hPa		0.7 hPa		
Notes							
Verification/Validation I	Methods	Standard deviation	tandard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution							
Spatial Coverage	Horizoi	ntal Resolution	Vertical Resolution		Temporal Re	solution	
Global	GRAS	resolution	Scalar at surface	Scalar at surface		tion	



GRM-66	Offline E	Bending	Angle		ОВАМЕС		PRD_v3.4
Туре	-		Offline Produc	t			
Applications and	Users		Climate and at	Climate and atmosphere researchers			
			hi-res wave op interpolated to	otics sampling; 247 fixed levels			
Operational Sate	ellite Input	Data	Metop-C/GRA	S			
Other Operational Input Data			GPS orbits (EI Metop orbits (I ECMWF FC, A	EUM)			
Dissemination							
Format			Means		Timeliness		
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold			Target		Optimal		
35 – 60 km: 4 m 8 – 35 km: 4% 2 – 8 km: 20%			35 – 60 km: 2 murad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 murad 8 – 35 km: 1% 2 – 8 km: 5% - 1%		
Notes			over the given ver				een the two values (rad;
Verification/Valid	dation Met	hods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Res	olution						
Spatial Coverag	е	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	esolution
Global		GRAS resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ıtion



GRM-67 Offline F	Refracti	vity Profile		ORPMEC		PRD_v3.4	
Туре		Offline Product	:				
Applications and Users		Climate and at	mosphere researc	hers			
Characteristics and Metho	•	hi-res wave optics sampling; interpolated to 247 fixed levels					
Operational Satellite Input	Data	Metop-C/GRAS	3				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination		_					
Format		Means		Timeliness			
netCDF BUFR			5 - 30 d				
Accuracy							
Threshold		Target		Optimal			
30 – 50 km: 0.06 N-units 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		5 – 30 km: 0.6%	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values	
Verification/Validation Met	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)		
Coverage, Resolution					_		
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	GRAS resolution		hi-res wave optic sampling; interpolated to 24 levels		GRAS resolu	ition	



GRM-68 Offline	Temper	ature Profile		ОТРМЕС		PRD_v3.4	
Туре		Offline Produc	ct				
Applications and Users		Climate and a	tmosphere researc	hers			
			with interpolation); 247 fixed levels				
Operational Satellite Inp	ut Data	Metop-C/GRA	\S				
Other Operational Input	Data	Metop orbits (GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means		Timeliness	Timeliness		
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K			
Notes		An accuracy inter over the given ve	val means a linearl	y changing	quantity betwe	een the two values	
Verification/Validation M	lethods	Standard deviation	n of (1D-Var solution	on – ECMW	F analysis)		
Coverage, Resolution		•					
Spatial Coverage	Horizo	ntal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global			model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolu	ıtion	



GRM-69 Of	fline Specific	c Hu	midity Profile		ОНРМЕС	PRD_v3.4		
Туре			Offline Product					
Applications and Us	sers		Climate and atmosphere researchers					
			,	vith interpolation); 247 fixed levels				
Operational Satellit	e Input Data		Metop-C/GRAS	3				
Other Operational Input Data			GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination	Dissemination							
Format		Ме	Means		Timeliness			
netCDF BUFR			Web		5 - 30 d			
Accuracy								
Threshold		Tai	Target		Optimal			
1.8 g/kg 30% *			0.6 g/kg 10% *		0.3 g/kg 10% *			
Notes			hichever is grea e interval 0 – 12	iter; km is considered				
Verification/Validati	on Methods	Sta	indard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolu	tion							
Spatial Coverage	Horizo	ntal	Resolution	Vertical Resolution	on	Temporal Resolution		
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution			



GRM-70 Offline	Pressur	e Profile		ОРРМЕС	PRD_v3.4			
Туре		Offline Product	t					
Applications and Users		Climate and at	Climate and atmosphere researchers					
Characteristics and Metho		model levels (with interpolation); interpolated to 247 fixed levels						
Operational Satellite Inpu	t Data	Metop-C/GRAS	S					
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN						
Dissemination	Dissemination							
Format		Means		Timeliness	Timeliness			
netCDF BUFR		Web		5 - 30 d				
Accuracy								
Threshold		Target		Optimal				
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *				
Notes		* whichever is great The interval 0 – 50	atest of (a) and (b) but not greater than (c); km is considered					
Verification/Validation Me	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)			
Coverage, Resolution								
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Resolution			
Global	GRAS resolution		model levels (with interpolation); interpolated to 247 fixed levels		GRAS resolution			



GRM-71 Of	ffline Surface	Pressure		OSPMEC		PRD_v3.4	
Туре		Offline Product	t				
Applications and U	sers	Climate and at	Climate and atmosphere researchers				
Characteristics and	l Methods	Scalar at surfa	се				
Operational Satellit	e Input Data	Metop-C/GRAS	S				
Other Operational I	Input Data	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means	Means		Timeliness		
netCDF BUFR		Web	Veb		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
2.4 hPa		0.8 hPa		0.7 hPa			
Notes							
Verification/Validati	ion Methods	Standard deviation	Standard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolu	ition						
Spatial Coverage Horizontal Reso		ntal Resolution	Vertical Resolution		Temporal Resolution		
Global	GRAS	resolution	Scalar at surface		GRAS resolut	ion	



GRM-73 Offline Be	nding Ar	ngle Grid		OBGMEC		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atmosphere researchers				
Characteristics and Method	Zonal monthly i	means on 200 m >	5 deg grid	S		
Operational Satellite Input D	Data	Metop-C/GRAS	3			
Other Operational Input Dat	а	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)
Dissemination						
Format	Me	eans		Timeliness		
netCDF	We	eb	30 d			
Accuracy						
Threshold	Та	Target		Optimal		
25 – 50 km: 0.6 % or 1.2 mg *) 8 – 25 km: 0.6 % 0 – 8 km: 6 – 0.6 %	8	25 – 50 km: 0.3 % or 0.6 murad*) 8 – 25 km: 0.3 % 0 – 8 km: 3 – 0.3 %		25 – 50 km: 0.15 % or 0.3 murad*) 8 – 25 km: 0.15 % 0 – 8 km: 1.5 – 0.15 %		
Notes	An	whichever is greater In accuracy interval means a linearly changing quantity between the two values ver the given vertical coordinate				
Verification/Validation Method	atistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.					
Coverage, Resolution						
Spatial Coverage Horizontal Resolution			Vertical Resolution Temporal Resolution			esolution
Global 5	deg latitu	ıde	200 m		1 month	



GRM-74	Offline F	Refractiv	vity Grid		ORGMEC		PRD_v3.4	
Туре	-		Offline Product					
Applications an	d Users		Climate and at	Climate and atmosphere researchers				
Characteristics	and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Satellite Input Data			Metop-C/GRAS	3				
Other Operation	nal Input D	ata	ECMWF ERA	Interim (validation,	sampling e	rror estimatio	n)	
Dissemination	ı		<u>.</u>					
Format M			Means		Timeliness	·		
netCDF V			Web		30 d			
Accuracy								
Threshold			arget		Optimal			
25 – 50 km: 0.2 units*) 8 – 25 km: 0.2 0 – 8 km: 2.4	4 %)12 N-	units*) 8 – 25 km: 0.12 %	25 – 50 km: 0.12 % or 0.006 N- units*) 8 – 25 km: 0.12 % 0 – 8 km: 1.2 – 0.12 %		25 – 50 km: 0.06 % or 0.003 N-units*) 8 – 25 km: 0.06 % 0 – 8 km: 0.6 – 0.06 %		
Notes			An accuracy interv	whichever is greater; An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate				
				tatistics of differences relative to ECMWF ERA Interim.Resampling statistics: ter-comparison of RO data subsets.				
Coverage, Res	olution							
Spatial Coverage	atial Coverage Horizontal Resolution		Vertical Resolution		Temporal Resolution			
Global		5 deg la	atitude	200 m		1 month		



GRM-75	Offline T	empera	ture Grid		OTGMEC		PRD_v3.4	
Туре			Offline Product	t				
Applications and	Users		Climate and at	mosphere researc	hers			
Characteristics and Methods			Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Satellite Input Data			Metop-C/GRAS	S				
Other Operational Input Data			ECMWF ERA	Interim (validation,	sampling e	rror estimation	n)	
Dissemination								
Format N			Means		Timeliness			
netCDF V		Web	30 d					
Accuracy								
Threshold			Target		Optimal			
25 – 50 km: 0.6 - 8 – 25 km: 0.6 km: 0 – 8 km: 2.0 -	<		8 – 25 km: 0.3 K	25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: 1.0 – 0.3 K		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: 0.50 – 0.15 K		
Notes			An accuracy intervover the given vert		y changing	quantity betwe	een the two values	
Verification/Valid	ation Met	hods		tatistics of differences relative to ECMWF ERA Interim.Resampling statistics: tter-comparison of RO data subsets.				
Coverage, Reso	lution							
Spatial Coverage)	Horizor	ital Resolution	Vertical Resolution		Temporal Resolution		
Global		5 deg la	atitude	200 m		1 month		



GRM-76	Offline S	Specific	Humidity Grid		OHGMEC		PRD_v3.4	
Туре	•		Offline Product					
Applications an	d Users		Climate and at	Climate and atmosphere researchers				
Characteristics and Methods			Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Sa	tellite Inpu	t Data	Metop-C/GRAS	3				
Other Operational Input Data			ECMWF ERA	Interim (validation,	sampling e	rror estimatio	n)	
Dissemination	1							
Format			Means	Means Timeline				
netCDF \		Web 30		30 d				
Accuracy								
Threshold			Target		Optimal			
8 – 12 km: 8.0 0 – 8 km: 8.0			8 – 12 km: 4.0 % 0 – 8 km: 4.0 %		8 – 12 km: 2.0 % 0 – 8 km: 2.0 %			
Notes			An accuracy interv		y changing	changing quantity between the two values		
				atistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.				
Coverage, Res	solution							
Spatial Covera	ge	Horizon	tal Resolution	Vertical Resolution Temporal Resolution			solution	
Global		5 deg la	atitude	200 m	1 month			



GRM-77 Climate	Dry Geop	ootential Height		OZGMEC		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researc	hers			
Characteristics and Metho	Zonal monthly	means on 200 m	c 5 deg grid	S			
Operational Satellite Input	Data	Metop-C/GRAS	3				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	٨	/leans		Timeliness			
netCDF V		Veb	30 d				
Accuracy							
Threshold	Т	Target		Optimal			
25 – 50 km: 12 – 120 m 8 – 25 km: 12 m 0 - 8 km: –		25 – 50 km: 6 – 60 m 8 – 25 km: 6 m 0 – 8 km: –		25 – 50 km: 3 – 30 m 8 – 25 km: 3 m 0 – 8 km: –			
Notes		an accuracy intervious the given verti		rly changing quantity between the two values			
			of differences relative to ECMWF ERA Interim.Resampling statistics:				
Coverage, Resolution							
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude	200 m	1 month			



GRM-78 Offline I	Ory Temp	erature Grid		ODGMEC		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researc	hers			
Characteristics and Metho	Zonal monthly	means on 200 m >	c 5 deg grid	S			
Operational Satellite Input	t Data	Metop-C/GRAS	3				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination		<u>.</u>					
Format	N	Means		Timeliness			
netCDF W		Veb	30 d				
Accuracy							
Threshold	1	Target		Optimal			
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: –	2	25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: –		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: –			
Notes		An accuracy intervented the given vertices and the control of the		orly changing quantity between the two values			
Verification/Validation Me			istics of differences relative to ECMWF ERA Interim.Resampling statistics: r-comparison of RO data subsets.				
Coverage, Resolution	<u> </u>						
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude	200 m	1 month			



