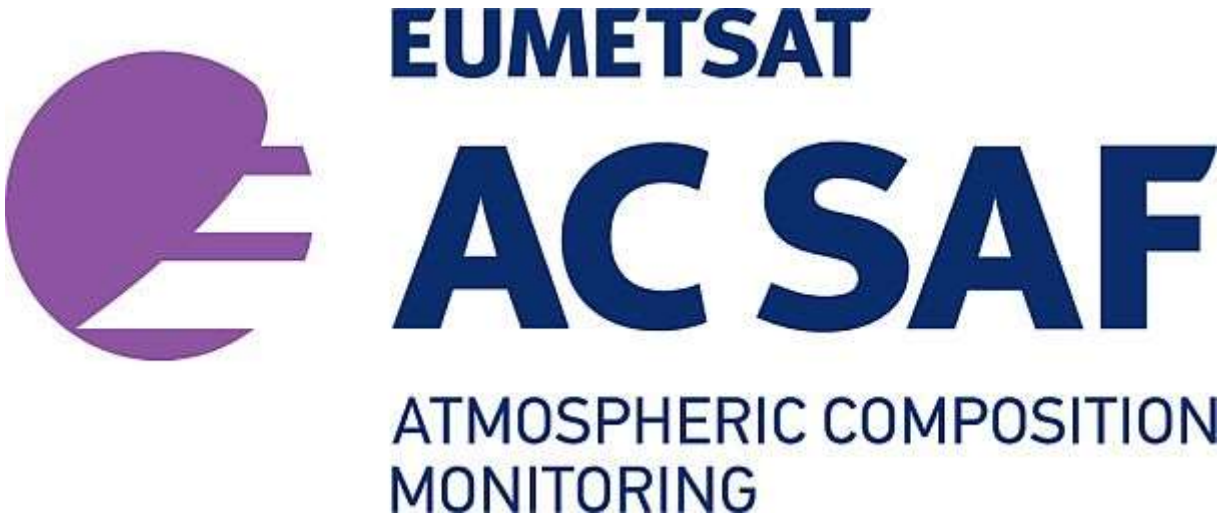

SERVICE SPECIFICATION

Issue 1.7

EUMETSAT AC SAF

REFERENCE: **SAF/AC/FMI/RQ/SESP/001**
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Introduction to EUMETSAT Satellite Application Facility on Atmospheric Composition monitoring (AC SAF)

Background

The monitoring of atmospheric chemistry is essential due to several human caused changes in the atmosphere, like global warming, loss of stratospheric ozone, increasing UV radiation, and pollution. Furthermore, the monitoring is used to react to the threats caused by the natural hazards as well as to follow the effects of the international protocols.

Therefore, monitoring the chemical composition and radiation of the atmosphere is a very important duty for EUMETSAT and the target is to provide information for policy makers, scientists, and the general public.

Objectives

The main objectives of the AC SAF are to process, archive, validate and disseminate atmospheric composition products (O_3, NO_2, SO_2, BrO, HCHO, H_2O, OClO, CO, NH3), aerosol products and surface ultraviolet radiation products utilising the satellites of EUMETSAT. The majority of the AC SAF products are based on data from the GOME-2 and IASI instruments onboard Metop satellites.

Another important task besides the near real-time (NRT) and offline data dissemination is the provision of long-term, high-quality atmospheric composition products resulting from reprocessing activities.

Product categories, timeliness and dissemination

NRT products are available in less than three hours after measurement. These products are disseminated via EUMETCast, WMO GTS or internet.

- Near real-time trace gas columns (total and tropospheric O_3 and NO_2, total SO_2, total HCHO, CO) and ozone profiles
- Near real-time absorbing aerosol height and absorbing aerosol index from polarization measurement detectors
- Near real-time UV indexes, clear-sky and cloud-corrected

Offline products are available within two weeks after measurement and disseminated via dedicated AC SAF web services.

- Offline trace gas columns (total and tropospheric O_3 and NO_2, total SO_2, total BrO, total HCHO, total H_2O) and ozone profiles
- Offline absorbing aerosol height and absorbing aerosol index from polarization measurement detectors
- Offline surface UV, daily doses and daily maximum values with several weighting functions

Data records are available after reprocessing activities from the AC SAF archives.

- Data records generated in reprocessing
- Lambertian-equivalent reflectivity
- Total OClO
- Total CHOCHO
- Tropospheric BrO

Users can access the AC SAF offline products and data records (free of charge) by registering at the AC SAF web site.

More information about the AC SAF project, products and services: https://acsaf.org/

AC SAF Helpdesk: helpdesk@acsaf.org

Twitter: https://twitter.com/Atmospheric_SAF

Document signatures			
	FUNCTION	NAME	DATE
PREPARED BY	AC SAF Technical Manager	Jari Hovila / FMI	01/03/2023
CHECKED BY	AC SAF Project Manager	Seppo Hassinen / FMI	01/03/2023
APPROVED BY	AC SAF Steering Group		01/06/2023

Document change log		
ISSUE	DATE	Description of change
1.0	07/09/2017	Name of the SAF changed from O3M SAF to AC SAF in the beginning of the CDOP-3, Service Specification updated accordingly. Updates in Appendix 1: - Metop-A product (O3M-181) added to NRT IASI CO product table Updates in Appendix 2: - Reprocessed absorbing aerosol index products (O3M-113, O3M-178, O3M-179, O3M-180) added - Product table for LER Surface Albedo for GOME-2/Metop-A (O3M-89) updated, new identifier is O3M-89.1 - Product table for LER Surface Albedo for GOME-2/Metop-B (O3M-90) added - Reprocessed total OClO product (O3M-119) added - "Time period" and "Data Volume" updated for the following data records: O3M-110, O3M-114, O3M-115, O3M-117, O3M-118, O3M-121, O3M-123 Updates in Appendix 3: - NRT SO2 and NRT HCHO added to EUMETCast and WMO/GTS Updates in Appendix 4: - O3M SAF replaced by AC SAF Approved by the Steering Group (AC_DEC_CDOP3SG02-06)
1.1	19/04/2018	Updates in Appendix 1: - NRT IASI SO2 products (O3M-57) added Updates in Appendix 2: - NO2 and H2O climate data records (O3M-87, O3M-88) added Approved by the Steering Group (AC_DEC_CDOP3SG03-09)
1.2	07/06/2019	Updates in Appendix 1: - Old surface UV products replaced by multi-mission products (O3M-450 – O3M-464) Updates in Appendix 2: - Reprocessed surface UV data record R1 tables (O3M-138 – O3M-152) added Approved by the Steering Group (AC_DEC_CDOP3SG06-01)

1.3	17/06/2019	Section 3.1: PR-35 updated to specify three working days as the maximum response time for user contacts to AC SAF Helpdesk. Updates in Appendix 2: - LER surface albedo for GOME-2/Metop-A (O3M-89.1) and LER surface albedo for GOME-2/Metop-B (O3M-90) replaced by merged LER Surface Albedo for GOME-2 (Metop-A/B) (O3M-402) Approved by the Steering Group (AC_DEC_CDOP3SG06-07)
1.4	22/09/2020	Updates in Appendix 1: - AAH products (O3M-68, O3M-69, O3M-78, O3M-79, O3M-364, O3M-365) added - Metop-C information added to: • Total O3 (O3M-300, O3M-301) • Offline tropical tropospheric O3 (O3M-302) • Global tropospheric O3 (O3M-304, O3M-305) • Total NO2 (O3M-338, O3M-339) • Tropospheric NO2 (O3M-341, O3M-342) • Total SO2 (O3M-374, O3M-375) • Total HCHO (O3M-344, O3M-345) • Offline total BrO (O3M-317) • Offline total H2O (O3M-386) • Ozone profiles, high resolution (O3M-311, O3M-312) • AAI from PMDs (O3M-362, O3M-363) • NRT UV index (O3M-409, O3M-410) Update in Appendix 2: - Reprocessed AAH data record (O3M-170) added Appendices 3 and 4 updated to reflect the current situation All remaining references to MACC replaced by CAMS Approved by the Steering Group (AC_DEC_CDOP3SG08-02)

1.5	14/12/2021	General updates: - All requirements and references to EUMETSAT Data Centre and/or UMARF system removed Update in Appendix 1: - Comment section of the total SO2 products (O3M-09.1, O3M-54.1, O3M-55.1, O3M-56.1, O3M-374, O3M-375) updated - Absorbing aerosol index products from main science channels (O3M-14.1, O3M-61.1, O3M-70.1, O3M-71.1) removed due to product discontinuation during the CDOP 3 evaluation process and accepted CDOP 3 product portfolio - Metop-C IASI CO and SO2 products (O3M-352, O3M-377) added - Acronym for Metop-A/B IASI SO2 products (O3M-57) renamed MABI-N-SO2 to better illustrate data usage from two satellite platforms behind a single product ID Update in Appendix 2 based on Delivery Readiness Review (DRR) for total CHOCHO and tropospheric BrO data records (O3M-120.0 and O3M-116), May-June 2021: - Total CHOCHO data record (O3M-120.0) added Appendices 3 and 4 updated to reflect the current situation Approved by the Steering Group (AC_DEC_CDOP3SG11-03)
1.6	22/06/2022	Update in Appendix 1 based on Operational Readiness Review (ORR) for the NRT IASI HNO3 (O3M-81, O3M-336), NRT IASI total O3 (O3M-44, O3M-306) and NRT IASI O3 Profile (O3M-49, O3M-315): - Tables for NRT IASI HNO3 (O3M-81, O3M-336), NRT IASI total ozone (O3M-44, O3M-306) and NRT IASI ozone profile (O3M-49, O3M-315) added. Tables updated: HDF5 removed as data format. Update in Appendix 2 based on delta Delivery Readiness Review (DRR) for the tropospheric BrO data record (O3M-116.0): - Tropospheric BrO data record (O3M-116.0) added Update in Appendix 2 based on Delivery Readiness Review (DRR) for the reprocessed GOME-2 ozone profile data record (O3M-112): - Reprocessed high-resolution ozone profile data record (O3M-112) added. Table updated: data volume added, spatial resolution information updated, comment removed. Approved by the Steering Group (AC_DEC_CDOP4SG02-02)

1.7	01/03/2023	AC SAF introductory page: typos corrected Update in Appendix 1 based on Operational Readiness Review (ORR) for the offline L3 daily/monthly products based on Metop-A/B/C: - Level 3 daily averaged total O3 (O3M-303) added - Level 3 daily averaged BrO (O3M-318) added - Level 3 daily averaged total NO2 (O3M-340) added - Level 3 daily averaged tropospheric NO2 (O3M-343) added - Level 3 daily averaged total HCHO (O3M-346) added - Level 3 daily averaged SO2 (O3M-376) added - Level 3 daily averaged total H2O (O3M-387) added - Level 3 monthly averaged total O3 (O3M-388) added - Level 3 monthly averaged total NO2 (O3M-389) added - Level 3 monthly averaged tropospheric NO2 (O3M-390) added - Level 3 monthly averaged BrO (O3M-391) added - Level 3 monthly averaged total H2O (O3M-393) added - Level 3 monthly averaged total HCHO (O3M-394) added - Level 3 monthly averaged SO2 (O3M-397) added Updates in Appendix 1 based on AC SAF Operations Review 14 (OR-14) Recommendation 01: - NRT coarse resolution ozone profile products (O3M-03, O3M-45) removed - Offline coarse resolution ozone profile products (O3M-13, O3M-46) removed Updates in Appendix 2 based on IASI L3 CO CDR/ICDR (O3M-543, O3M-359) Product Consolidation Review (PCR) and Operational/Delivery Readiness Review (ORR/DRR): - Tables for O3M-359 and O3M-543 added Approved by the Steering Group (AC_DEC_CDOP4SG03-10)

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1. Introduction

1.1. Scope

This document presents the requirements for operational products and services of the Satellite Application Facility on Atmospheric Composition Monitoring (AC SAF) of the EUMETSAT.