GRM-79 Offline D	ry Press	ure Grid		OYGMEC		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	Climate and atmosphere researchers				
Characteristics and Metho	ds	Zonal monthly	means on 200 m >	c 5 deg grid	S		
Operational Satellite Input	Data	Metop-C/GRAS	3				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	N	leans		Timeliness			
netCDF W		Veb	30 d		30 d		
Accuracy							
Threshold	Т	Target		Optimal			
25 – 50 km: 0.24 – 1.20 % 8 – 25 km: 0.24 % 0 – 8 km –		25 – 50 km: 0.12 – 0.60 % 8 – 25 km: 0.12 % 0 – 8 km: –		25 – 50 km: 0.06 – 0.30 % 8 – 25 km: 0.06 % 0 – 8 km: –			
Notes		n accuracy intervater the given verti		ly changing quantity between the two values			
Verification/Validation Met			stics of differences relative to ECMWF ERA Interim.Resampling statistics:				
Coverage, Resolution	<u> </u>						
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lati	tude	200 m	1 month			

Ref: SAF/ROM/DMI/MGT/PRD/001

Issue: 3.4 Date: 26 January 2019



GRM-83 GRM-84 GRM-85 GRM-86 GRM-87 GRM-88 GRM-89 GRM-194	Offline temp Offline speci Offline dry to Offline dry p	etiveral	vity grid potential height grid Iture grid humidity grid perature grid	RBGMET RRGMET RZGMET RTGMET RHGMET RDGMET RYGMET RCGMET	PRD_v3.4	
Туре			Offline Product			
Applications and Use	ers		Climate and atmosphere research	archers		
Characteristics and	Methods		Zonal monthly means on 200	m x 5 deg grids		
Operational Satellite	Input Data		Offline Level 1A Metop (Multin	nission Metop)		
Other Operational In	put Data		ECMWF ERA Interim (validati	on, sampling error	estimation)	
Dissemination						
Format		Ме	ans	Timeliness		
netCDF	,	We	eb	n/a		
Accuracy						
Threshold		Tar	rget	Optimal		
Bending angle						
25 – 50 km: 0.4 % or 0.8 μrad*) 8 – 25 km: 0.4 % 0 – 8 km: 4 – 0.4 %		25 – 50 km: 0.2 % or 0.4 μrad*) 8 – 25 km: 0.2 % 0 – 8 km: 2.0– 0.20 %		25 – 50 km: 0.10 % or 0.2 μrad*) 8 – 25 km: 0.10 % 0 – 8 km: 1.0 – 0.10 %		
Refractivity						
25 – 50 km: 0.16 % units*) 8 – 25 km: 0.16 % 0 – 8 km: 1.6 – 0.		8	– 50 km: 0.08 % or 0.004 N- units*) – 25 km: 0.08 % – 8 km: 0.8 – 0.08 %	25 – 50 km: 0.04 % or 0.002 N- units*) 8 – 25 km: 0.04 % 0 – 8 km: 0.4 – 0.04 %		
Dry temperature						
25 – 50 km: 0.4 – 4 l 8 – 25 km: 0.4 K 0 – 8 km: –	K .	8	– 50 km: 0.2 – 2 K – 25 km: 0.2 K – 8 km: –	25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: –		
Dry pressure						
25 – 50 km: 0.16 – 0 8 – 25 km: 0.16 % 0 – 8 km –	0.80 %	8	– 50 km: 0.08 – 0.40 % – 25 km: 0.08 % – 8 km: –	25 – 50 km: 0.04 – 8 – 25 km: 0.04 % 0 – 8 km: –		
Dry geopotential he	eight					
8 – 25 km: 8 m		8	– 50 km: 4 – 40 m – 25 km: 4 m – 8 km: –	25 – 50 km: 2 – 20 m 8 – 25 km: 2 m 0 – 8 km: –		
Temperature						
25 – 50 km: 0.4 – 4 l 8 – 25 km: 0.4 K 0 – 8 km: 2.0 – 0.4		8	– 50 km: 0.2 – 2 K – 25 km: 0.2 K – 8 km: 1.0 – 0.2 K	25 – 50 km: 0.10 – 8 – 25 km: 0.10 k 0 – 8 km: 0.50 –	(



Specific humidity					
8 – 12 km: 6.0 % 0 – 8 km: 6.0 %		8 – 12 km: 3.0 ° 0 – 8 km: 3.0 °		8 – 12 km: 1.5 % 0 – 8 km: 1.5 %	
Tropopause Height					
0.2 km		0.1 km		0.05 km	
Notes	An accuracy interval means a linearly changing quantity between t two values over the given vertical coordinate. *) whichever is greater				
Verification/Validation Methods	0.10111	tatistics of differences relative to ECMWF ERA Interim. esampling statistics: inter-comparison of RO data subsets.			
Coverage, Resolution	<u>.</u>				
Spatial Coverage	Horizonta	I Resolution	Vertical Resolut	ion	Temporal Resolution
global	5 deg latit	ude	200 m		1 month



GRM-92 Ground	Based (GNSS Package		GBGP	PRD_v3.4		
Туре		Software Prod	Software Product				
Applications and Users		Analysis Centr	Analysis Centres and NWP				
Characteristics and Metho	ods	Routines for ha	andling ground-bas	sed GNSS (ZTD, IWV)		
Operational Satellite Input Data Output of gro			nd-based GNSS p	rocessing			
Other Operational Input D	ata						
Dissemination							
Format Me		Means		Timeliness			
tarballs		Web		N/A			
Accuracy							
Threshold		Target	Target		Optimal		
N/A		N/A	V/A		N/A		
Notes							
Verification/Validation Me	thods	Test Folder	est Folder				
Coverage, Resolution							
Spatial Coverage	Horizon	ital Resolution	Vertical Resolution		Temporal Resolution		
N/A	N/A						



GRM-93 Offline E	Bending A	Angle Grid		OBGMEA		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	Climate and atmosphere researchers				
Characteristics and Metho	ods	Zonal monthly i	Zonal monthly means on 200 m x 5 deg grids				
Operational Satellite Input	Data	Metop-A/GRAS	3				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)	
Dissemination		<u>.</u>					
Format	N	Means		Timeliness			
netCDF	\	Web		30 d			
Accuracy							
Threshold		Гarget	Optimal				
25 – 50 km: 0.6 % or 1.2 r *) 8 – 25 km: 0.6 % 0 – 8 km: 6 – 0.6 %	murad 2	25 – 50 km: 0.3 % or 0.6 murad*) 8 – 25 km: 0.3 % 0 – 8 km: 3 – 0.3 %		25 – 50 km: 0.15 % or 0.3 murad*) 8 – 25 km: 0.15 % 0 – 8 km: 1.5 – 0.15 %			
Notes * whichever is greated An accuracy intervover the given vertex.			val means a linearly changing quantity between the two values				
Verification/Validation Met		Statistics of differer			Interim.Resa	mpling statistics:	
Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude	200 m	200 m		1 month	



GRM-94	Offline F	Refractivi	ty Grid		ORGMEA		PRD_v3.4		
Туре	<u> </u>		Offline Product						
Applications a	nd Users		Climate and atr	Climate and atmosphere researchers					
Characteristics	and Metho	ods	Zonal monthly	Zonal monthly means on 200 m x 5 deg grids					
Operational Sa	atellite Inpu	t Data	Metop-A/GRAS	3					
Other Operation	nal Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)		
Disseminatio	n								
Format M			Means		Timeliness	1			
netCDF	netCDF W				30 d				
Accuracy									
Threshold		1	Target		Optimal				
25 – 50 km: 0. units*) 8 – 25 km: 0. 0 – 8 km: 2.	24 %		25 – 50 km: 0.12 % or 0.006 N- units*) 8 – 25 km: 0.12 % 0 – 8 km: 1.2 – 0.12 %		25 – 50 km: 0.06 % or 0.003 N-units*) 8 – 25 km: 0.06 % 0 – 8 km: 0.6 – 0.06 %				
Notes		A	An accuracy interv	nichever is greater; accuracy interval means a linearly changing quantity between the two values r the given vertical coordinate					
				atistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.					
Coverage, Re	solution								
Spatial Covera	ıge	Horizont	al Resolution	Vertical Resolution		Temporal Resolution			
Global		5 deg lat	itude	200 m	1 month				



GRM-95 Offi	ine Tempera	ature Grid		OTGMEA		PRD_v3.4
Туре		Offline Product	:			
Applications and Use	rs	Climate and at	mosphere researchers			
Characteristics and M	1ethods	Zonal monthly	means on 200 m	k 5 deg grid	S	
Operational Satellite	Input Data	Metop-A/GRAS	3			
Other Operational Inp	out Data	ECMWF ERA	ECMWF ERA Interim (validation, sample			n)
Dissemination						
Format		Means		Timeliness		
netCDF		Web		30 d		
Accuracy						
Threshold		Target		Optimal		
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: 2.0 – 0.6	-	25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: 1.0 – 0.3 K		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: 0.50 – 0.15 K		
Notes		An accuracy intervover the given vert		y changing	quantity betwe	en the two values
Verification/Validation	n Methods		es of differences relative to ECMWF ERA Interim.Resampling statistics: mparison of RO data subsets.			
Coverage, Resolution	on					
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on Temporal Resolution		solution
Global	5 deg la	atitude	200 m		1 month	



GRM-96 Offline	Specific I	Humidity Grid		OHGMEA		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and at	mosphere researc	hers			
Characteristics and Met	thods	Zonal monthly	means on 200 m	k 5 deg grids	3		
Operational Satellite Inp	out Data	Metop-A/GRAS	3				
Other Operational Input	Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	ı	Means	Timeliness				
netCDF	1	Web		30 d			
Accuracy							
Threshold	-	Гarget	Optimal				
8 – 12 km: 8.0 % 0 – 8 km: 8.0 %		8 – 12 km: 4.0 % 0 – 8 km: 4.0 %					
8 – 12 km: 8.0 % 0 – 8 km: 8.0 %	{			8 – 12 km: 0 – 8 km			
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	,	0 – 8 km: 4.0 %		0 – 8 km	: 2.0 %	een the two values	
0 – 8 km: 8.0 %	// (Alethods	0 – 8 km: 4.0 % An accuracy interv	ical coordinate	0 – 8 km y changing o	: 2.0 % quantity betwe		
0 - 8 km: 8.0 % Notes	// dethods i	0 – 8 km: 4.0 % An accuracy intervover the given vert Statistics of difference	ical coordinate	0 – 8 km y changing o	: 2.0 % quantity betwe		
0 – 8 km: 8.0 % Notes Verification/Validation M	// dethods i	0 – 8 km: 4.0 % An accuracy intervover the given vert Statistics of difference	ical coordinate	0 – 8 km y changing o CMWF ERA	: 2.0 % quantity betwe	mpling statistics:	



GRM-97 Climate	Dry Geo	potential Height		OZGMEA		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	mosphere researchers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S	
Operational Satellite Input	Data	Metop-A/GRAS	3			
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)
Dissemination						
Format	ı	Means		Timeliness	1	
netCDF	,	Web		30 d		
Accuracy						
Threshold	-	Target		Optimal		
25 – 50 km: 12 – 120 m 8 – 25 km: 12 m 0 - 8 km: –	2	25 – 50 km: 6 – 60 m 8 – 25 km: 6 m 0 – 8 km: –		25 – 50 km: 3 – 30 m 8 – 25 km: 3 m 0 – 8 km: –		
Notes		An accuracy intervented the second control of the given verting the second control of th		y changing	quantity betwe	een the two values
Verification/Validation Met			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.			
Coverage, Resolution						
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg la	titude	200 m	1 month		



GRM-98 Offline I	Ory Temp	perature Grid		ODGMEA		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	mosphere researchers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S	
Operational Satellite Inpu	t Data	Metop-A/GRAS	3			
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination						
Format		Means		Timeliness		
netCDF	,	Web		30 d		
Accuracy	•					
Threshold		Target		Optimal		
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: –		25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: –		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: –		
Notes		An accuracy intervolver the given vert		y changing	quantity betwe	een the two values
Verification/Validation Me			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.			
Coverage, Resolution	<u> </u>					
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	ution Temporal Resolution		
Global	5 deg la	titude	200 m	1 month		



GRM-99 Offline	Dry Pres	sure Grid		OYGMEA		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and at	mosphere researc	hers			
Characteristics and Met	nods	Zonal monthly	means on 200 m	x 5 deg grid	s		
Operational Satellite Inp	ut Data	Metop-A/GRAS	3				
Other Operational Input	Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)	
Dissemination		.					
Format		Means		Timeliness	i		
netCDF	,	Web		30 d			
Accuracy							
Threshold	-	Target	Optimal				
25 – 50 km: 0.24 – 1.20 8 – 25 km: 0.24 % 0 – 8 km –	% :	25 – 50 km: 0.12 – 0.60 % 8 – 25 km: 0.12 % 0 – 8 km: –		25 – 50 km: 0.06 – 0.30 % 8 – 25 km: 0.06 % 0 – 8 km: –			
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values	
Verification/Validation M		Statistics of different nter-comparison o		es relative to ECMWF ERA Interim.Resampling statistics: O data subsets.			
Coverage, Resolution							
Spatial Coverage	Horizon	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg la	titude	200 m		1 month		



GRM-100	NRT Dry	Tempe	rature Profile			NDPMEA		PRD_v3.4
Туре			NRT Produ	uct				
Applications and	Users		NWP	IWP				
				res wave optics sampling; terpolated to 247 fixed levels				
Operational Sate	llite Input	Data	Metop-A/G	SRAS	3			
Metop orb			S orbits (EUM) op orbits (EUM) MWF FC, AN					
Dissemination								
Format			Means			Timeliness	1	
E		GTS EUMETCast Web		3 h				
Accuracy								
Threshold			Target		Optimal			
20 – 40 km: 2 K - 5 – 20 km: 2 K 0 – 5 km: 4 K -			20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K			
Notes			An accuracy ir over the given			y changing	quantity betwe	een the two values
Verification/Valid	ation Met	hods	Standard devi	ation	of (Product – ECI	MWF foreca	asts)	
Coverage, Reso	lution							
Spatial Coverage)	Horizor	ntal Resolution		Vertical Resolution	on	Temporal Re	solution
Global		GRAS	resolution		hi-res wave optic sampling; interpolated to 24 levels		GRAS resolu	ition



GRM-101 Offline D	Dry Tem	perature Profile		ODPMEA		PRD_v3.4
Туре		Offline Product	t			
Applications and Users		Climate and at	Climate and atmosphere researchers			
			ave optics sampling; ted to 247 fixed levels			
Operational Satellite Input	Data	Metop-A/GRAS	3			
Other Operational Input Data GPS orbits (E Metop orbits (ECMWF FC, A			(EUM)			
Dissemination						
Format		Means		Timeliness		
BUFR netCDF		Web		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy intervover the given vert		ly changing quantity between the two values		
Verification/Validation Met	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Resolution						
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	GRAS	resolution	hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ition



GRM-102 NRT Dry	Tempe	rature Profile		NDPMEB		PRD_v3.4
Туре		NRT Product				
Applications and Users		NWP				
		·	hi-res wave optics sampling; interpolated to 247 fixed levels			
Operational Satellite Input	Data	Metop-B/GRAS	3			
·		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN			
Dissemination		-				
Format		Means		Timeliness		
BUFR/netCDF		GTS EUMETCast Web		3 h		
Accuracy				-		
Threshold		Target		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy interval over the given verti		y changing	quantity betwe	een the two values
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Resolution						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	GRAS I	resolution	hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ition



GRM-103 Offline I	ry Tem	perature Profile		ODPMEB		PRD_v3.4
Туре		Offline Produc	t			
Applications and Users		Climate and at	Climate and atmosphere researchers			
Characteristics and Metho		hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-B/GRAS	S			
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination						
Format		Means		Timeliness		
BUFR netCDF		Web		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy intervover the given ver		urly changing quantity between the two values		
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	asts)	
Coverage, Resolution		-				
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	esolution
Global	GRAS	resolution	hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ution



GRM-104 NRT Dry	Tempe	rature Profile		NDPMEC		PRD_v3.4
Туре		NRT Product				
Applications and Users		NWP	NWP			
			hi-res wave optics sampling; interpolated to 247 fixed levels			
Operational Satellite Input	Data	Metop-C/GRAS	3			
Meto		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN			
Dissemination		-				
Format		Means		Timeliness	Timeliness	
BUFR/netCDF		GTS EUMETCast Web		3 h		
Accuracy				-		
Threshold		Target		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy interva		y changing	quantity betwe	een the two values
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Resolution						
Spatial Coverage	Horizon	ital Resolution	Vertical Resolution	on	Temporal Re	esolution
Global	GRAS	resolution	hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	ıtion



GRM-105 Offline D	ry Tem	perature Profile		ODPMEC		PRD_v3.4
Туре		Offline Product	t			
Applications and Users		Climate and at	Climate and atmosphere researchers			
Characteristics and Metho	•	hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-C/GRAS	S			
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination						
Format		Means		Timeliness		
BUFR netCDF		Web		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 5 – 20 km: 1 K 0 – 5 km: 2 K - 1		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values
Verification/Validation Met	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Resolution					_	
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	GRAS	resolution	hi-res wave optics sampling; interpolated to 247 fixed levels		GRAS resolu	tion



GRM-107 Offline B	Bending A	ngle Grid		OBGCO2		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	Climate and atmosphere researchers				
Characteristics and Metho	Characteristics and Methods Z			c 5 deg grid	S		
Operational Satellite Input	Data	COSMIC-2 Pos	st-processed data				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination		.					
Format	M	leans		Timeliness			
netCDF	V	Web		30 - 180 d			
Accuracy							
Threshold	T	arget	Optimal				
25 – 50 km: 0.4 % or 0.8 murad*) 8 – 25 km: 0.4 % 0 – 8 km: 4 – 0.4 %	1	25 – 50 km: 0.2 % or 0.4 murad*) 8 – 25 km: 0.2 % 0 – 8 km: 2.0– 0.20 %		25 – 50 km: 0.10 % or 0.2 murad*) 8 – 25 km: 0.10 % 0 – 8 km: 1.0 – 0.10 %			
Notes	А	whichever is grean n accuracy interva ver the given verti	al means a linearly	y changing quantity between the two values			
Verification/Validation Methods Statistics of differences relating				ve to ECMWF ERA Interim.Resampling statistics: subsets.			
Coverage, Resolution							
Spatial Coverage	Horizonta	l Resolution	Vertical Resolution	on Temporal Resolution			
Global	5 deg lati	tude	200 m		1 month		



GRM-108 Offline F	Refractivit	ty Grid		ORGCO2		PRD_v3.4	
Туре		Offline Product	Product				
Applications and Users		Climate and atr	Climate and atmosphere researchers				
Characteristics and Metho	Characteristics and Methods		Zonal monthly means on 200 m x 5 deg grids				
Operational Satellite Input	Data	COSMIC-2 Pos	st-processed data				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	N	leans		Timeliness			
netCDF	V	Web		30 - 180 d			
Accuracy							
Threshold	Т	Target		Optimal			
25 – 50 km: 0.16 % or 0.0 units*) 8 – 25 km: 0.16 % 0 – 8 km: 1.6 – 0.16 %	u	25 – 50 km: 0.08 % or 0.004 N- units*) 8 – 25 km: 0.08 % 0 – 8 km: 0.8 – 0.08 %		25 – 50 km: 0.04 % or 0.002 N-units*) 8 – 25 km: 0.04 % 0 – 8 km: 0.4 – 0.04 %			
Notes	* whichever is greater; An accuracy interval mover the given vertical of			/ changing	quantity betwe	een the two values	
Verification/Validation Met			tistics of differences relative to ECMWF ERA Interim.Resampling statistics: r-comparison of RO data subsets.				
Coverage, Resolution							
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lati	tude	200 m	1 month			



GRM-109 O	offline Ten	nperatu	re Grid		OTGCO2		PRD_v3.4	
Туре			Offline Product					
Applications and U	Jsers		Climate and atr	mosphere researc	hers			
Characteristics and	d Methods	;	Zonal monthly	means on 200 m >	c 5 deg grid	S		
Operational Satelli	te Input Da	ata	COSMIC-2 Pos	st-processed data				
Other Operational	Input Data	a	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)	
Dissemination			-					
Format M		M	eans		Timeliness			
netCDF	etCDF V		Web		30 - 180 d			
Accuracy								
Threshold		Та	arget		Optimal			
25 – 50 km: 0.4 – 4 8 – 25 km: 0.4 K 0 – 8 km: 2.0 – 6		8	- 50 km: 0.2 - 2 K - 25 km: 0.2 K - 8 km: 1.0 - 0.2 K		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: 0.50 – 0.10 K			
Notes			accuracy interver er the given vert		y changing	quantity betwe	een the two values	
Verification/Validat	tion Metho			nces relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.				
Coverage, Resolu	ution							
Spatial Coverage	Но	orizonta	al Resolution Vertical Resolution		on Temporal Resolution		solution	
Global	5 (deg latit	ude	200 m		1 month		



GRM-110 Offline	Specific H	umidity Grid		OHGCO2		PRD_v3.4
Туре		Offline Product				
Applications and Users	Climate and atr	Climate and atmosphere researchers				
Characteristics and Meth	nods	Zonal monthly	means on 200 m	c 5 deg grid	3	
Operational Satellite Inp	ut Data	COSMIC -2Pos	st-processed data			
Other Operational Input	Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination		•				
Format		Means		Timeliness		
netCDF	W	Web		30 - 180 d		
Accuracy						
Threshold	T	Target		Optimal		
8 – 12 km: 6.0 % 0 – 8 km: 6.0 %		8 – 12 km: 3.0 % 0 – 8 km: 3.0 %		8 – 12 km: 1.5 % 0 – 8 km: 1.5 %		
0 - 0 KIII. 0.0 70	(0 – 8 km: 3.0 %				
Notes	A			0 – 8 km	: 1.5 %	een the two values
	A over the contract of the con	n accuracy interviver the given vert		0 – 8 km y changing o	n: 1.5 % quantity betwe	
Notes	A over the contract of the con	n accuracy interviver the given vert	ical coordinate	0 – 8 km y changing o	n: 1.5 % quantity betwe	
Notes Verification/Validation M	ethods S in	n accuracy interviver the given vert	ical coordinate	0 – 8 km y changing o CMWF ERA	n: 1.5 % quantity betwe	mpling statistics:



GRM-111 Climate	Dry Geo	potential Height		OZGCO2		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researchers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Satellite Input	t Data	COSMIC-2 Pos	st-processed data				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format		Means		Timeliness			
netCDF	F		Web		30 - 180 d		
Accuracy	•						
Threshold		Target	Optimal				
25 – 50 km: 8 – 80 m 8 – 25 km: 8 m 0 - 8 km: –		25 – 50 km: 4 – 40 8 – 25 km: 4 m 0 – 8 km: –	8 – 25 km: 4 m		25 – 50 km: 2 – 20 m 8 – 25 km: 2 m 0 – 8 km: –		
Notes		An accuracy intervolver the given vert		y changing	quantity betwe	een the two values	
Verification/Validation Me			nces relative to ECMWF ERA Interim.Resampling statistics: f RO data subsets.				
Coverage, Resolution	<u> </u>						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	ion Temporal Resolution		solution	
Global	5 deg la	titude	200 m	1 month			



GRM-112 Offline	Dry Tem	perature Grid		ODGCO2		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and at	Climate and atmosphere researchers			
Characteristics and Metho	Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Satellite Inpu	t Data	COSMIC-2 Pos	st-processed data			
Other Operational Input D	Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)
Dissemination						
Format	Format M			Timeliness		
netCDF		Web 30		30 - 180 d		
Accuracy						
Threshold		Target		Optimal		
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: –		25 – 50 km: 0.2 – 2 K 8 – 25 km: 0.2 K 0 – 8 km: –		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: –		
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values
Verification/Validation Me	thods	Statistics of different inter-comparison o			Interim.Resa	mpling statistics:
Coverage, Resolution						
Spatial Coverage	Horizon	ntal Resolution	Vertical Resolution	ion Temporal Resol		solution
Global	5 deg la	atitude	200 m		1 month	