This document is made available to the users and constantly revised and updated as new products and services are brought into operation.

1.2. Reference documents

Reference	Title	Id.
RD1	EUMETSAT Operational Services Specification	EUM/OPS/SPE/09/0810
RD2	EPS End User Requirements Document	EPS/MIS/REQ/93001

1.3. Definition of terms

Availability is based on the definition in the EUMETSAT Operational Services Specification [RD1].

Product-specific clarifications:

- For NRT products, the monthly availability limit is 97.5 %. The availability is calculated as a "worst case scenario":

$$\frac{\text{in time processed and disseminated L2 PDUs}}{\text{received L1b PDUs} + \text{missed L1b PDUs marked as "reception confirmed" in the EUMETCast sendlist}}$$

- For offline products, the availability is defined as the ratio of the number of in time processed, archived and quality-approved L2 products to the number of orbits for which L1b PDUs have been received per month. Availability limit for offline products is 95.5 %.

NUV and OUV are daily L3 products, and availability is defined as the fraction of days in a month with products fulfilling the timeliness requirements.

Timeliness defines whether the product is near real time (NRT) product which is disseminated or ready for download in three hours from sensing at the latest or offline product which is available for download in two weeks after sensing at the latest, during system availability. System unavailability will in most cases not lead to loss of data but to delays with respect to the specified timeliness. In practice, timeliness of a product is determined by calculating the time from sensing to EUMETCast or archive upload.

Accuracy is defined as in the EPS End User Requirements Document [RD2]: the values of accuracy "represent RMS values" taking as reference the 'true value' measured by ground-based instruments.

2. Requirements related to products

2.1. General requirements

PR-1: The AC SAF shall generate and distribute the products as specified in Appendices 1 and 2. Delivery of operational products is presented in Appendix 3.

2.2. Requirements related to product archiving and distribution

PR-2: The products and services shall be available to all EUMETSAT member counties

PR-3: All offline products derived within AC SAF shall be available from the (decentralized) AC SAF archive

PR-4: National Meteorological Services of the EUMETSAT member states, and users authorized by these shall have access to the AC SAF archive

PR-5: All AC SAF products shall be archived at least until the end of the Metop program

PR-6: The SAF products shall be recoverable for at a minimum the EPS mission duration

PR-7: **Removed**

PR-8: HDF5 or NetCDF (for Thematic Climate Data Records) shall be the archive and disk storage format for the geophysical products

PR-9: AC SAF shall deliver the offline products in HDF5 or NetCDF formats. NRT products, excluding NUV, shall be delivered in HDF5 and/or BUFR format. NUV shall be delivered in PNG format.

PR-10: It shall be possible to reprocess all the GOME-2 data sets using new or improved algorithms

PR-11: Temporary access failures to archive items shall not exceed 0.5 % over any one month period

PR-12: There shall be provisions to ensure that no more than 0.1 % of vital data, and none of the algorithms and coefficients, of the total archive can be permanently lost

PR-13: There shall be provisions to ensure that no more than 0.5 % of non-vital data of the total archive can be permanently lost

PR-14: **Removed**

PR-15: NRT products shall be made available in three hours from sensing. Products are made available to users via EUMETCast, WMO GTS, FTP, web pages and/or web-services.

PR-16: Offline products shall be delivered to AC SAF archives at DLR or FMI and made available directly from the archives and other web services in 15 days from sensing.

2.3. Requirements related to product validation and quality control

PR-17: The AC SAF shall provide validation services for all the products in operations, against their product requirements

PR-18: Quality of the products shall be controlled with continuous online quality monitoring services

PR-19: Removed

PR-20: Removed

PR-21: Validation reports shall be available via Internet

PR-22: The AC SAF project team shall cooperate with the community of the EPS system development in order to ensure that the following availability requirements are to be fulfilled:

- EPS-SYS-8.3-220: The EPS Ground Segment NRT product delivery function to any single user shall be successful within timeliness for more than 97.5 % of the overall data downlinked by the spacecraft, for any 30 days period.
- EPS-SYS-8.3-225: Service for a SAF chain shall be better than 95 % over calendar month with a target availability of 98 %.
- EPS-SYS-8.3-230: The EPS Ground Segment archive function shall be successful within the specified timeliness for more than 95.5 % of the overall data downlinked by the spacecraft, for any 30 days period.
- EPS-SYS-8.3-240: The EPS Ground Segment archive function at the end of the full mission lifetime shall have been successful for more than 98.9 % of the overall data downlinked by the successive operational spacecrafts during the whole mission.
- EPS-SYS-8.3-245: The access to the archive function provided by the EPS Ground Segment to any single user shall be successful within the specified timeliness for more than 98 % of the overall user access requests, for any 30 days period.
- EPS-SYS-8.3-250: The access to the archive function provided by the EPS Ground Segment to any single user shall be successful for more than 99.5 % of the overall user access requests, for any 30 days period.

PR-23: Online quality control shall be undertaken during the generation of the SAF products

PR-24: Online quality control shall be performed within the timeliness requirements

PR-25: Offline quality control of the data and products generated by the product generation facilities shall be implemented

PR-26: Offline quality control shall be performed for each type of data and product in order to identify improvements required in the data and product processing chains

3. Requirements related to user services

3.1. Product ordering, AC SAF website and helpdesk

PR-27: Removed

PR-28: Users shall be able to submit orders for receiving offline AC SAF products directly from the DLR archive

PR-29: Users shall be able to submit orders for receiving offline AC SAF products directly from the FMI archive

PR-30: AC SAF shall provide a centralized website (https://acsaf.org) for user services

PR-31: The website and associated user services shall be maintained by the operative SAF personnel at the FMI

PR-32: The website shall reflect that the AC SAF is a consortium effort

PR-33: The AC SAF website shall provide the following public functions:

- Overview of the SAF project
- Access to the product descriptions
- Links to the websites of other consortium members
- Latest SAF news
- Links to product user manuals, validation reports and algorithm theoretical basis documents
- Contact information

PR-34: The SAF team pages shall have restricted access. These pages shall include the whole SAF documentation and additional information about the project.

PR-35: Contacts by users shall be responded within three (3) working days. FMI personnel can forward the inquiries to other consortium members, if necessary.

PR-36: The user community shall be kept informed of any service disruptions and possibly associated reduced quality of the service offered

PR-37: All users shall be informed in advance of any planned reduction of service by email

PR-38: All users shall be informed of any failure within the SAF affecting operational services by email

Appendix 1: AC SAF products

The following tables provide detailed characteristics and requirements of pre-operational and operational AC SAF products. Products are divided into product categories. The coloured bar on top of each category table lists the product IDs, names and acronyms.

NOTE: the nominal spatial resolution of the GOME-2 instrument depends on the actually implemented instrument operations mode.

Total O3		
NRT: O3M-01.1, O3M-41.1, O3M-300 **Offline: O3M-06.1, O3M-42.1, O3M-301**	**MAG-N-O3, MBG-N-O3, MCG-N-O3** **MAG-O-O3, MBG-O-O3, MCG-O-O3**	
Type	Product	
Applications and users	Climate monitoring, C3S, air quality, NWP, CAMS, ozone depletion	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
20 %	4 % (SZA < 80) 6 % (SZA > 80)	1.5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Offline tropical tropospheric O3		
O3M-35, O3M-43, O3M-302	**MAG-O-O3TR, MBG-O-O3TR, MCG-O-O3Tr**	
Type	Product	
Applications and users	Climate monitoring, air quality	
Characteristics and methods	Convective-Cloud-Differential Method	
Generation frequency	Monthly/weekly	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF	FTP
Accuracy		
Threshold	Target	Optimal
50 %	25 %	15 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
(sub)tropics: 20S – 20N	1.25° x 2.5° lat-lon grid	≤ 2 weeks
Comments		

Global tropospheric O3		
NRT: O3M-172, O3M-174, O3M-304 **Offline: O3M-173, O3M-175, O3M-305**	**MAG-N-O3TROC, MBG-N-O3TROC, MCG-N-O3TROC** **MAG-O-O3TROC, MBG-O-O3TROC, MCG-O-O3TROC**	
Type	Product	
Applications and users	NWP, air quality, health, scientific, ECMWF	
Characteristics and methods	Ozone profiles	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	1.37	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	15 %
Verification method	Balloon soundings, lidar and microwave radiometer measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Total NO2		
NRT: O3M-02.1, O3M-50.1, O3M-338 **Offline: O3M-07.1, O3M-51.1, O3M-339**	**MAG-N-NO2, MBG-N-NO2, MCG-N-NO2** **MAG-O-NO2, MBG-O-NO2, MCG-O-NO2**	
Type	Product	
Applications and users	NWP, Climate change monitoring, air quality, health, CAMS	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
10^{15} molec/cm^2 (20 % annual mean)	3-5·10^{14} molec/cm^2 (8-15 % annual mean)	1-3·10^{14} molec/cm^2 (4-8 % annual mean)
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Tropospheric NO2		
NRT: O3M-36.1, O3M-52.1, O3M-341 **Offline: O3M-37.1, O3M-53.1, O3M-342**	**MAG-N-NO2TR, MBG-N-NO2TR, MCG-N-NO2TR** **MAG-O-NO2TR, MBG-O-NO2TR, MCG-O-NO2TR**	
Type	Product	
Applications and users	NWP, air quality, health, CAMS	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	20 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Total SO2		
NRT: O3M-54.1, O3M-55.1, O3M-374 **Offline: O3M-09.1, O3M-56.1, O3M-375**	**MAG-N-SO2, MBG-N-SO2, MCG-N-SO2** **MAG-O-SO2, MBG-O-SO2, MCG-O-SO2**	
Type	Product	
Applications and users	Volcanic emissions, SACS, VAACs, TEMIS, research institutes, anthropogenic emission monitoring, CAMS	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 % (SZA < 70˚)	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		
A specific volcanic SO2 detection flag to identify enhanced GOME-2 SO2 levels and to separate these measurements from GOME-2 pixels with high noise levels is required for use of GOME-2 SO2 columns in CAMS. This volcanic SO2 flag is included in the NRT and offline GOME-2 total SO2 products.		