GRM-113 Offline I	Ory Pres	sure Grid		OYGCO2		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researchers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m >	5 deg grid	S		
Operational Satellite Input	t Data	COSMIC-2 Pos	st-processed data				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	I	Means		Timeliness			
netCDF	,	Web		30 - 180 d			
Accuracy							
Threshold	-	Target	Optimal				
25 – 50 km: 0.16 – 0.80 % 8 – 25 km: 0.16 % 0 – 8 km –	,	25 – 50 km: 0.08 – 0.40 % 8 – 25 km: 0.08 % 0 – 8 km: –		25 – 50 km: 0.04 – 0.20 % 8 – 25 km: 0.04 % 0 – 8 km: –			
Notes		An accuracy interva		/ changing	quantity betwe	een the two values	
Verification/Validation Me	cation/Validation Methods Statistics of differences inter-comparison of RO			ces relative to ECMWF ERA Interim.Resampling statistics:			
Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution	ion Temporal Resolution		solution	
Global	5 deg la	titude	200 m	1 month			



GRM-116 Offline E	Bending	Angle		OBAJA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	atmosphere researchers			
			e optics sampling; d to 247 fixed levels			
Operational Satellite Input	t Data	Jason-CS A1				
Metop orbits		GPS orbits (EU Metop orbits (E ECMWF FC, Al	(EUM)			
Dissemination		-				
Format		Means		Timeliness		
netCDF BUFR		Web		5 - 60 d		
Accuracy						
Threshold	•	Target		Optimal		
35 – 60 km: 4 murad 8 – 35 km: 4% 2 – 8 km: 20% - 4%	;	35 – 60 km: 2 murad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 murad 8 – 35 km: 1% 2 – 8 km: 5% - 1%		
Notes	(An accuracy interva over the given verti BA noise above 60	cal coordinate			
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Resolution						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	RO reso	olution	hi-res wave optic sampling; interpolated to 24 levels		RO resolution	n



GRM-117 Offline F	Refractiv	vity Profile		ORPJA1		PRD_v3.4	
Туре		Offline Product	:				
Applications and Users		Climate and at	Climate and atmosphere researchers				
Characteristics and Metho	·	hi-res wave optics sampling; interpolated to 247 fixed levels					
Operational Satellite Input	Data	Jason-CS A1					
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination							
Format		Means		Timeliness			
netCDF BUFR		Web	Veb 5 -		5 - 60 d		
Accuracy							
Threshold		Target		Optimal			
30 – 50 km: 0.06 N-units 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		30 – 50 km: 0.03 N 5 – 30 km: 0.6% 0 – 5 km: 2% – 0		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%			
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values	
Verification/Validation Met	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)		
Coverage, Resolution							
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	RO resolution		hi-res wave optic sampling; interpolated to 24 levels		RO resolution	n	



GRM-118	Offline T	empera	ature Profile			OTPJA1		PRD_v3.4
Туре			Offline Pro	duct				
Applications and	Users		Climate an	Climate and atmosphere researchers				
				model levels (with interpolation); interpolated to 247 fixed levels				
Operational Sate	llite Input	Data	Jason-CS	A1				
Other Operational Input Data			Metop orbi	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination	Dissemination							
Format			Means	Means		Timeliness	Timeliness	
netCDF BUFR			Veb		5 - 60 d			
Accuracy								
Threshold			Target		Optimal			
30 – 50 km: 3 K 5 – 30 km: 3 K 0 – 5 km: 6 K			5 – 30 km: 1	30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K		
Notes					al means a linearly	ly changing quantity between the two values		
Verification/Valid	ation Met	thods	Standard devia	ation	of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Reso	lution							
Spatial Coverage	9	Horizor	ntal Resolution		Vertical Resolution	on	Temporal Re	solution
Global		RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	n	



GRM-119 Offlir	ne Specific	Humidity Profile		OHPJA1	PRD_v3.4	
Туре		Offline Produc	t			
Applications and Users	3	Climate and a	tmosphere researc	hers		
			with interpolation); 247 fixed levels			
Operational Satellite Ir	nput Data	Jason-CS A1				
Other Operational Inpu	Metop orbits (I	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination						
Format		Means	Means			
netCDF BUFR			Web			
Accuracy						
Threshold		Target		Optimal		
1.8 g/kg 30% *		0.6 g/kg 10% *				
Notes		* whichever is gre The interval 0 – 12	ater; 2 km is considered			
Verification/Validation	Methods	Standard deviation	n of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Resolution	n					
Spatial Coverage	Horizo	ntal Resolution	Vertical Resolution	on	Temporal Resolution	
Global	RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	



GRM-120 Offline F	ressure	Profile		OPPJA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and at	Climate and atmosphere researchers			
			vith interpolation); 247 fixed levels			
Operational Satellite Input	Data	Jason-CS A1				
Metop or			PS orbits (EUM) etop orbits (EUM) CMWF FC, AN			
Dissemination		-				
Format		Means		Timeliness		
netCDF BUFR		Web		5 - 60 d		
Accuracy						
Threshold		Target		Optimal		
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		b) 0.25%		a) 0.005 hPa b) 0.1% c) 0.7 hPa *		
Notes		* whichever is grea The interval 0 – 50	. , , , ,	•	ater than (c);	
Verification/Validation Me	thods	Standard deviation	of (1D-Var solution	on – ECMW	F analysis)	
Coverage, Resolution						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution
Global	RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	n



GRM-121 OffI	ine Surface	Pressure		OSPJA1		PRD_v3.4	
Туре		Offline Product					
Applications and Use	rs	Climate and at	mosphere researc	hers			
Characteristics and M	/lethods	Scalar at surface	ce				
Operational Satellite	Input Data	Jason-CS A1					
Other Operational Inp	out Data	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means	leans		Timeliness		
netCDF BUFR		Web	Veb		5 - 60 d		
Accuracy							
Threshold		Target		Optimal			
2.4 hPa		0.8 hPa		0.7 hPa			
Notes							
Verification/Validation	n Methods	Standard deviation	andard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution	on						
Spatial Coverage	Horizo	ntal Resolution	Vertical Resolution		Temporal Re	solution	
Global	RO res	olution	Scalar at surface		RO resolution	1	



GRM-122 Offline I	Ory Tem	perature Profile		ODPJA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	mosphere researc	hers		
Characteristics and Metho	hi-res wave opt	tics sampling; 247 fixed levels				
Operational Satellite Input	Data	Jason-CS A1				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-				
Format	Format M		Means		Timeliness	
netCDF BUFR			Veb 5 - 60 o			
Accuracy						
Threshold		Target		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 7 5 – 20 km: 1 K 0 – 5 km: 2 K - 1		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes						
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	asts)	
Coverage, Resolution						
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	n



GRM-123 Offline Be	nding Ar	igle Grid		OBGJA1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	Climate and atmosphere researchers				
Characteristics and Method	S	Zonal monthly i	means on 200 m x	5 deg grid	S		
Operational Satellite Input D	Data	Jason-CS A1					
Other Operational Input Dat	ta	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)	
Dissemination		<u> </u>					
Format	Ме	ans		Timeliness			
netCDF	We	eb		30 - 180 d			
Accuracy							
Threshold	Та	Target		Optimal	Optimal		
25 – 50 km: 0.4 % or 0.8 murad*) 8 – 25 km: 0.4 % 0 – 8 km: 4 – 0.4 %	8	25 – 50 km: 0.2 % or 0.4 murad*) 8 – 25 km: 0.2 % 0 – 8 km: 2.0– 0.20 %		25 – 50 km: 0.10 % or 0.2 murad*) 8 – 25 km: 0.10 % 0 – 8 km: 1.0 – 0.10 %			
Notes	An	whichever is greater; a accuracy interval means a linearly changing quantity between the two values er the given vertical coordinate					
Verification/Validation Method		stics of differences relative to ECMWF ERA Interim.Resampling statistics: -comparison of RO data subsets.					
Coverage, Resolution							
Spatial Coverage Horizontal Resolution		Resolution	Vertical Resolution		Temporal Resolution		
Global 5	deg latitu	ıde	200 m		1 month		



GRM-124 Offline R	efractivity	/ Grid		ORGJA1		PRD_v3.4		
Туре		Offline Product						
Applications and Users		Climate and atmosphere researchers						
Characteristics and Metho	ds	Zonal monthly r	means on 200 m >	c 5 deg grid	S			
Operational Satellite Input	Data	Jason-CS A1						
Other Operational Input Da	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)		
Dissemination	Dissemination							
Format	Me	eans		Timeliness				
netCDF	W	eb	30 - 180 d					
Accuracy								
Threshold	Та	Target		Optimal				
25 – 50 km: 0.16 % or 0.00 units*) 8 – 25 km: 0.16 % 0 – 8 km: 1.6 – 0.16 %	un 8	25 – 50 km: 0.08 % or 0.004 N- units*) 8 – 25 km: 0.08 % 0 – 8 km: 0.8 – 0.08 %		25 – 50 km: 0.04 % or 0.002 N-units*) 8 – 25 km: 0.04 % 0 – 8 km: 0.4 – 0.04 %				
Notes	Ar		never is greater; uracy interval means a linearly changing quantity between the two values e given vertical coordinate;					
Verification/Validation Met		stics of differences relative to ECMWF ERA Interim.Resampling statistics: -comparison of RO data subsets.						
Coverage, Resolution								
Spatial Coverage Horizontal Resolution		Vertical Resolution		Temporal Resolution				
Global	5 deg latiti	ude	200 m		1 month			



GRM-125 Offline T	emperat	ure Grid		OTGJA!		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	mosphere researc	hers		
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S	
Operational Satellite Input	Data	Jason-CS A1				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination		•				
Format	N	/leans		Timeliness		
netCDF	V	Veb	30 - 180 d		I	
Accuracy						
Threshold	Т	Target		Optimal		
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: 2.0 – 0.4 K		25 – 50 km: 0.2 – 2 K 8 – 25 km: 0.2 K 0 – 8 km: 1.0 – 0.2 K		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: 0.50 – 0.10 K		
Notes		An accuracy intervious the given vert		y changing	quantity betwe	een the two values
Verification/Validation Met			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.			
Coverage, Resolution						
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg lat	itude	200 m	1 month		



GRM-126	Offline S	Specific	Humidity Grid		OHGJA1		PRD_v3.4	
Туре			Offline Product	ffline Product				
Applications and	Users		Climate and at	mosphere researc	hers			
Characteristics a	and Metho	ods	Zonal monthly	means on 200 m	x 5 deg grid	S		
Operational Sate	ellite Input	Data	Jason-CS A1					
Other Operation	al Input D	ata	ECMWF ERA	Interim (validation,	, sampling e	rror estimatio	n)	
Dissemination			<u>.</u>					
Format			Means		Timeliness	i		
netCDF V		Web		30 - 180 d				
Accuracy								
Threshold			Target		Optimal			
8 – 12 km: 6.0 % 0 – 8 km: 6.0	-		8 – 12 km: 3.0 % 0 – 8 km: 3.0 %		8 – 12 km: 1.5 % 0 – 8 km: 1.5 %			
Notes			An accuracy interv		ly changing quantity between the two values			
				atistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.				
Coverage, Rese	olution							
Spatial Coverag	е	Horizon	tal Resolution	Vertical Resolution		Temporal Resolution		
Global		5 deg la	titude	200 m	1 month			



GRM-127 Clin	mate Dry Ge	opotential Height		OZGJA1		PRD_v3.4	
Туре		Offline Product					
Applications and Use	ers	Climate and at	mosphere researc	hers			
Characteristics and	Methods	Zonal monthly	means on 200 m >	k 5 deg grid	S		
Operational Satellite	Input Data	Jason-CS A1					
Other Operational In	put Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)	
Dissemination							
Format		Means		Timeliness			
netCDF V		Web 3		30 - 180 d			
Accuracy							
Threshold		Target		Optimal			
25 – 50 km: 8 – 80 n 8 – 25 km: 8 m 0 - 8 km: –	n	25 – 50 km: 4 – 40 m 8 – 25 km: 4 m 0 – 8 km: –		25 – 50 km: 2 – 20 m 8 – 25 km: 2 m 0 – 8 km: –			
Notes		An accuracy intervover the given vert		y changing	quantity betwe	en the two values	
Verification/Validation	n Methods		atistics of differences relative to ECMWF ERA Interim.Resampling statistics: ter-comparison of RO data subsets.				
Coverage, Resolut	ion						
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg la	atitude	200 m		1 month		