Total HCHO		
NRT: O3M-176, O3M-177, O3M-344 **Offline: O3M-10.1, O3M-58.1, O3M-345**	**MAG-N-HCHO, MBG-N-HCHO, MCG-N-HCHO** **MAG-O-HCHO, MBG-O-HCHO, MCG-O-HCHO**	
Type	Product	
Applications and users	Air quality. The NRT HCHO product is required by CAMS for assimilation and monitoring purposes, since it is the only constraint on the VOC chemistry in the CAMS system. The offline HCHO product is used by CAMS for validation/monitoring purposes, and for assimilation in the CAMS reanalysis system.	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 % (polluted)	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Offline total BrO		
O3M-08.1, O3M-82.1, O3M-317	**MAG-O-BrO, MBG-O-BrO, MCG-O-BrO**	
Type	Product	
Applications and users	Climate monitoring research: ozone depletion, UCAM	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	15 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	≤ 2 weeks
Comments		

Offline total H2O		
O3M-12.1, O3M-86.1, O3M-386	**MAG-O-H2O, MBG-O-H2O, MCG-O-H2O**	
Type	Product	
Applications and users	Climate monitoring: Climate change, WCRP-GEWEX and GlobVapour.	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Generation frequency	Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	Metop-A/B: GDP 4.8 Metop-C: GDP 4.9	
Dissemination		
Type	Format	Means
Offline	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
25 %	10 %	5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 80 x 40 km^2	≤ 2 weeks
Comments		

Ozone profiles, high resolution		
NRT: O3M-38.1, O3M-47.1, O3M-311 **Offline: O3M-39.1, O3M-48.1, O3M-312**	**MAG-N-O3HRPR, MBG-N-O3HRPR, MCG-N-O3HRPR** **MAG-O-O3HRPR, MBG-O-O3HRPR, MCG-O-O3HRPR**	
Type	Product	
Applications and users	NWP, air quality, health, scientific, ECMWF	
Characteristics and methods	RTModel: LidortA; Inversion: Optimal estimation	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Algorithm version	2.0	
Dissemination		
Type	Format	Means
NRT	BUFR	EUMETCast, WMO GTS
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
30 % in stratosphere 70 % in troposphere	15 % in stratosphere 30 % in troposphere	10 % in stratosphere 25 % in troposphere
Verification method	Balloon soundings, lidar and microwave radiometer measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution nominal size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Absorbing aerosol index from PMDs		
NRT: O3M-62.1, O3M-72.1, O3M-362 **Offline: O3M-63.1, O3M-73.1, O3M-363**	**MAG-N-AAIPMD, MBG-N-AAIPMD, MCG-N-AAIPMD** **MAG-O-AAIPMD, MBG-O-AAIPMD, MCG-O-AAIPMD**	
Type	Product	
Applications and users	Climate monitoring, desert dust, biomass burning, volcanic ash, aerosol modelling	
Characteristics and methods	Rayleigh scattering, including a correction on the reflectance for the degradation of the GOME-2 instrument	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Dissemination		
Type	Format	Means
NRT	HDF5	EUMETCast
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
1.0 index points	0.5 index points	0.2 index points
Verification method	Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 10 x 40 km^2 (before 15 July 2013) nominal pixel size 5 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B/C: nominal pixel size 10 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

Absorbing aerosol height		
NRT: O3M-68, O3M-78, O3M-364 **Offline: O3M-69, O3M-79, O3M-365**	**MAG-N-AAH, MBG-N-AAH, MCG-N-AAH** **MAG-O-AAH, MBG-O-AAH, MCG-O-AAH**	
Type	Product	
Applications and users	Aviation Security, Volcanic Ash Advisory Centres (VAAC), aerosol plume modelling	
Characteristics and methods	Height of absorbing aerosol layer, RTModel, retrieval, Rayleigh scattering, FRESCO++	
Generation frequency	NRT: PDU dissemination frequency, every 3 minutes on daylight side of orbit Offline: Metop orbit repeat cycle	
Input satellite data	Metop-A/B/C: GOME-2	
Dissemination		
Type	Format	Means
NRT	HDF5	EUMETCast, WMO GTS
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
Layer height < 10 km: 3 km Layer height > 10 km: 4 km	Layer height < 10 km: 2 km Layer height > 10 km: 3 km	Layer height < 10 km: 1 km Layer height > 10 km: 2 km
Verification method	Lidar and microwave radiometer measurements, other satellites with cloud top and/or aerosol detection	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution nominal size 80 x 40 km^2	NRT ≤ 3 hours Offline ≤ 2 weeks
Comments		

NRT IASI CO		
O3M-181, O3M-80, O3M-352	**MAI-N-CO, MBI-N-CO, MCI-N-CO**	
Type	Product	
Applications and users	Scientific institutes for modelling, validation, inversion sources, dedicated campaigns e.g. Polarcat, BORTAS and CAMS	
Characteristics and methods	RT: FORLI, OEM	
Generation frequency	PDU dissemination frequency, every 3 minutes	
Input satellite data	Metop-A/B/C: IASI	
Algorithm version	v20151001	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Accuracy on total column for standard cases		
Threshold	Target	Optimal
25 %	12 %	5 %
Accuracy on total column for unusual cases (high pollution or low signal)		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Airplane campaigns, other satellite instruments	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	IASI spatial resolution, cloud fraction below 25 %	≤ 3 hours
Comments		

NRT IASI SO2		
O3M-57, O3M-377	**MABI-N-SO2, MCI-N-SO2**	
Type	Product	
Applications and users	Climate studies, volcanic monitoring (VAACs)	
Characteristics and methods	LUT	
Generation frequency	PDU dissemination frequency, every 3 minutes	
Input satellite data	Metop-A/B/C: IASI	
Algorithm version	v20150205_sp20171122	
Dissemination		
Type	Format	Means
NRT	BUFR, HDF5	EUMETCast, WMO GTS
Accuracy below 10 km		
Threshold	Target	Optimal
200 %	100 %	50 %
Accuracy above 10 km		
Threshold	Target	Optimal
100 %	35 %	20 %
Verification method	Other satellite data and possibly ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	IASI spatial resolution, cloud fraction below 20 %	≤ 3 hours
Comments		
Accuracies are highly dependent on the altitude of the SO2 plume. The percentages in this table assume knowledge of the altitude, temperature and pressure of the SO2 layer, and in addition assume no major cloud and aerosol contamination. The operational range of the algorithm is 0.5-5000 DU (depending on the altitude).		

NRT IASI HNO3		
O3M-81, O3M-336	**MxI-N-HNO3**	
Type	Product	
Applications and users	Stratospheric ozone chemistry monitoring; Lightning NOx emissions, polar chemistry monitoring	
Characteristics and methods	RT: FORLI, OEM	
Generation frequency	PDU dissemination frequency, every 3 minutes	
Input satellite data	Metop-B/C: IASI	
Algorithm version	v20151001	
Dissemination		
Type	Format	Means
NRT	BUFR	EUMETCast, WMO GTS
Accuracy on total column for standard cases		
Threshold	Target	Optimal
50 %	35 %	10 %
Verification method	Ground-based FTIR, data from other satellites	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	IASI spatial resolution, cloud fraction below 25 %	≤ 3 hours
Comments		

NRT IASI total ozone		
O3M-44, O3M-306	**MxI-N-O3**	
Type	Product	
Applications and users	NWP, air quality, ESA TEMIS, DLR WDC-RSAT, MACC/CAMS, ECMWF	
Characteristics and methods	RT: FORLI, OEM	
Generation frequency	PDU dissemination frequency, every 3 minutes on morning and evening orbits	
Input satellite data	Metop-B/C: IASI	
Algorithm version		
Dissemination		
Type	Format	Means
NRT	BUFR	EUMETCast, WMO GTS
Accuracy		
Threshold	Target	Optimal
10 %	5 %	1 %
Verification method	Sondes, ground-based and other satellite instruments	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	IASI resolution	≤ 3 hours
Comments		

NRT IASI ozone profile		
O3M-49, O3M-315	**MxI-N-O3PR**	
Type	Product	
Applications and users	NWP, air quality, ESA TEMIS, DLR WDC-RSAT, MACC/CAMS, ECMWF	
Characteristics and methods	RT: FORLI, OEM	
Generation frequency	PDU dissemination frequency, every 3 minutes on morning and evening orbits	
Input satellite data	Metop-B/C: IASI	
Algorithm version		
Dissemination		
Type	Format	Means
NRT	BUFR	EUMETCast, WMO GTS
Accuracy		
Threshold	Target	Optimal
30 % in stratosphere 50 % in troposphere	15 % in stratosphere 30 % in troposphere	5 % in stratosphere 10 % in troposphere
Verification method	Sondes, ground-based and other satellite instruments	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	IASI resolution	≤ 3hours
Comments		

NRT UV, clear-sky		
O3M-409	**MCG-NUV_CLEAR**	
Type	Product	
Applications and users	Climate monitoring, health risk evaluation, INMH	
Characteristics and methods	Climatologies applied to Assimilated Total Ozone from KNMI	
Generation frequency	1 per day	
Input satellite data	GOME-2 via internal ATO product	
Algorithm version	3.3	
Dissemination		
Type	Format	Means
NRT	PNG, HTML	FTP, WWW, GE
Accuracy		
Threshold	Target	Optimal
20 %	10 %	5 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25˚ x 0.25˚ grid	≤ 3 hours
Comments		

NRT UV, cloud-corrected		
O3M-410	**MCG-NUV_CLOUD**	
Type	Product	
Applications and users	Climate monitoring, health risk evaluation, INMH	
Characteristics and methods	Climatologies applied to Assimilated Total Ozone from KNMI	
Generation frequency	1 per day	
Input satellite data	GOME-2 via internal ATO product	
Algorithm version	3.3	
Dissemination		
Type	Format	Means
NRT	PNG, HTML	FTP, WWW, GE
Accuracy		
Threshold	Target	Optimal
20 %	10 %	5 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25˚ x 0.25˚ grid	≤ 3 hours
Comments		

Offline UV, daily dose, erythemal (CIE) weighting		
O3M-450	**MM-O-UV_DD_CIE**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily dose, plant response weighting		
O3M-451	**MM-O-UV_DD_PLANT**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily dose, DNA damage weighting		
O3M-452	**MM-O-UV_DD_DNA**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		
The DNA damage UV product corresponds to the UV damage on pure DNA, dissolved in liquid, following Setlow *et al.* (1974). It is to be noted that it can't directly be interpreted as DNA damage in living tissues, e.g. human skin.		