GRM-128 Offline I	Ory Temp	perature Grid		ODGJA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	Climate and atmosphere researchers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S	
Operational Satellite Input	t Data	Jason-CS A1				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination						
Format		Means		Timeliness		
netCDF		Web		30 - 180 d		
Accuracy						
Threshold	•	Target		Optimal		
25 – 50 km: 0.4 – 4 K 8 – 25 km: 0.4 K 0 – 8 km: –		25 – 50 km: 0.2 – 2 K 8 – 25 km: 0.2 K 0 – 8 km: –		25 – 50 km: 0.10 – 1.0 K 8 – 25 km: 0.10 K 0 – 8 km: –		
Notes		An accuracy intervented the second control of the second control o	al means a linearly changing quantity between the two values ical coordinate;			
Verification/Validation Met		Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: inter-comparison of RO data subsets.				
Coverage, Resolution					_	
Spatial Coverage	Horizon	al Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg la	titude	200 m		1 month	



GRM-129 Offline I	Ory Press	sure Grid		OYGJA1		PRD_v3.4			
Туре		Offline Product							
Applications and Users	Climate and atr	mosphere researc	hers						
Characteristics and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S				
Operational Satellite Input	Data	Jason-CS A1							
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)			
Dissemination		-							
Format	N	Means		Timeliness					
netCDF W		Veb	30 - 180 d						
Accuracy									
Threshold	7	Target		Optimal					
25 – 50 km: 0.16 – 0.80 % 8 – 25 km: 0.16 % 0 – 8 km –		25 – 50 km: 0.08 – 0.40 % 8 – 25 km: 0.08 % 0 – 8 km: –		25 – 50 km: 0.04 – 0.20 % 8 – 25 km: 0.04 % 0 – 8 km: –					
Notes		An accuracy interva		ly changing quantity between the two values					
			rences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.						
Coverage, Resolution	Coverage, Resolution								
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution				
Global	5 deg lat	itude	200 m 1 month						



GRM-130 NRT Ref	ractivity	Profile		NRPMA1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
Characteristics and Methods			hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-SG A1					
Other Operational Input Data			PS orbits (EUM) etop orbits (EUM) CMWF FC, AN				
Dissemination		<u>.</u>					
Format		Means		Timeliness	1		
E		GTS EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy				-			
Threshold		Target		Optimal			
30 – 50 km: 0.09 N-units 5 – 30 km: 1.8% 0 – 5 km: 6% – 1.8%		5 – 30 km: 0.6%	0 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		
Notes		An accuracy interv		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	asts)		
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global, Regional (TBD)	nal (TBD) RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	on	



GRM-131 N	NRT Ten	nperatu	re Profile		NTPMA1		PRD_v3.4	
Туре			NRT Product					
Applications and U	Jsers		NWP	NWP				
Characteristics and Methods			· ·	vith interpolation); 247 fixed levels				
Operational Satell	ite Input	Data	Metop-SG A1					
Other Operational	Input D	ata	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination			-					
Format			Means		Timeliness			
		GTS EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD				
Accuracy								
Threshold			Target	Optimal				
30 – 50 km: 3 K – 5 – 30 km: 3 K 0 – 5 km: 6 K –			30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K			
Notes			An accuracy interv		y changing	quantity betwe	een the two values	
Verification/Valida	tion Met	hods	Standard deviation	n of (1D-Var solution – ECMWF analysis)				
Coverage, Resol	ution							
Spatial Coverage		Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global, Regional (, Regional (TBD) RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	on		



GRM-132	NRT Spe	ecific H	umidity Profile		NHPMA1	PRD_v3.4		
Туре	=		NRT Product					
Applications and Users		NWP	NWP					
Characteristics a	and Metho	ods	,	with interpolation); 247 fixed levels				
Operational Sate	ellite Input	Data	Metop-SG A1					
Other Operational Input Data			Metop orbits (I	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination								
Format			Means		Timeliness	3		
EL		Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD				
Accuracy								
Threshold			Target		Optimal			
1.8 g/kg 30% *			0.6 g/kg 10% *			0.3 g/kg 10% *		
Notes				whichever is greater; e interval 0 – 12 km is considered				
Verification/Valid	dation Me	thods	Standard deviation	n of (1D-Var solution	n – ECMW	(F analysis)		
Coverage, Res	olution							
Spatial Coverag	е	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Resolution		
Global, Regiona	ıl (TBD)	D) RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution		



GRM-133 NRT Pre	ssure Pr	ofile		NPPMA1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP	NWP				
Characteristics and Metho	ods	model levels (w	vith interpolation); 247 fixed levels				
Operational Satellite Input	Data	Metop-SG A1					
Other Operational Input D	ata	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format	N	Means		Timeliness	1		
E		EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy	=			-			
Threshold	1	Target		Optimal			
a) 0.03 hPa b) 0.75% c) 2.4 hPa *	t	a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *			
Notes		whichever is grea The interval 0 – 50		but not grea	ater than (c);		
Verification/Validation Me	thods S	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global, Regional (TBD)	RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	on	



GRM-134 NRT Surfa	ce Pres	sure		NSPMA1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
Characteristics and Methods	S	Scalar at surface	ce				
Operational Satellite Input D	Data	Metop-SG A1					
Other Operational Input Date	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination							
Format	Me	eans	Timeliness		3		
BUFR/netCDF	BUFR/netCDF GTS EUN Wel		Global: Th: 150 r B: 80 mir Regional				
Accuracy							
Threshold	Та	arget		Optimal			
2.4 hPa	0.8	8 hPa		0.7 hPa			
Notes							
Verification/Validation Methods Standard de			deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution							
Spatial Coverage H	Horizontal Resolution		Vertical Resolution		Temporal Re	solution	
Global, Regional (TBD)	O resolu	ution	Scalar at surface		RO resolution	n	



GRM-135 NRT Dry	Tempe	rature Profile		NDPMA1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
Characteristics and Methods		·	hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellite Input	t Data	Metop-SG A1					
Other Operational Input Data		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format		Means		Timeliness	1		
		EUMETCast Tr Web B:		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy	<u>-</u>						
Threshold		Target	Opti		Optimal		
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		5 – 20 km: 1 K	20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy interv		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	asts)		
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global, Regional (TBD)	gional (TBD) RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	on	



GRM-136	Offline E	Bending	Angle		OBAMA1		PRD_v3.4
Туре	S		Offline Produc	t			
Applications and	d Users		Climate and at	Climate and atmosphere researchers			
Characteristics	and Metho	ods	hi-res wave op interpolated to	otics sampling; 247 fixed levels			
Operational Sat	ellite Input	Data	Metop-SG A1				
Other Operational Input Data			GPS orbits (EUMetop orbits (ECMWF FC, A	EUM)			
Dissemination							
Format			Means		Timeliness		
netCDF BUFR			Web	Veb 5 - 3		5 - 30 d	
Accuracy							
Threshold			Target		Optimal		
35 – 60 km: 4 m 8 – 35 km: 4% 2 – 8 km: 209			8 – 35 km: 2%	35 – 60 km: 2 murad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 murad 8 – 35 km: 1% 2 – 8 km: 5% - 1%	
Notes			An accuracy intervover the given ver BA noise above 60	tical coordinate			een the two values (rad;
Verification/Vali	dation Met	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Res	olution						
Spatial Coverage	je	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution
Global		RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	on



GRM-137 Offline F	Refractiv	vity Profile		ORPMA1		PRD_v3.4		
Туре		Offline Product	t					
Applications and Users		Climate and at	Climate and atmosphere researchers					
Characteristics and Metho	•	hi-res wave optics sampling; interpolated to 247 fixed levels						
Operational Satellite Input	Data	Metop-SG A1						
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN						
Dissemination								
Format		Means Time		Timeliness	imeliness			
netCDF BUFR		Web	5 - 30 d					
Accuracy								
Threshold		Target		Optimal				
30 – 50 km: 0.06 N-units 5 – 30 km: 1.2% 0 – 5 km: 4% – 1.2%		30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%				
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values		
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)			
Coverage, Resolution					_			
Spatial Coverage	Horizontal Resolution		Vertical Resolution	on	Temporal Re	esolution		
Global	RO resolution		hi-res wave optic sampling; interpolated to 24 levels		RO resolution	on		



GRM-138 Offline T	empera	ature Profile		OTPMA1		PRD_v3.4		
Туре		Offline Produc	t					
Applications and Users		Climate and at	Climate and atmosphere researchers					
Characteristics and Metho	,	with interpolation); 247 fixed levels						
Operational Satellite Input	Data	Metop-SG A1						
Other Operational Input D	Metop orbits (I	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN						
Dissemination								
Format		Means		Timeliness				
netCDF BUFR		Web	5 - 30 d					
Accuracy								
Threshold		Target		Optimal				
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K				
Notes		An accuracy intervover the given ver		y changing	quantity betwe	een the two values		
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)			
Coverage, Resolution			_		_			
Spatial Coverage	Horizontal Resolution		Vertical Resolution	on	Temporal Re	solution		
Global	RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	on		



GRM-139 Offlin	e Specific	Humidity	y Profile		ОНРМА1	PRD_v3.4	
Туре		Offlin	ne Product				
Applications and Users	3	Clima	ate and atr	mosphere researc	hers		
			•	vith interpolation); 247 fixed levels			
Operational Satellite In	put Data	Meto	p-SG A1				
·		Meto	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means	Means		Timeliness		
netCDF BUFR			Web		5 - 30 d		
Accuracy							
Threshold		Target		Optimal			
1.8 g/kg 30% *		0.6 g/kg 10% *		0.3 g/kg 10% *			
Notes			ver is grea val 0 – 12	iter; km is considered			
Verification/Validation I	Methods	Standard	d deviation	of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Resolution	1						
Spatial Coverage	Horizo	Horizontal Resolution		Vertical Resolution	on	Temporal Resolution	
Global			model levels (with interpolation); interpolated to 247 fixed levels		RO resolution		



GRM-140 Offline F	Pressure	e Profile		OPPMA1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and at	Climate and atmosphere researchers				
Characteristics and Metho	· ·	vith interpolation); 247 fixed levels					
Operational Satellite Input	Data	Metop-SG A1					
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination		_					
Format		Means		Timeliness			
netCDF BUFR		Veb		5 - 30 d			
Accuracy							
Threshold		Target		Optimal			
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		b) 0.25%		a) 0.005 hPa b) 0.1% c) 0.7 hPa *			
Notes		* whichever is great The interval 0 – 50	. , , , ,	but not grea	ater than (c);		
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution							
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolutio	n	



GRM-141	Offline S	Surface	Pressure		OSPMA1		PRD_v3.4	
Туре	- -		Offline Produ	ct				
Applications ar	nd Users		Climate and a	Climate and atmosphere researchers				
Characteristics	and Metho	ods	Scalar at surf	ace				
Operational Sa	tellite Inpu	t Data	Metop-SG A1					
Other Operational Input Data			Metop orbits	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination	1							
Format			Means	Means		Timeliness		
netCDF BUFR			Web		5 - 30 d			
Accuracy								
Threshold			Target		Optimal			
2.4 hPa			0.8 hPa		0.7 hPa			
Notes					•			
Verification/Val	idation Me	thods	Standard deviation	on of (1D-Var solution	on – ECMW	F analysis)		
Coverage, Re	solution							
Spatial Covera	ge	Horizo	ntal Resolution	Vertical Resolution	Vertical Resolution		solution	
Global		RO re	solution	Scalar at surface)	RO resolutio	n	



GRM-142 Offline D	Dry Tem	perature Profile		ODPMA1		PRD_v3.4		
Туре		Offline Product						
Applications and Users		Climate and at	tmosphere researchers					
Characteristics and Methods hi-res wave op interpolated to			otics sampling; 247 fixed levels					
Operational Satellite Input	Data	Metop-SG A1						
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN						
Dissemination								
Format		Means		Timeliness	Timeliness			
netCDF BUFR		Web		5 - 30 d				
Accuracy								
Threshold		Target		Optimal				
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 5 – 20 km: 1 K 0 – 5 km: 2 K - 1		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K				
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values		
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)			
Coverage, Resolution								
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution		
Global	RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	on		