Offline UV, daily dose, UVA range (315-400 nm)		
O3M-453	**MM-O-UV_DD_UVA**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily dose, UVB range (280-315 nm)		
O3M-454	**MM-O-UV_DD_UVB**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum dose rate, erythemal (CIE) weighting		
O3M-455	**MM-O-UV_MDSR_CIE**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum dose rate, plant response weighting		
O3M-456	**MM-O-UV_MDSR_PLANT**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum dose rate, DNA damage weighting		
O3M-457	**MM-O-UV_MDSR_DNA**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		
The DNA damage UV product corresponds to the UV damage on pure DNA, dissolved in liquid, following Setlow *et al.* (1974). It is to be noted that it can't directly be interpreted as DNA damage in living tissues, e.g. human skin.		

Offline UV, daily maximum dose rate, UVA range (315-400 nm)		
O3M-458	**MM-O-UV_MDSR_UVA**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- Total ozone NRT products O3M-01.1 and O3M-41.1 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum dose rate, UVB range (280-315 nm)		
O3M-459	**MM-O-UV_MDSR_UVB**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, solar noon UV Index		
O3M-460	**MM-O-UV_NOON_UVI**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum ozone photolysis rate		
O3M-461	**MM-O-UV_MPHR_O3**	
Type	Product	
Applications and users	Climate monitoring, UV chemical effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum NO2 photolysis rate		
O3M-462	**MM-O-UV_MPHR_NO2**	
Type	Product	
Applications and users	Climate monitoring, UV chemical effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily dose, vitamin D weighting		
O3M-463	**MM-O-UV_DD_VITD**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline UV, daily maximum dose rate, vitamin D weighting		
O3M-464	**MM-O-UV_MDSR_VITD**	
Type	Product	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Generation frequency	1 per day	
Input satellite data	- AC SAF GOME-2 NRT total ozone products that are available - AVHRR/3 channel 1 reflectance from Metops and NOAA-18/19 that are available - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Dissemination		
Type	Format	Means
Offline	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged total O3		
O3M-303	**MxG-O-O3-daily**	
Type	Product	
Applications and users	Climate monitoring, C3S, air quality, NWP, CAMS, ozone depletion	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
20 %	4 % (SZA < 80) 6 % (SZA > 80)	1.5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged BrO		
O3M-318	**MxG-O-BrO-daily**	
Type	Product	
Applications and users	Climate monitoring, ozone depletion	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	15 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged total NO2		
O3M-340	**MxG-O-NO2-daily**	
Type	Product	
Applications and users	Air quality, CAMS	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
20%	8 %	5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged tropospheric NO2		
O3M-343	**MxG-O-NO2Tr-daily**	
Type	Product	
Applications and users	Air quality, CAMS	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	20 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged total HCHO		
O3M-346	**MxG-O-HCHO-daily**	
Type	Product	
Applications and users	Air quality	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
100 % (polluted cond.)	50 % (polluted cond.)	30 % (polluted cond.)
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged SO2		
O3M-376	**MxG-O-SO2-daily**	
Type	Product	
Applications and users	Volcanic emissions, air quality, anthropogenic emission monitoring	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 % (SZA < 70˚)	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 daily averaged total H2O		
O3M-387	**MxG-O-H2O-daily**	
Type	Product	
Applications and users	Climate monitoring: Climate change, WCRP-GEWEX	
Characteristics and methods	L3 daily gridded	
Generation frequency	Daily	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
25 %	10 %	5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged total O3		
O3M-388	**MxG-O-O3-monthly**	
Type	Product	
Applications and users	Climate monitoring, C3S, air quality, NWP, CAMS, ozone depletion	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
20 %	4 % (SZA < 80) 6 % (SZA > 80)	1.5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged total NO2		
O3M-389	**MxG-O-NO2-monthly**	
Type	Product	
Applications and users	Climate monitoring, air quality	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
20%	8 %	5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged tropospheric NO2		
O3M-390	**MxG-O-NO2Tr-monthly**	
Type	Product	
Applications and users	Climate monitoring, air quality	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	20 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged BrO		
O3M-391	**MxG-O-BrO-monthly**	
Type	Product	
Applications and users	Climate monitoring, ozone depletion	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	15 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged total H2O		
O3M-393	**MxG-O-H2O-monthly**	
Type	Product	
Applications and users	Climate monitoring: Climate change, WCRP-GEWEX	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
25 %	10 %	5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged total HCHO		
O3M-394	**MxG-O-HCHO-monthly**	
Type	Product	
Applications and users	Climate monitoring, air quality	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
100 % (polluted cond.)	50 % (polluted cond.)	30 % (polluted cond.)
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Offline GOME-2 L3 monthly averaged SO2		
O3M-397	**MxG-O-SO2-monthly**	
Type	Product	
Applications and users	Volcanic emissions, air quality, anthropogenic emission monitoring	
Characteristics and methods	L3 monthly means	
Generation frequency	Monthly	
Input satellite data	Metop-B and/or Metop-C GOME-2 instrument data which is available, Level 2 GDP 4.8/4.9	
Algorithm version	1.0	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 % (SZA < 70˚)	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	≤ 2 weeks
Comments		

Appendix 2: AC SAF data records

Reprocessed total O3		
O3M-40	**MAG-RP1-O3**	
Type	Data Record	
Applications and users	Climate monitoring	
Characteristics and methods	DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A: GOME-2 L1 (PPF 4.x)	
Algorithm version	GDP 4.4	
Time period	January 2007 – December 2009	
Data volume	200 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
20 %	3 % (SZA < 80°) 6 % (SZA > 80°)	1.5 %
Verification methods	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution, nominal size 80 x 40 km^2	-
Comments		

Reprocessed total O3		
O3M-110	**MxG-RP1-O3**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, monitoring and applications. Targeted users are: WMO WOUDC, WMO OMP, DLR WDC-RSAT, TEMIS, CAMS (Copernicus Atmospheric Monitoring Service) reanalysis, and C3S (Copernicus Climate Change Service). In general, scientific community interested in the long-term evolution of the ozone layer.	
Characteristics and Methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input Satellite Data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm Version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data Volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
20 %	3 % (SZA < 80°) 6 % (SZA > 80°)	1.5 %
Verification methods	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		

Reprocessed total NO2		
O3M-114	**MxG-RP1-NO2**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate and air quality research, monitoring and applications. The GOME-2 NO2 column is important input product to the Copernicus Atmospheric Monitoring Service (CAMS) for assimilation in the reanalysis system, and for CAMS validation/monitoring purposes. In addition, it is used in support of regional model runs for Europe as well as in verification of emissions, investigation of trends etc.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
10^{15} molec/cm^2 (20 % annual mean)	3-5·10^{14} molec/cm^2 (8-15 % annual mean)	1-3·10^{14} molec/cm^2 (4-8 % annual mean)
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		
The accuracy specifications for this product are focussed on stratospheric applications and have been verified with ground-based stratospheric NO2 measurements from NDACC.		

Reprocessed total BrO		
O3M-115	**MxG-RP1-BrO**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, monitoring and applications. The product is used by research institutes (e.g. UCAM) for comparison with local measurements and with chemistry-transport model simulations (Yang et al., 2010). In the future, GOME-2 BrO data could also be useful for the planning and interpretation of polar campaign experiments such as the past ARCTAS campaign (Salawitch et al., 2010). The product can be used in assessment of the Montreal Protocol.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 %	15 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		

Reprocessed total SO2		
O3M-117	**MxG_RP1-SO2**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate and air quality research, monitoring and applications. The key users will be CAMS, i.e. for assimilation in the CAMS reanalysis system, and for CAMS validation/monitoring activities. Furthermore, the product is used in support of regional model runs for Europe. Other users are volcanic emissions monitoring services, such as SACS, VAST and VAACs. The SO2 product is also used by several research institutes for various applications such as evaluation of anthropogenic SO2 emissions from large point sources (smelters and power plants) (Fioletov et al., 2013), investigation of temporal trends in high-polluted regions (e.g. ESA Dragon-3 project), verification of bottom-up emission inventory etc.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 % (SZA < 70°)	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		
A specific volcanic SO2 detection flag to identify enhanced GOME-2 SO2 levels and to separate these measurements from GOME-2 pixels with high noise levels is required for use of GOME-2 SO2 columns in CAMS. This volcanic SO2 flag will be included in the GOME-2 reprocessed total SO2 product.		

Reprocessed total HCHO		
O3M-118	**MxG-RP1-HCHO**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate and air quality research, monitoring and applications. The GOME-2 formaldehyde column is an important input product to the Copernicus Atmospheric Monitoring Service (CAMS) for assimilation in the reanalysis system, and for validation/monitoring of the CAMS system. In addition, it is used in support of regional model runs for Europe as well as in verification of emissions, investigation of trends etc.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 % (polluted)	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		

Reprocessed total OClO		
O3M-119	**MxG-RP1-OClO**	
Type	Data Record	
Applications and users	This is a homogenous, stable and long data record for climate research, monitoring and applications. It is targeted to research institutes for comparison with local measurements and with chemistry-transport model simulations. The data record can be used by WMO and other research institutes in the framework of the Montreal Protocol Assessments.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting. Only OClO slant column densities are provided.	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0 and 6.X)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
100 %	50 %	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution, nominal size 80 x 40 km^2	-
Comments		

Reprocessed total H2O		
O3M-121	**MxG-RP1-H2O**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, monitoring and applications. H2O product is an important input to the WCRP-GEWEX project and ESA's DUE GlobVapour project.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
25 %	10 %	5 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		

Reprocessed tropospheric NO2		
O3M-123	**MxG-RP1-NO2TR**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate and air quality research, monitoring and applications. The GOME-2 NO2 column is an important input product to the Copernicus Atmospheric Monitoring Service (CAMS) for assimilation in the reanalysis system, and for validation/monitoring of the CAMS system. In addition, it is used in support of regional model runs for Europe.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	GDP 4.8	
Time period	23/01/2007 – 16/11/2016	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	FTP
Accuracy		
Threshold	Target	Optimal
50 %	30 % (polluted)	20 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) GOME-2/Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		

Reprocessed absorbing aerosol index		
O3M-113	**MAG-RP1-AAI**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, aerosol services and applications. The specific areas are: climate monitoring (CAMS), detection and modelling of desert dust, volcanic ash (like Temis and SACS, biomass burning and validation of polar multi-sensor aerosol properties (PMAp) product (EUMETSAT). Users indicate the need for the stable long term aerosol products in the following documents (for example): • ESA Climate Change Initiative aerosol_cci User Requirement Document, Version 1.5 (Aerosol_cci_URD_v1.5) • 1997 Aerosol Workshop http://www.giss.nasa.gov/meetings/aerosols1997/summary.html • Global Aerosol Climatology Project (http://gacp.giss.nasa.gov/) • SACS support letter This is the first reprocessing for the GOME-2 aerosol products.	
Characteristics and methods	Rayleigh scattering including degradation correction: de Graaf, M., P. Stammes, O. Torres, and R. B. A. Koelemeijer (2005), Absorbing Aerosol Index: Sensitivity analysis, application to GOME and comparison with TOMS, J. Geophys. Res., 110, D01201, doi:10.1029/2004JD005178	
Input satellite data	Metop-A: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	OPERA 1.30	
Time period	24/01/2007 – 'current'	
Data volume	~4 GB / year	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
General quality requirement	Specific accuracy user requirements for AAI products don't exist due to the qualitative nature of the product. Thus, the quality success criteria is such that the product allow setting of Absorbing Aerosol Index value thresholds for applications mentioned in the "Applications and Users" section and that the selected threshold values are usable for the whole data record without time dependent variations. The values of those thresholds are set by the data users and thus, cannot be specified here.	
Verification method	Satellite-to-satellite comparison (SCIAMACHY/Envisat)	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2/Metop-A resolution: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013)	-
Comments		

Absorbing aerosol height data record		
O3M-170	**MxG-RP1-AAH**	
Type	Data Record	
Applications and users	Aviation Security, Volcanic Ash Advisory Centres (VAAC), aerosol plume modelling	
Characteristics and methods	Height of absorbing aerosol layer, RTModel, retrieval, Rayleigh scattering, FRESCO++	
Input satellite data	Metop-A/B: GOME-2	
Algorithm version	1.25	
Time period	January 2007 - July 2018	
Data volume	82.3 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
Layer height < 10 km: 3 km Layer height > 10 km: 4 km	Layer height < 10 km: 2 km Layer height > 10 km: 3 km	Layer height < 10 km: 1 km Layer height > 10 km: 2 km
Verification method	Lidar and microwave radiometer measurements Other satellites with cloud top and/or aerosol detection	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution, nominal size 80 x 40 km^2	-
Comments		

Reprocessed absorbing aerosol index from PMDs		
O3M-178	**MAG-RP1-AAIPMD**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, aerosol services and applications. The specific areas are: climate monitoring (CAMS), detection and modelling of desert dust, volcanic ash (like Temis and SACS), biomass burning and validation of polar multi-sensor aerosol properties (PMAp) product (EUMETSAT). Users indicate the need for the stable long term aerosol products in the following documents (for example): • ESA Climate Change Initiative aerosol_cci User Requirement Document, Version 1.5 (Aerosol_cci_URD_v1.5) • 1997 Aerosol Workshop http://www.giss.nasa.gov/meetings/aerosols1997/summary.html • Global Aerosol Climatology Project (http://gacp.giss.nasa.gov/) • SACS support letter This is the first reprocessing for the GOME-2 aerosol products	
Characteristics and methods	Rayleigh scattering including degradation correction: de Graaf, M., P. Stammes, O. Torres, and R. B. A. Koelemeijer (2005), Absorbing Aerosol Index: Sensitivity analysis, application to GOME and comparison with TOMS, J. Geophys. Res., 110, D01201, doi:10.1029/2004JD005178	
Input satellite data	Metop-A: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	OPERA 1.30	
Time period	24/01/2007 – 'current' Note: the PMD data before and after 12 March 2008 are not comparable because the wavelength definition of the PMD bands is different.	
Data volume	~30 GB / year	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
General quality requirement	Specific accuracy user requirements for AAI products don't exist due to the qualitative nature of the product. Thus, the quality success criteria is such that the product allow setting of Absorbing Aerosol Index value thresholds for applications mentioned in the "Applications and Users" section and that the selected threshold values are usable for the whole data record without time dependent variations. The values of those thresholds are set by the data users and thus, cannot be specified here.	
Verification method	Satellite-to-satellite comparison (SCIAMACHY/Envisat)	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 PMD resolution: nominal pixel size 10 x 40 km^2 (before 15 July 2013) nominal pixel size 5 x 40 km^2 (after 15 July 2013)	-
Comments		

Reprocessed absorbing aerosol index		
O3M-179	**MBG-RP1-AAI**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, aerosol services and applications. The specific areas are: climate monitoring (CAMS), detection and modelling of desert dust, volcanic ash (like Temis and SACS, biomass burning and validation of polar multi-sensor aerosol properties (PMAp) product (EUMETSAT). Users indicate the need for the stable long term aerosol products in the following documents (for example): • ESA Climate Change Initiative aerosol_cci User Requirement Document, Version 1.5 (Aerosol_cci_URD_v1.5) • 1997 Aerosol Workshop http://www.giss.nasa.gov/meetings/aerosols1997/summary.html • Global Aerosol Climatology Project (http://gacp.giss.nasa.gov/) • SACS support letter This is the first reprocessing for the GOME-2 aerosol products.	
Characteristics and methods	Rayleigh scattering including degradation correction: de Graaf, M., P. Stammes, O. Torres, and R. B. A. Koelemeijer (2005), Absorbing Aerosol Index: Sensitivity analysis, application to GOME and comparison with TOMS, J. Geophys. Res., 110, D01201, doi:10.1029/2004JD005178	
Input satellite data	Metop-B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	OPERA 1.30	
Time period	12/12/2012 – ‘current’	
Data volume	~4 GB / year	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
General quality requirement	Specific accuracy user requirements for AAI products don’t exist due to the qualitative nature of the product. Thus, the quality success criteria is such that the product allow setting of Absorbing Aerosol Index value thresholds for applications mentioned in the “Applications and Users” section and that the selected threshold values are usable for the whole data record without time dependent variations. The values of those thresholds are set by the data users and thus, cannot be specified here.	
Verification method	Satellite-to-satellite comparison (SCIAMACHY/Envisat)	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution, nominal pixel size 80 x 40 km^2	-
Comments		

Reprocessed absorbing aerosol index from PMDs		
O3M-180	**MBG-RP1-AAIPMD**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, aerosol services and applications. The specific areas are: climate monitoring (CAMS), detection and modelling of desert dust, volcanic ash (like Temis and SACS), biomass burning and validation of polar multi-sensor aerosol properties (PMAp) product (EUMETSAT). Users indicate the need for the stable long term aerosol products in the following documents (for example): • ESA Climate Change Initiative aerosol_cci User Requirement Document, Version 1.5 (Aerosol_cci_URD_v1.5) • 1997 Aerosol Workshop http://www.giss.nasa.gov/meetings/aerosols1997/summary.html • Global Aerosol Climatology Project (http://gacp.giss.nasa.gov/) • SACS support letter This is the first reprocessing for the GOME-2 aerosol products	
Characteristics and methods	Rayleigh scattering including degradation correction: de Graaf, M., P. Stammes, O. Torres, and R. B. A. Koelemeijer (2005), Absorbing Aerosol Index: Sensitivity analysis, application to GOME and comparison with TOMS, J. Geophys. Res., 110, D01201, doi:10.1029/2004JD005178	
Input satellite data	Metop-B: GOME-2 L1 (PPF 5.3.0)	
Algorithm version	OPERA 1.30	
Time period	12/12/2012 – 'current'	
Data volume	~30 GB / year	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
General quality requirement	Specific accuracy user requirements for AAI products don't exist due to the qualitative nature of the product. Thus, the quality success criteria is such that the product allow setting of Absorbing Aerosol Index value thresholds for applications mentioned in the "Applications and Users" section and that the selected threshold values are usable for the whole data record without time dependent variations. The values of those thresholds are set by the data users and thus, cannot be specified here.	
Verification method	Satellite-to-satellite comparison (SCIAMACHY/Envisat)	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 PMD resolution, nominal pixel size 10 x 40 km^2	-
Comments		

TCDR NO2		
O3M-87	**MxG-DS-TCDRNO2**	
Type	Data Record	
Applications and users	The product is targeted for climate and air quality research and applications. The product contain both total as well as tropospheric NO2.	
Characteristics and methods	Monthly means	
Input satellite data	Metop-x: GOME-2 L2 product	
Algorithm version	1.0	
Time period	January 2007 – August 2017	
Data volume	2.9 GB	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
Total NO2: 20% Trop. NO2: 50 %	8 % 30 %	5 % 20 %
Verification method	-	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.25° x 0.25°	-
Comments		
The GCOS long term accuracy target for tropospheric NO2 column is 20 % (CGOS, 2016). This GCOS target is in line with the estimated optimal accuracy of 20 % for the GOME-2 TCDR NO2 product.		

TCDR H2O		
O3M-88	**MxG-DS-TCDRH2O**	
Type	Data Record	
Applications and users	The product is targeted for climate change research, and applications. WCRP-GEWEX.	
Characteristics and methods	Monthly means	
Input satellite data	Metop-x: GOME-2 L2 product	
Algorithm version	1.0	
Time period	January 2007 – August 2017	
Data volume	2.9 GB	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
25 %	10 %	5 %
Verification method	-	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5°	-
Comments		
GCOS long-term accuracy target for total H2O column is 2 % (CGOS, 2016). This GCOS target for the H2O column will be difficult to obtain from GOME-2. Although a 2 % accuracy might not be feasible, the GOME-2 H2O TCDR is a valuable data set because of its long-term consistency and stability, the limited use of external (auxiliary) information in the retrieval, and the global coverage over both land and ocean.		