GRM-143 Offline E	Bending A	Angle Grid		OBGMA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atmosphere researchers				
Characteristics and Metho	Zonal monthly i	Zonal monthly means on 200 m x 5 deg grids				
Operational Satellite Input	Data	Metop-SG A1				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)
Dissemination						
Format	N	leans		Timeliness		
netCDF	W	Veb 30 c		30 d) d	
Accuracy						
Threshold	T	Target		Optimal		
25 – 50 km: 0.6 % or 1.2 r *) 8 – 25 km: 0.6 % 0 – 8 km: 6 – 0.6 %		25 – 50 km: 0.3 % or 0.6 murad*) 8 – 25 km: 0.3 % 0 – 8 km: 3 – 0.3 %		25 – 50 km: 0.15 % or 0.3 murad*) 8 – 25 km: 0.15 % 0 – 8 km: 1.5 – 0.15 %		
Notes	А	whichever is grea in accuracy interva ver the given verti	val means a linearly changing quantity between the two values			
Verification/Validation Met			nces relative to E0 f RO data subsets		Interim.Resa	mpling statistics:
Coverage, Resolution						
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg lati	tude	200 m	1 month		



GRM-144 Offline R	efractivity	Grid		ORGMA1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	nosphere researc	hers			
Characteristics and Methods		Zonal monthly means on 200 m x 5 deg grids					
Operational Satellite Input	Metop-SG A1						
Other Operational Input Da	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)	
Dissemination							
Format	Мє	eans		Timeliness			
netCDF	We	eb		30 d			
Accuracy							
Threshold	Та	Target		Optimal			
25 – 50 km: 0.24 % or 0.01 units*) 8 – 25 km: 0.24 % 0 – 8 km: 2.4 – 0.24 %	un 8	25 – 50 km: 0.12 % or 0.006 N- units*) 8 – 25 km: 0.12 % 0 – 8 km: 1.2 – 0.12 %		25 – 50 km: 0.06 % or 0.003 N-units*) 8 – 25 km: 0.06 % 0 – 8 km: 0.6 – 0.06 %			
Notes	An		eater ; rval means a linearly changing quantity between the two values ertical coordinate				
Verification/Validation Meth	tatistics of differences relative to ECMWF ERA Interim.Resampling statistics: ter-comparison of RO data subsets.						
Coverage, Resolution							
Spatial Coverage	Horizontal	Resolution	Vertical Resolution Temporal Resolut		solution		
Global	5 deg latitu	ude	200 m		1 month		



GRM-145 Offline	Tempera	ture Grid		OTGMA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and at	mosphere researc	hers		
Characteristics and Met	Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Satellite Inp	ut Data	Metop-SG A1				
Other Operational Input	Data	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)
Dissemination		<u>.</u>				
Format		Means		Timeliness		
netCDF W		Web		30 d		
Accuracy						
Threshold		Target		Optimal		
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: 2.0 – 0.6 K		25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: 1.0 – 0.3 K		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: 0.50 – 0.15 K		
Notes		An accuracy intervover the given vert		y changing	quantity betwe	en the two values
Verification/Validation M			tistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.			
Coverage, Resolution						
Spatial Coverage	Horizon	tal Resolution	Resolution Vertical Resolution		ion Temporal Resolution	
Global	5 deg la	ıtitude	200 m		1 month	



GRM-146 Offlin	e Specific	Humidity Grid		OHGMA1		PRD_v3.4
Туре		Offline Product	:			
Applications and Users	3	Climate and at	Climate and atmosphere researchers			
Characteristics and Me	Zonal monthly	means on 200 m	c 5 deg grids	3		
Operational Satellite In	put Data	Metop-SG A1				
Other Operational Inpu	ıt Data	ECMWF ERA	Interim (validation,	sampling e	rror estimation	٦)
Dissemination		•				
Format		Means		Timeliness		
netCDF V		Web		30 d		
Accuracy						
Threshold		Target		Optimal		
		8 – 12 km: 4.0 % 0 – 8 km: 4.0 %		8 – 12 km: 2.0 % 0 – 8 km: 2.0 %		
0 – 8 km: 8.0 %						
0 – 8 km: 8.0 % Notes				0 – 8 km	: 2.0 %	een the two values
	Methods	0 – 8 km: 4.0 % An accuracy interv	ical coordinate	0 – 8 km y changing o	2.0 %	
Notes		0 – 8 km: 4.0 % An accuracy intervover the given vert Statistics of differe	ical coordinate	0 – 8 km y changing o	2.0 %	
Notes Verification/Validation	1	0 – 8 km: 4.0 % An accuracy intervover the given vert Statistics of differe	ical coordinate	0 – 8 km y changing o	2.0 %	mpling statistics:



GRM-147 Climate	Dry Geo	potential Height		OZGMA1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	atmosphere researchers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S	
Operational Satellite Input	t Data	Metop-SG A1				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)
Dissemination						
Format	1	Means		Timeliness		
netCDF	\	Web		30 d		
Accuracy	•					
Threshold	-	Target		Optimal		
25 – 50 km: 12 – 120 m 8 – 25 km: 12 m 0 - 8 km: –	2	25 – 50 km: 6 – 60 m 8 – 25 km: 6 m 0 – 8 km: –		25 – 50 km: 3 – 30 m 8 – 25 km: 3 m 0 – 8 km: –		
Notes		An accuracy intervious the given vert		y changing	quantity betwe	een the two values
Verification/Validation Me		Statistics of different of the comparison of the			Interim.Resa	mpling statistics:
Coverage, Resolution	·					
Spatial Coverage	Horizont	al Resolution	Vertical Resolution	ion Temporal Resolution		
Global	5 deg la	titude	200 m		1 month	



GRM-148 Offline I	Ory Tem	perature Grid		ODGMA1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	atmosphere researchers				
Characteristics and Methods Zonal n			means on 200 m	c 5 deg grid	S		
Operational Satellite Input	t Data	Metop-SG A1					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format		Means		Timeliness			
netCDF	netCDF		Web		30 d		
Accuracy							
Threshold		Target		Optimal			
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: –		25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: –		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: –			
Notes		An accuracy intervolver the given vert		y changing	quantity betwe	een the two values	
Verification/Validation Me			stics of differences relative to ECMWF ERA Interim.Resampling statistics: comparison of RO data subsets.				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg la	titude	200 m	1 month			



GRM-149 Offline I	Ory Pres	sure Grid		OYGMA1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	atmosphere researchers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S		
Operational Satellite Input	t Data	Metop-SG A1					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)	
Dissemination							
Format		Means		Timeliness			
netCDF	CDF 1		Web		30 d		
Accuracy							
Threshold		Target		Optimal			
25 – 50 km: 0.24 – 1.20 % 8 – 25 km: 0.24 % 0 – 8 km –	6	25 – 50 km: 0.12 – 0.60 % 8 – 25 km: 0.12 % 0 – 8 km: –		25 – 50 km: 0.06 – 0.30 % 8 – 25 km: 0.06 % 0 – 8 km: –			
Notes		An accuracy interva		y changing	quantity betwe	een the two values	
			fferences relative to ECMWF ERA Interim.Resampling statistics:				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg la	titude	200 m	1 month			



GRM-150	NRT Ref	ractivit	y Profile		NRPMB1		PRD_v3.4	
Туре			NRT Product					
Applications and	Users		NWP					
Characteristics and Methods				hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satel	llite Input	Data	Metop-SG B1					
Other Operational Input Data		Metop orbits (GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination			_					
Format			Means		Timeliness	,		
		EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD				
Accuracy					-			
Threshold			Target	arget Optimal				
30 – 50 km: 0.09 5 – 30 km: 1.8% 0 – 5 km: 6% –)		5 – 30 km: 0.6%	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		
Notes			An accuracy inter over the given ve	val means a linearl	y changing	quantity betwe	een the two values	
Verification/Valida	ation Met	hods	Standard deviation	on of (Product – EC	n of (Product – ECMWF forecasts)			
Coverage, Reso	lution							
Spatial Coverage		Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global, Regional	(TBD)	RO res	solution	sampling;	interpolated to 247 fixed		on	



GRM-151 NRT Ter	nperatu	re Profile		NTPMB1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
		,	model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite Input	t Data	Metop-SG B1					
Other Operational Input Data		Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination							
Format		Means		Timeliness	1		
		EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy				-			
Threshold		Target	arget		Optimal		
30 – 50 km: 3 K – 30 K 5 – 30 km: 3 K 0 – 5 km: 6 K – 3 K		5 – 30 km: 1 K			30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K		
Notes		An accuracy interv		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution							
Spatial Coverage	Horizor	ital Resolution	Vertical Resolution	on	Temporal Re	solution	
Global, Regional (TBD)			model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	n	



GRM-152 NRT Spe	ecific Hu	ımidity Profile		NHPMB1	PF	RD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
			model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-SG B1					
Metop		,	PS orbits (EUM) etop orbits (EUM) CMWF FC, AN				
Dissemination		<u>.</u>					
Format		Means		Timeliness	Timeliness		
BUFR/netCDF		GTS EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy							
Threshold		Target		Optimal			
1.8 g/kg 30% *		0.6 g/kg 10% *		0.3 g/kg 10% *			
Notes		* whichever is grea The interval 0 – 12					
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)		
Coverage, Resolution	•						
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Resolu	ution	
Global, Regional (TBD)	RO res	olution	model levels (with interpolation); interpolated to 247 fixed levels		RO resolution		



GRM-153 NRT F	Pressure F	Profile		NPPMB1		PRD_v3.4	
Туре		NRT Product					
Applications and Users	i	NWP	NWP				
Characteristics and Me	thods	,	model levels (with interpolation); interpolated to 247 fixed levels				
Operational Satellite In	put Data	Metop-SG B1					
Other Operational Inpu	t Data	Metop orbits (GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format		Means		Timeliness	,		
		EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy				-			
Threshold		Target		Optimal			
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		a) 0.01 hPa b) 0.25% c) 0.8 hPa *	b) 0.25%		a) 0.005 hPa b) 0.1% c) 0.7 hPa *		
Notes			atest of (a) and (b) 0 km is considered	-	ater than (c);		
Verification/Validation I	Methods	Standard deviation	on of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution	1						
Spatial Coverage	Horizor	ntal Resolution	tal Resolution Vertical Resolution		Temporal Re	esolution	
Global, Regional (TBD)	obal, Regional (TBD) RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	on	



GRM-154 NRT Sur	rface Pre	essure		NSPMB1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
Characteristics and Metho	ods	Scalar at surface	ce				
Operational Satellite Input	Metop-SG B1						
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination							
Format		Means	eans		Timeliness		
BUFR/netCDF		GTS EUMETCast Web	UMETCast		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD		
Accuracy	_			_			
Threshold		Target		Optimal			
2.4 hPa		0.8 hPa		0.7 hPa			
Notes							
Verification/Validation Me	thods	Standard deviation	andard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution	Coverage, Resolution						
Spatial Coverage	tal Resolution	Vertical Resolution		Temporal Resolution			
Global, Regional (TBD)	RO res	olution	Scalar at surface	,	RO resolutio	'n	



GRM-155 NRT Dry	Tempe	rature Profile		NDPMB1		PRD_v3.4	
Туре		NRT Product					
Applications and Users		NWP					
Characteristics and Metho	ods	·	hi-res wave optics sampling; interpolated to 247 fixed levels				
Operational Satellite Input	t Data	Metop-SG B1					
Other Operational Input D	ata	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format		Means		Timeliness	1		
		GTS EUMETCast Web		Global: Th: 150 min (90%) B: 80 min (95%) Regional: TBD			
Accuracy	<u>-</u>						
Threshold		Target		Optimal			
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		5 – 20 km: 1 K	0 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K		
Notes		An accuracy interv		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	asts)		
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global, Regional (TBD) RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	on		



GRM-156 Offline E	Bending A	Angle		OBAMB1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	Climate and atmosphere researchers				
			ics sampling; 247 fixed levels				
Operational Satellite Input	t Data	Metop-SG B1					
Other Operational Input D	ata	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination		-					
Format	N	Means		Timeliness	Timeliness		
netCDF BUFR	٧	Web		5 - 30 d			
Accuracy							
Threshold	7	Γarget	Optimal				
35 – 60 km: 4 murad 8 – 35 km: 4% 2 – 8 km: 20% - 4%		35 – 60 km: 2 murad 8 – 35 km: 2% 2 – 8 km: 10% - 2%		35 – 60 km: 1 murad 8 – 35 km: 1% 2 – 8 km: 5% - 1%			
Notes	c	An accuracy interva over the given verti 3A noise above 60	cal coordinate			een the two values (rad;	
Verification/Validation Me	thods S	Standard deviation	of (Product – ECI	MWF foreca	ısts)		
Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution	on	Temporal Re	solution	
Global	RO resolution		hi-res wave optic sampling; interpolated to 24 levels		RO resolution	n	



GRM-157	Offline F	Refractiv	ity Profile		ORPMB1		PRD_v3.4
Туре			Offline Product				
Applications and	Users		Climate and atr	Climate and atmosphere researchers			
Characteristics and Methods				hi-res wave optics sampling; interpolated to 247 fixed levels			
Operational Sate	ellite Input	Data	Metop-SG B1				
Other Operational Input Data			Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN			
Dissemination							
Format		1	Means		Timeliness	Timeliness	
netCDF BUFR		\	Veb		5 - 30 d		
Accuracy							
Threshold		-	Target		Optimal		
30 – 50 km: 0.06 5 – 30 km: 1.29 0 – 5 km: 4%	6	3	30 – 50 km: 0.03 N-units 5 – 30 km: 0.6% 0 – 5 km: 2% – 0.6%		30 – 50 km: 0.02 N-units 5 – 30 km: 0.3% 0 – 5 km: 1% – 0.3%		3
Notes			An accuracy interva		y changing	quantity betwe	een the two values
Verification/Valid	lation Met	thods	Standard deviation	of (Product – ECI	MWF foreca	ısts)	
Coverage, Reso	olution					_	
Spatial Coverage	е	Horizont	al Resolution	Vertical Resolution	on	Temporal Re	solution
Global		RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolutio	on



GRM-158	Offline T	empera	ature Profile		ОТРМВ1		PRD_v3.4	
Туре			Offline Produ	ct				
Applications and	Users		Climate and	atmosphere researd	chers			
				(with interpolation); o 247 fixed levels				
Operational Sate	llite Input	Data	Metop-SG B1					
,			Metop orbits	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination	Dissemination							
Format			Means		Timeliness	Timeliness		
netCDF BUFR			Web		5 - 30 d	5 - 30 d		
Accuracy								
Threshold			Target		Optimal	Optimal		
30 – 50 km: 3 K – 5 – 30 km: 3 K 0 – 5 km: 6 K –			30 – 50 km: 1 K – 10 K 5 – 30 km: 1 K 0 – 5 km: 2 K – 1 K		5 – 30 km	30 – 50 km: 0.5 K – 5 K 5 – 30 km: 0.5 K 0 – 5 km: 1 K – 0.5 K		
Notes			An accuracy inte	rval means a linear	y changing	quantity betwe	een the two values	
Verification/Valida	ation Met	hods	Standard deviation	on of (1D-Var solution	n of (1D-Var solution – ECMWF analysis)			
Coverage, Reso	lution							
Spatial Coverage	!	Horizor	ntal Resolution	Vertical Resoluti	on	Temporal Re	solution	
Global				interpolation);	interpolated to 247 fixed		on	



GRM-159 Offline S	Specific	Humidity Profile		ОНРМВ1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	Climate and atmosphere researchers			
Characteristics and Metho	·	model levels (with interpolation); nterpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-SG B1				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination						
Format		Means		Timeliness		
netCDF BUFR		Web 5 - 30 d		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
1.8 g/kg 30% *		0.6 g/kg 10% *		0.3 g/kg 10% *		
Notes		* whichever is grea The interval 0 – 12				
Verification/Validation Me	thods	Standard deviation	of (1D-Var solution	n – ECMW	F analysis)	
Coverage, Resolution						
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	esolution
Global	RO res	solution	model levels (with interpolation); interpolated to 247 fixed levels		RO resolution	on



GRM-160 Offline F	Pressur	e Profile		ОРРМВА1	I	PRD_v3.4
Туре		Offline Product	t			
Applications and Users		Climate and at	Climate and atmosphere researchers			
Characteristics and Metho	,	nodel levels (with interpolation); nterpolated to 247 fixed levels				
Operational Satellite Input	Data	Metop-SG B1				
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination						
Format		Means		Timeliness		
netCDF BUFR		Web		5 - 30 d		
Accuracy						
Threshold		Target		Optimal		
a) 0.03 hPa b) 0.75% c) 2.4 hPa *		a) 0.01 hPa b) 0.25% c) 0.8 hPa *		a) 0.005 hPa b) 0.1% c) 0.7 hPa *		
Notes		* whichever is grea The interval 0 – 50	. , . ,	but not grea	ater than (c);	
Verification/Validation Met	thods	Standard deviation	of (1D-Var solution	on – ECMW	F analysis)	
Coverage, Resolution						
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	solution
Global	RO resolution		model levels (with interpolation); interpolated to 247 fixed levels		RO resolutio	n



GRM-161	Offline S	Surface	Pressure		OSPMB1		PRD_v3.4	
Туре			Offline Produc	t				
Applications and Users			Climate and at	mosphere researc	hers			
Characteristics a	and Metho	ods	Scalar at surfa	ice				
Operational Sate	ellite Input	Data	Metop-SG B1					
Other Operational Input Data			Metop orbits (I	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN				
Dissemination								
Format			Means	leans		Timeliness		
netCDF BUFR			Web	5 -		5 - 30 d		
Accuracy								
Threshold			Target		Optimal			
2.4 hPa			0.8 hPa		0.7 hPa			
Notes					•			
Verification/Validation Methods Stan			Standard deviation	tandard deviation of (1D-Var solution – ECMWF analysis)				
Coverage, Resolution								
Spatial Coverage	е	Horizor	ntal Resolution	Vertical Resolution		Temporal Resolution		
Global		RO res	solution	Scalar at surface	Scalar at surface		n	



GRM-162 Offline I	Dry Tem	perature Profile		ODPMB1		PRD_v3.4	
Туре		Offline Product	:				
Applications and Users		Climate and at	Climate and atmosphere researchers				
Characteristics and Metho		hi-res wave optics sampling; interpolated to 247 fixed levels					
Operational Satellite Input	Data	Metop-SG B1					
Other Operational Input D	Metop orbits (E	GPS orbits (EUM) Metop orbits (EUM) ECMWF FC, AN					
Dissemination	Dissemination						
Format		Means		Timeliness			
netCDF BUFR		Web		5 - 30 d			
Accuracy							
Threshold		Target		Optimal			
20 – 40 km: 2 K – 20 K 5 – 20 km: 2 K 0 – 5 km: 4 K - 2 K		20 – 40 km: 1 K – 10 K 5 – 20 km: 1 K 0 – 5 km: 2 K - 1 K		20 – 40 km: 0.5 K – 5 K 5 – 20 km: 0.5 K 0 – 5 km: 1 K - 0.5 K			
Notes		An accuracy intervover the given vert		y changing	quantity betwe	een the two values	
Verification/Validation Me	thods	Standard deviation	of (Product – ECI	MWF foreca	asts)		
Coverage, Resolution							
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution	on	Temporal Re	esolution	
Global	RO resolution		hi-res wave optics sampling; interpolated to 247 fixed levels		RO resolution	on	



GRM-163 Offline Be	ending Ar	ngle Grid		OBGMB1		PRD_v3.4
Туре		Offline Product	ffline Product			
Applications and Users		Climate and atmosphere researchers				
Characteristics and Method	Zonal monthly i	means on 200 m >	5 deg grid	S		
Operational Satellite Input D	Data	Metop-SG B1				
Other Operational Input Dat	ta	ECMWF ERA I	nterim (validation,	sampling e	rror estimatio	n)
Dissemination		'				
Format	Мє	eans		Timeliness	i	
netCDF	We	eb		30 d		
Accuracy						
Threshold	Та	Target		Optimal		
25 – 50 km: 0.6 % or 1.2 mg *) 8 – 25 km: 0.6 % 0 – 8 km: 6 – 0.6 %	8	25 – 50 km: 0.3 % or 0.6 murad*) 8 – 25 km: 0.3 % 0 – 8 km: 3 – 0.3 %		25 – 50 km: 0.15 % or 0.3 murad*) 8 – 25 km: 0.15 % 0 – 8 km: 1.5 – 0.15 %		
Notes	whichever is greater; An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate					
Verification/Validation Meth	atistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.					
Coverage, Resolution						
Spatial Coverage Horizontal Resolution			Vertical Resolution Temporal Resolution			esolution
Global 5	deg latitu	ıde	200 m		1 month	



GRM-164 Offline F	Refractivit	y Grid		ORGMB1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atmosphere researchers				
Characteristics and Metho	ods	Zonal monthly i	means on 200 m >	c 5 deg grid	S	
Operational Satellite Input	Data	Metop-SG B1				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)
Dissemination		•				
Format	М	eans		Timeliness		
netCDF	W	/eb		30 d		
Accuracy						
Threshold	T	Target		Optimal		
25 – 50 km: 0.24 % or 0.0 units*) 8 – 25 km: 0.24 % 0 – 8 km: 2.4 – 0.24 %	uı 8	25 – 50 km: 0.12 % or 0.006 N- units*) 8 – 25 km: 0.12 % 0 – 8 km: 1.2 – 0.12 %		25 – 50 km: 0.06 % or 0.003 N-units*) 8 – 25 km: 0.06 % 0 – 8 km: 0.6 – 0.06 %		
Notes	* whichever is greater ; An accuracy interval means a linearly changing quantity between the two values over the given vertical coordinate					
Verification/Validation Met	Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.					
Coverage, Resolution						
Spatial Coverage	Spatial Coverage Horizontal Resolution		Vertical Resolution Ten		Temporal Resolution	
Global	5 deg latit	tude	200 m		1 month	



GRM-165 Offline T	emperat	ure Grid		OTGMB1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	tmosphere researchers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S		
Operational Satellite Input	Data	Metop-SG B1					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	N	Means		Timeliness			
netCDF	\	Veb		30 d			
Accuracy							
Threshold		Target		Optimal			
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: 2.0 – 0.6 K	2	25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: 1.0 – 0.3 K		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: 0.50 – 0.15 K			
Notes		An accuracy intervative the given verti		y changing	quantity betwe	een the two values	
Verification/Validation Met			nces relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.				
Coverage, Resolution	·						
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude	200 m	1 month			



GRM-166 Offline	Specific	Humidity Grid		OHGMB1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and at	imate and atmosphere researchers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m >	c 5 deg grid	S		
Operational Satellite Inpu	t Data	Metop-SG B1					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format		Means		Timeliness			
netCDF		Web		30 d			
Accuracy							
Threshold		Target		Optimal			
8 – 12 km: 8.0 % 0 – 8 km: 8.0 %		8 – 12 km: 4.0 % 0 – 8 km: 4.0 %		8 – 12 km: 2.0 % 0 – 8 km: 2.0 %			
			val means a linearly changing quantity between the two values rtical coordinate				
		over the given vert		,	quarity both	een the two values	
Verification/Validation Me	thods		ical coordinate	CMWF ERA			
Verification/Validation Me Coverage, Resolution	thods	over the given vert Statistics of different	ical coordinate	CMWF ERA			
	thods	over the given vert Statistics of different	ical coordinate	CMWF ERA		mpling statistics:	



GRM-167 Climate	Dry Geo	potential Height		OZGMB1		PRD_v3.4
Туре		Offline Product				
Applications and Users		Climate and atr	mosphere researc	hers		
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S	
Operational Satellite Input	Data	Metop-SG B1				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)
Dissemination						
Format	N	Means		Timeliness		
netCDF	\	Web		30 d		
Accuracy						
Threshold	1	Target		Optimal		
25 – 50 km: 12 – 120 m 8 – 25 km: 12 m 0 - 8 km: –	2	25 – 50 km: 6 – 60 m 8 – 25 km: 6 m 0 – 8 km: –		25 – 50 km: 3 – 30 m 8 – 25 km: 3 m 0 – 8 km: –		
Notes		An accuracy intervented the given vertices		y changing	quantity betwe	een the two values
Verification/Validation Me			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.			
Coverage, Resolution						
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution	
Global	5 deg lat	itude	200 m	1 month		