UV data record R1, daily dose, erythemal (CIE) weighting		
O3M-138	**MxG-RP1-O-UV_DD_CIE**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily dose, plant response weighting		
O3M-139	**MxG-RP1-O-UV_DD_PLANT**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily dose, DNA damage weighting		
O3M-140	**MxG-RP1-O-UV_DD_DNA**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		
The DNA damage UV product corresponds to the UV damage on pure DNA, dissolved in liquid, following Setlow *et al.* (1974). It is to be noted that it can't directly be interpreted as DNA damage in living tissues, e.g. human skin.		

UV data record R1, daily dose, UVA range (315-400 nm)		
O3M-141	**MxG-RP1-O-UV_DD_UVA**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily dose, UVB range (280-315 nm)		
O3M-142	**MxG-RP1-O-UV_DD_UVB**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum dose rate, erythemal (CIE) weighting		
O3M-143	**MxG-RP1-O-UV_MDSR_CIE**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum dose rate, plant response weighting		
O3M-144	**MxG-RP1-O-UV_MDSR_PLANT**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum dose rate, DNA damage weighting		
O3M-145	**MxG-RP1-O-UV_MDSR_DNA**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		
The DNA damage UV product corresponds to the UV damage on pure DNA, dissolved in liquid, following Setlow *et al.* (1974). It is to be noted that it can't directly be interpreted as DNA damage in living tissues, e.g. human skin.		

UV data record R1, daily maximum dose rate, UVA range (315-400 nm)		
O3M-146	**MxG-RP1-O-UV_MDSR_UVA**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum dose rate, UVB range (280-315 nm)		
O3M-147	**MxG-RP1-O-UV_MDSR_UVB**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, solar noon UV index		
O3M-148	**MxG-RP1-O-UV_NOON_UVI**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum ozone photolysis rate		
O3M-149	**MxG-RP1-O-UV_MPHR_O3**	
Type	Data Record	
Applications and users	Climate monitoring, UV chemical effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum NO2 photolysis rate		
O3M-150	**MxG-RP1-O-UV_MPHR_NO2**	
Type	Data Record	
Applications and users	Climate monitoring, UV chemical effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily dose, vitamin D weighting		
O3M-151	**MxG-RP1-O-UV_DD_VITD**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

UV data record R1, daily maximum dose rate, vitamin D weighting		
O3M-152	**MxG-RP1-O-UV_MDSR_VITD**	
Type	Data Record	
Applications and users	Climate monitoring, UV biological effects	
Characteristics and methods	Radiative transfer modelling	
Input satellite data	- Total ozone data record O3M-110 - AVHRR/3 channel 1 reflectance from Metop-A/B and NOAA-18/19 - Surface albedo and aerosol come from MODIS Aura/Terra Collection 006 instead of Tanskanen, Koepke and Kinne climatologies	
Algorithm version	OUV PGE 2.00	
Time period	June 2007 – May 2017	
Data volume	Approx. 160 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	HDF5	HTTP
Accuracy		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Comparison with ground-based measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	0.5° x 0.5° grid	-
Comments		

Merged LER surface albedo for GOME-2 (Metop-A/B)		
O3M-402	**MxG-DS-LER**	
Type	Data Record	
Applications and users	Climate monitoring: shortwave radiation balance, models, support of trace gas retrievals and of retrievals of clouds and aerosols	
Characteristics and methods	The derived GOME-2 surface DLER product is the directionally dependent Lambertian-equivalent reflectivity (DLER) of the surface, which contains the directional dependence of the surface reflectivity. The surface DLER is provided for 26 selected GOME-2 wavelength bands located outside strong gaseous absorption bands. From the main science channels (MSC): 328, 335, 340, 354, 367, 380, 388, 416, 425, 440, 463, 494, 510, 526, 546, 555, 564, 585, 610, 640, 670, 685, 697, 712, 758, 772 nm From the PMDs: 333, 339, 369, 382, 414, 461, 520, 555, 590, 640, 757, 799 nm	
Input satellite data	Metop-A/B GOME-2 L1b and assimilated total ozone columns from NTO	
Algorithm version	3.0	
Time period	MSC: 01/02/2007 – 30/06/2018 PMD: 01/04/2008 – 30/06/2018	
Data volume	MSC: 2.5 GB PMD: 1.6 GB	
Dissemination		
Type	Format	Means
Offline	NetCDF	HTTP
Accuracy		
Threshold	Target	Optimal
0.10	0.04	0.02
Verification method	Intercomparison with GOME-1, OMI and MERIS surface albedo databases	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	Resolution: - Main science channels: 1° x 1° - PMD bands: 0.5° x 0.5° Sampling: - MSC: 0.25° x 0.25° - PMD: 0.25° x 0.25°	-
Comments		
The MSC-LER and PMD-LER products are provided on a grid with a **sampling** of 0.25° x 0.25°. This is to accommodate a higher spatial **resolution** of 0.25° x 0.25° near the coastlines. The real, intrinsic resolution for land and ocean surfaces not containing coastlines is as noted above under “Spatial resolution” (Main science channels: 1° x 1° and PMD bands: 0.5° x 0.5°). With “spatial resolution” we mean the spatial representativeness, with “spatial sampling” we refer to the cell size in the latitude and longitude grid. The LER is dimensionless; the threshold/target/optimal accuracies mentioned above are also unitless.		

Reprocessed total CHOCHO		
O3M-120.0	**MxG-RP1-CHOCHO**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate and air quality research, monitoring and applications. The GOME-2 CHOCHO column is important input product to CAMS for assimilation in the reanalysis system, and for the validation/monitoring of this system. In addition, it is used in support of regional model runs for Europe as well as in verification of emissions, investigation of trends etc.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0 and 6.X)	
Algorithm version	GDP 4.9x	
Time period	GOME-2A: 23/01/2007 – 31/12/2017 GOME-2B: 01/01/2013 – 30/06/2020	
Data volume	240 GB	
Dissemination		
Type	Format	Means
Offline, reprocessed	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
100 % (polluted cond.)	50 % (polluted cond.)	30 % (polluted cond.)
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution, nominal size 80 x 40 km^2 / 40 x 40 km^2	-
Comments		

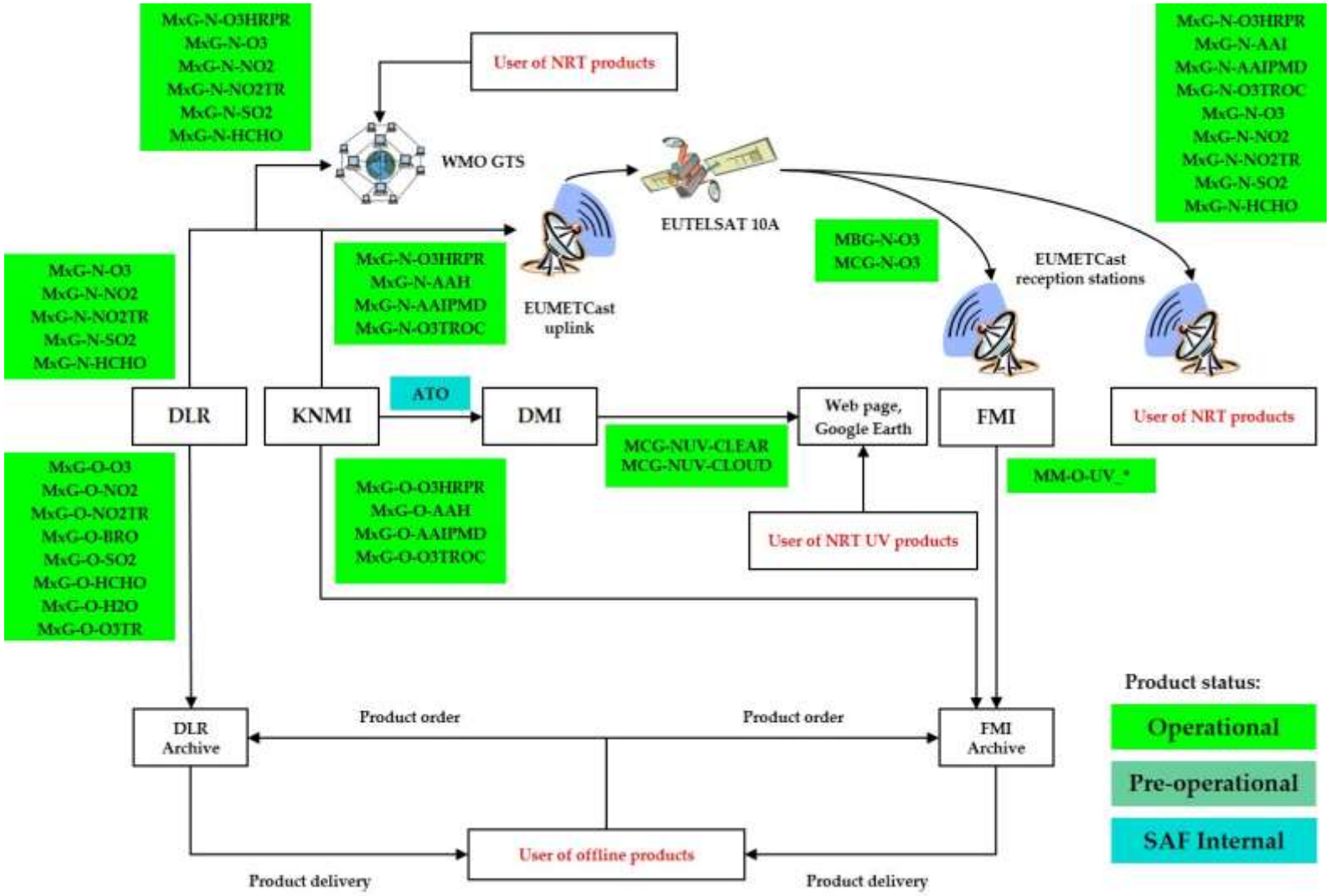
Reprocessed tropospheric BrO		
O3M-116.0	**MxG-RP1-BrOTR**	
Type	Data Record	
Applications and users	The product is targeted for the generation of homogenous and stable long data records for climate research, monitoring and applications. The product is used by research institutes (e.g. UCAM) for comparison with local measurements and with chemistry-transport model simulations (Yang et al., 2010). In the future, GOME-2 trop. BrO data could also be useful for the planning and interpretation of polar campaign experiments such as the past ARCTAS campaign (Salawitch et al., 2010). The product can be used in assessment of Montreal Protocol.	
Characteristics and methods	Homogenous data set, DOAS slant column fitting + AMF conversion	
Input satellite data	Metop-A/B: GOME-2 L1 (PPF 5.3.0 and 6.X)	
Algorithm version	GDP 4.9x	
Time period	23/01/2007 – 30/06/2020	
Data volume	1037 GB	
Dissemination		
Type	Format	Means
Offline	NetCDF-4	FTP
Accuracy		
Threshold	Target	Optimal
100 %	60 %	30 %
Verification method	Comparison with ground-based measurements Satellite-to-satellite comparison	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 resolution, nominal size 80 x 40 km^2 / 40 x 40 km^2	-
Comments		