GRM-168 Offline D	ry Temp	erature Grid		ODGMB1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researc	hers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S		
Operational Satellite Input	Data	Metop-SG B1					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	N	Means		Timeliness			
netCDF	netCDF W		Web		30 d		
Accuracy							
Threshold	1	Target		Optimal			
25 – 50 km: 0.6 – 6 K 8 – 25 km: 0.6 K 0 – 8 km: –		25 – 50 km: 0.3 – 3 K 8 – 25 km: 0.3 K 0 – 8 km: –		25 – 50 km: 0.15 – 1.5 K 8 – 25 km: 0.15 K 0 – 8 km: –			
Notes		An accuracy interva		y changing	quantity betwe	een the two values	
Verification/Validation Met			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.				
Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude	200 m	1 month			



GRM-169 Offline I	Ory Pres	sure Grid		OYGMB1		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researc	hers			
Characteristics and Metho	ods	Zonal monthly	means on 200 m	c 5 deg grid	S		
Operational Satellite Input	t Data	Metop-SG B1					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	n)	
Dissemination							
Format		Means		Timeliness			
netCDF	DF V		Web		30 d		
Accuracy							
Threshold		Target		Optimal			
25 – 50 km: 0.24 – 1.20 % 8 – 25 km: 0.24 % 0 – 8 km –	6	25 – 50 km: 0.12 – 0.60 % 8 – 25 km: 0.12 % 0 – 8 km: –		25 – 50 km: 0.06 – 0.30 % 8 – 25 km: 0.06 % 0 – 8 km: –			
Notes		An accuracy interva		y changing quantity between the two values			
Verification/Validation Me			ences relative to ECMWF ERA Interim.Resampling statistics: of RO data subsets.				
Coverage, Resolution							
Spatial Coverage	Horizon	tal Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg la	titude	200 m	1 month			



GRM-170 Electron	Density	Profile		EDPMA1		PRD_v3.4	
Туре		TBD					
Applications and Users	Space weather	Space weather and ionosphere researchers					
Characteristics and Metho	ods						
Operational Satellite Input	Data	Metop-SG A1					
Other Operational Input D	ata						
Dissemination							
Format	Format Me		Means		Timeliness		
TBD	-	TBD	BD				
Accuracy							
Threshold	-	Target		Optimal			
TBD	-	TBD	BD		TBD		
Notes							
Verification/Validation Met	thods	TBD					
Coverage, Resolution	Ė						
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Re	solution	
Global	GRAS-S	G resoltuion					



GRM-171 Electro	on Densit	y Pr	ofile		EDPMB1		PRD_v3.4
Туре			TBD				
Applications and Users			Space weather and ionosphere researchers				
Characteristics and Met	hods						
Operational Satellite Inp	ut Data		Metop-SG B1				
Other Operational Input	Data						
Dissemination							
Format Me		Mea	Means		Timeliness		
TBD		TBE	TBD		TBD		
Accuracy							
Threshold		Tar	Target		Optimal		
TBD		ТВЕ	BD .		TBD		
Notes							
Verification/Validation M	lethods	TBE	3D				
Coverage, Resolution							
Spatial Coverage	Horizor	ntal Resolution		Vertical Resolution		Temporal Re	solution
Global	GRAS-	SG ı	resoltuion				



GRM-172 Scintilla	ation Ind	ex		SINMA1	PRD_v3.4		
Туре		TBD					
Applications and Users		Space weather	Space weather and ionosphere researchers				
Characteristics and Meth	ods						
Operational Satellite Inpu	ıt Data	Metop-SG A1					
Other Operational Input I	Data						
Dissemination							
Format	Format Me		Means		Timeliness		
TBD		TBD	BD		TBD		
Accuracy							
Threshold		Target	Target		Optimal		
TBD		TBD	BD		TBD		
Notes							
Verification/Validation Me	thods	TBD	3D				
Coverage, Resolution							
Spatial Coverage	Horizor	ntal Resolution	Vertical Resolution		Temporal Resolution		
Global	GRAS-	SG resoltuion					



GRM-173 Scintilla	ation Ind	ex		SINMB1	PRD_v3.4		
Туре		TBD					
Applications and Users		Space weather	Space weather and ionosphere researchers				
Characteristics and Meth	ods						
Operational Satellite Inpu	ıt Data	Metop-SG B1					
Other Operational Input I	Data						
Dissemination							
Format	Format Me		Means		Timeliness		
TBD		TBD	BD		TBD		
Accuracy							
Threshold		Target	Γarget		Optimal		
TBD		TBD	BD		TBD		
Notes							
Verification/Validation Me	ethods	TBD	3D				
Coverage, Resolution							
Spatial Coverage	Horizon	ntal Resolution	Vertical Resolution		Temporal Resolution		
Global	GRAS-	SG resoltuion					



GRM-191	Offline 1	ropopau	se Height Grid		OCGMEA		PRD_v3.4	
Туре	•		Offline Produc	t				
Applications and	d Users		Climate and at	Climate and atmosphere researchers				
Characteristics and Methods Zonal monthl			Zonal monthly	means on 200 m	x 5 deg grid	S		
Operational Sat	ellite Input	Data	Metop-A/GRAS	3				
Other Operation	al Input D	ata	ECMWF ERA	Interim (validation,	sampling e	rror estimation	า)	
Dissemination			•					
Format	Format Me			Means		Timeliness		
netCDF	- Web			Veb		30 d		
Accuracy								
Threshold		-	Target		Optimal			
2 km		,	1 km		0.5 km			
Notes								
				atistics of differences relative to ECMWF ERA Interim.Resampling statistics: er-comparison of RO data subsets.				
Coverage, Res	olution	•						
Spatial Coverage	e	Horizont	al Resolution	Vertical Resolution		Temporal Resolution		
Global		5 deg la	itude			1 month		



GRM-192 Offline	Ггорораи	se Height Grid		OCGMEB		PRD_v3.4		
Туре		Offline Product						
Applications and Users	Applications and Users Climate			limate and atmosphere researchers				
Characteristics and Metho	ods	Zonal monthly	means on 200 m	k 5 deg grid	S			
Operational Satellite Inpu	t Data	Metop-B/GRAS	3					
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)		
Dissemination								
Format	Format Me		Means		Timeliness			
netCDF	V	Web		30 d				
Accuracy				L				
Threshold	Т	Target		Optimal				
2 km	1	1 km		0.5 km				
Notes				1				
Verification/Validation Me		statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.						
Coverage, Resolution								
Spatial Coverage	Horizonta	al Resolution	Vertical Resolution		Temporal Resolution			
Global	5 deg lat	itude			1 month			



GRM-193 Offline	Ггорорац	se Height Grid		OCGMEC		PRD_v3.4	
Туре		Offline Product					
Applications and Users		Climate and atr	mosphere researc	hers			
Characteristics and Metho	ods	Zonal monthly i	means on 200 m	x 5 deg grid	S		
Operational Satellite Inpu	t Data	Metop-C/GRAS	3				
Other Operational Input D	ata	ECMWF ERA I	nterim (validation,	sampling e	rror estimation	า)	
Dissemination							
Format	Format Me		Means		Timeliness		
netCDF	netCDF We		Web		30 d		
Accuracy							
Threshold	1	Target		Optimal			
2 km	1	1 km		0.5 km			
Notes				I			
Verification/Validation Me		Statistics of differences relative to ECMWF ERA Interim.Resampling statistics: nter-comparison of RO data subsets.					
Coverage, Resolution							
Spatial Coverage	Horizont	al Resolution	Vertical Resolution		Temporal Resolution		
Global	5 deg lat	itude			1 month		



			im Climate Da s L1B, L2, L3)		ICDRMET		PRD_v3.4	
GRM-29-L2-R-I1 GRM-29-L2-D-I1 GRM-29-L2-T-I1 GRM-29-L2-H-I1 GRM-29-L2-P-I1 GRM-29-L2-C-I1 GRM-29-L3-B-I1 GRM-29-L3-D-I1 GRM-29-L3-Y-I1 GRM-29-L3-Z-I1 GRM-29-L3-T-I1 GRM-29-L3-T-I1	CDR R CDR S CDR P CDR S CDR T CDR B CDR D CDR D CDR D	efracery Teempo pecificessing urfaceropo endicefracery Teempo empo empo pecifices	ng Angle ctivity Profile emperature P erature Profile fic Humidity F ure Profile ce Pressure pause Height ng Angle Grid emperature G ressure Grid eopotential H erature Grid fic Humidity (pause Height	e Profile d rid eight Grid	IBAMET IRPMET IDPMET ITPMET IPPMET ICHMET ICHMET IDGMET ITGMET ICGMET			
Туре			Interim Clima	te Data Record				
Applications and Users			Climate and atmosphere researchers					
Characteristics and Methods			Regularly extends in time CDR GRM-29-R1 using a system having optimum consistency with the system used to generate CDR GRM-29-R1; The extension in time will continue until the release of CDR GRM-29-R2 which will cover both the GRM-29-R1 and GRM-29-I1 time periods;					
Operational Satellite Input Data			Operational Level 1A/1B Metop files from EUMETSAT Secretariat					
Other Operational Input Data			ECMWF ERA Interim fields and ERA5 fields					
Dissemination								
Format Me			eans	Timeliness				
netCDF BUFR			eb	Two months				
Accuracy								
Threshold Ta			ırget	Optimal				
GRM-29-R1			GRM-29-R1		GRM-29-R1			
Notes								
Verification/Validation Same Methods			methods as used for CDR GRM-29-R1					
Coverage, Resolution	n							
Spatial Coverage	Spati	al Re	esolution	Vertical Resolu	ution	Tempora	al resolution	
GRM-29-R1	GRM	-29-F	R1	GRM-29-R1		GRM-29	-R1	



			im Climate Da s L1B, L2, L3)		ICDRMET		PRD_v3.4		
GRM-29-L2-R-I2 GRM-29-L2-D-I2 GRM-29-L2-T-I2 GRM-29-L2-H-I2 GRM-29-L2-P-I2 GRM-29-L2-C-I2 GRM-29-L3-B-I2 GRM-29-L3-D-I2 GRM-29-L3-Y-I2 GRM-29-L3-Z-I2 GRM-29-L3-T-I2 GRM-29-L3-T-I2 GRM-29-L3-T-I2	ICDR R ICDR D ICDR S ICDR S ICDR T ICDR S ICDR D ICDR D ICDR D ICDR D	efrace pecifices	ng Angle ctivity Profile emperature P erature Profile fic Humidity F ure Profile ce Pressure pause Height ng Angle Grid emperature G ressure Grid eopotential H erature Grid fic Humidity (pause Height	e Profile d rid eight Grid	IBAMET IRPMET IDPMET ITPMET IHPMET ISPMET ICHMET IBGMET IRGMET IDGMET IYGMET IZGMET ITGMET ITGMET ITGMET				
Туре			Interim Clima	te Data Record					
Applications and Users			Climate and atmosphere researchers						
Characteristics and Methods			Regularly extends in time CDR GRM-29-R2 using a system having optimum consistency with the system used to generate CDR GRM-29-R2; The extension in time will continue until the release of CDR GRM-29-R3 which will cover both the GRM-29-R2 and GRM-29-I2 time periods;						
Operational Satellite Input Data			Operational Level 1A/1B Metop files from EUMETSAT Secretariat						
Other Operational Input Data			ECMWF ERA5 fields and TBD						
Dissemination									
Format Me			eans	Timeliness					
netCDF BUFR			eb	Two months					
Accuracy									
Threshold Ta			rget	Optimal					
GRM-29-R2			RM-29-R2	GRM-29-R2					
Notes	3								
Verification/Validation Same Methods			methods as used for CDR GRM-29-R2						
Coverage, Resolution	n								
Spatial Coverage	Spati	ial Re	esolution	Vertical Resolu	ution	Tempora	al resolution		
GRM-29-R2	GRM	l-29-F	R2	GRM-29-R2		GRM-29	-R2		