Reprocessed ozone profiles in HR		
O3M-112	**MxG-RP1-O3HRPR**	
Type	Data Record	
Applications and users	Climate monitoring, air quality	
Characteristics and methods	RTModel: LidortA Inversion: Optimal estimation	
Input satellite data	Metop-A/B: GOME-2 L1b (PPF 5.3, 6.0 and 6.1)	
Algorithm version	Opera v2.0 or higher	
Time period	GOME-2A: 01/2007 – 12/2018, GOME-2B: 12/2012 – 12/2018	
Data volume	GOME-2A: 22.5 TB, GOME-2B: 11.5 TB	
Dissemination		
Type	Format	Means
Offline, reprocessed	NetCDF	HTTPS
Accuracy		
Threshold	Target	Optimal
30 % in stratosphere 70 % in troposphere	15 % in stratosphere 30 % in troposphere	10 % in stratosphere 25 % in troposphere
Verification methods	Balloon soundings Lidar and microwave radiometer measurements	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	GOME-2 band 1b resolution Metop-A: nominal pixel size 80 x 40 km^2 (before 15 July 2013) nominal pixel size 40 x 40 km^2 (after 15 July 2013) Metop-B: nominal pixel size 80 x 40 km^2	-
Comments		

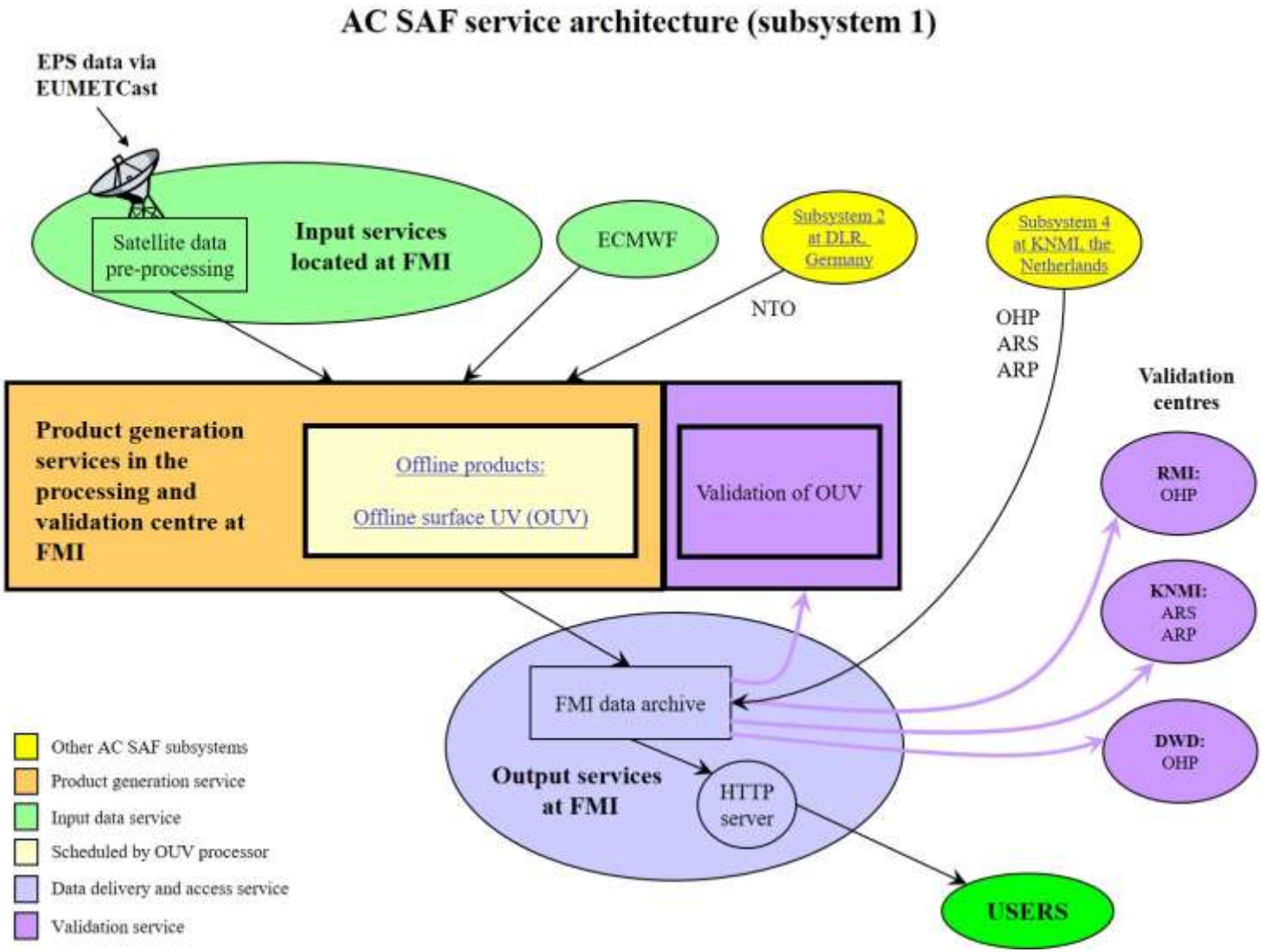
DR IASI L3 monthly gridded CO – Interim climate data record (ICDR)		
O3M-359	**MxI-O-CO-monthly**	
Type	Product	
Applications and users	Scientific institutes for studying long term trends and climate research. Potential users: model evaluation and climatologies (e.g., CAMS, C3S)	
Characteristics and methods	RT: FORLI, OEM ICDR continuing consistently and seamlessly the data record (O3M-543) for day and night observations separately.	
Generation frequency	Monthly	
Input satellite data	Metop-B/C: IASI	
Dissemination		
Type	Format	Means
Offline	NetCDF	AC SAF web page and redistribution through AERIS
Accuracy on total column for standard cases		
Threshold	Target	Optimal
15 %	10 %	8 %
Accuracy on total column for unusual cases (high pollution or low signal)		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Airplane campaigns, other satellite instruments	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	1.0° x 1.0° grid	≤ 5 days
Comments		
The errors on the L3 CO column during unusual cases listed here are nominal. The product is delivered with a retrieval error grid associated with each day/night monthly averaged CO concentration grid. When averaging over the 1°x1° grid, the total retrieval error of the different CO total columns within a grid is taken into account by giving more weight to the pixels associated with lowers errors (more information is found in the ATBD). The users can rely on these error grids in their product evaluation. The inter-comparison of the CO ICDR with the CO CDR, on overlapping periods should be zero (or very close). The reader can refer to the L3 ICDR validation report for more information.		

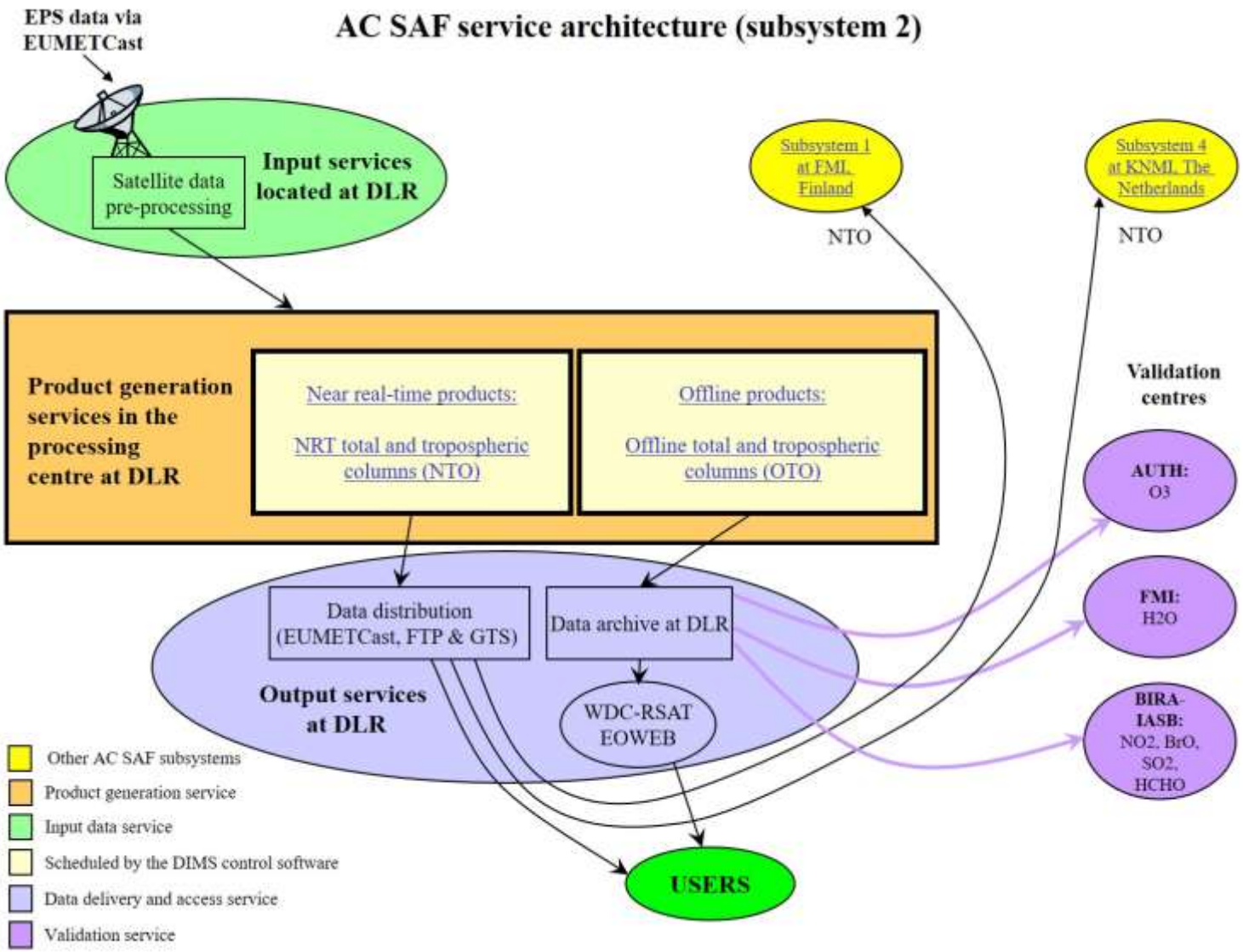
DR IASI L3 monthly gridded CO – Climate data record		
O3M-543	**MxI-O-CO-monthly**	
Type	Data record	
Applications and users	Scientific institutes for studying long term trends and climate research. Potential users: model evaluation and climatologies (e.g., CAMS, C3S)	
Characteristics and methods	RT: FORLI (Algorithm version Forli v20151001_sp2017112), OEM	
Generation frequency	Not applicable	
Input satellite data	Metop-A/B: IASI	
Time period	Metop-A: 10/07/2007 – 15/10/2021 Metop-B: 20/02/2013 – 31/12/2021	
Dissemination		
Type	Format	Means
Data record	NetCDF	AC SAF web page and redistribution through AERIS
Accuracy on total column for standard cases		
Threshold	Target	Optimal
15 %	10 %	8 %
Accuracy on total column for unusual cases (high pollution or low signal)		
Threshold	Target	Optimal
50 %	20 %	10 %
Verification method	Airplane campaigns, other satellite instruments	
Coverage, resolution and timeliness		
Spatial coverage	Spatial resolution	Timeliness
Global	1.0° x 1.0° grid	Not applicable
Comments		
The errors on the L3 CO column during unusual cases listed here are nominal. The product is delivered with a retrieval error grid associated with each day/night monthly averaged CO concentration grid. When averaging over the 1°x1° grid, the total retrieval error of the different CO total columns within a grid is taken into account by giving more weight to the pixels associated with lowers errors (more information is found in the ATBD). The users can rely on these error grids in their product evaluation. During pollution/exceptional events the errors depend on many factors affecting the L2 retrievals, such as the thermal contrast, the temperature (the season), and other meteorological factors such as the boundary layer height, etc. It is therefore highly dependent on the location of the event.		

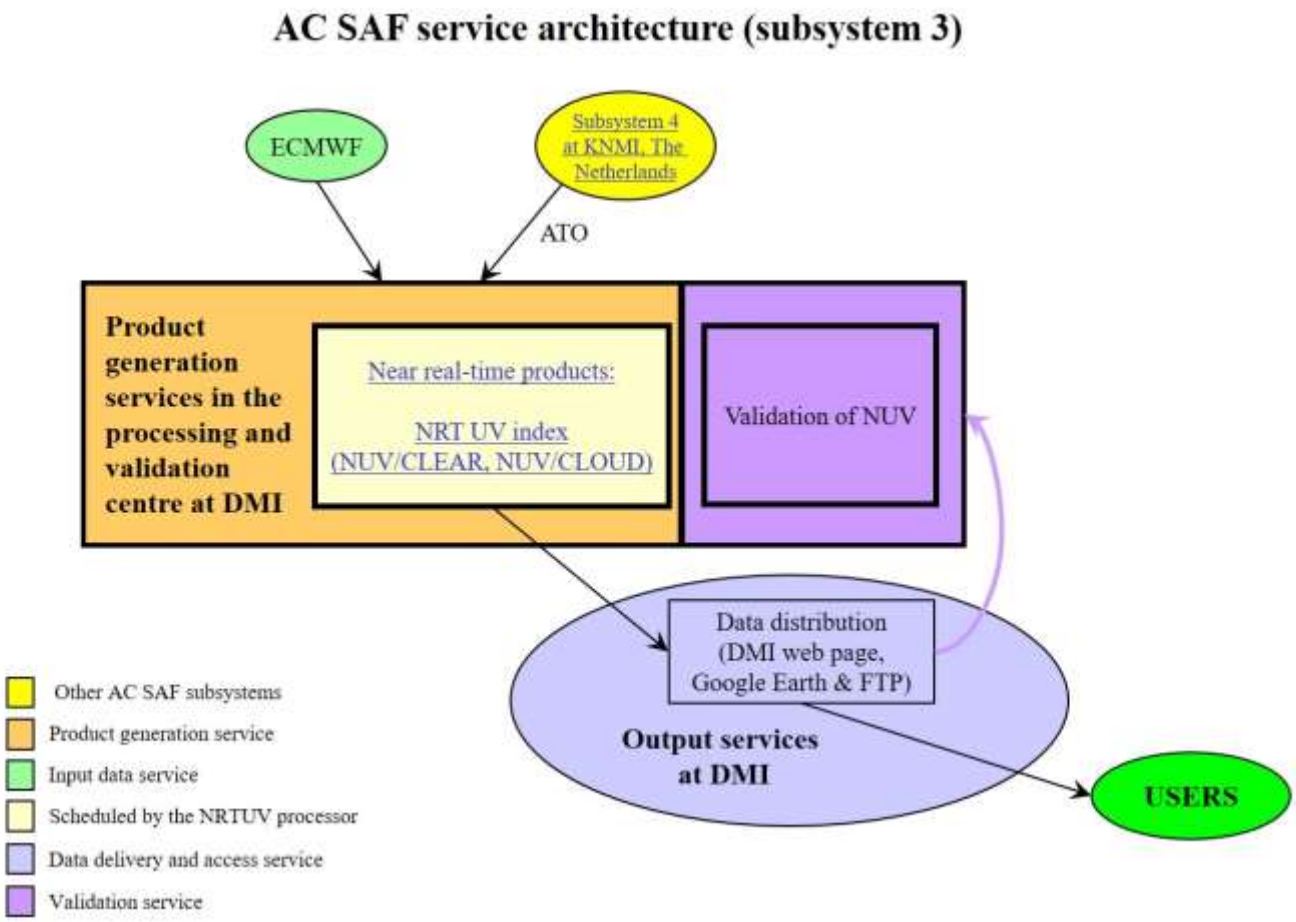
Appendix 3: AC SAF product delivery diagram

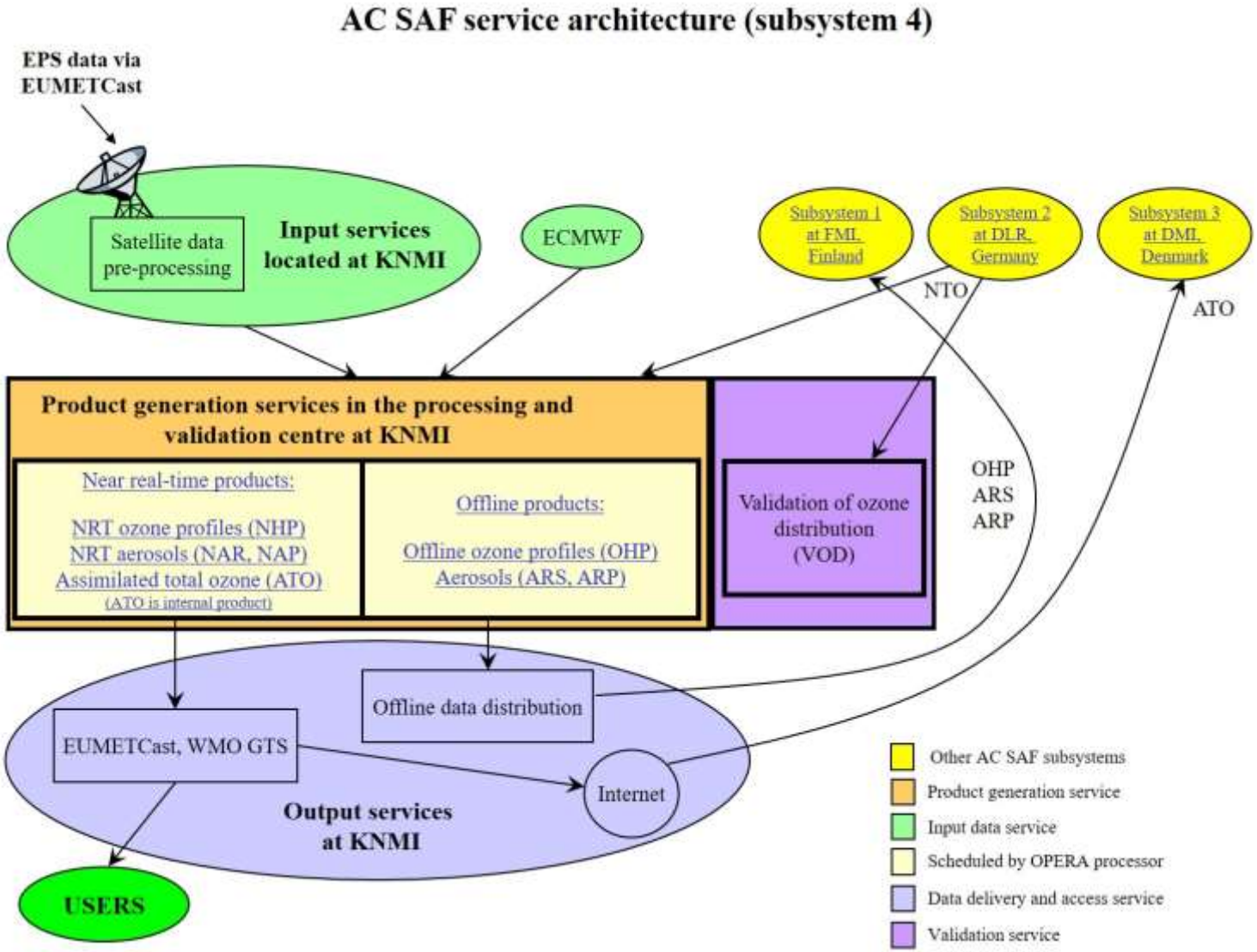


Appendix 4: AC SAF subsystems




AC SAF service architecture (subsystem 2)
EPS data via EUMETCast
Satellite data pre-processing
Input services located at DLR
Subsystem 1 at FMI, Finland
NTO
Subsystem 4 at KNMI, The Netherlands
NTO
Product generation services in the processing centre at DLR
Near real-time products:
NRT total and tropospheric columns (NTO)
Offline products:
Offline total and tropospheric columns (OTO)
Validation centres
AUTH: O3
FMI: H2O
BIRA-IASB: NO2, BrO, SO2, HCHO
Data distribution (EUMETCast, FTP & GTS)
Data archive at DLR
Output services at DLR
WDC-RSAT EOWEB
USERS
Other AC SAF subsystems
Product generation service
Input data service
Scheduled by the DIMS control software
Data delivery and access service
Validation service


AC SAF service architecture (subsystem 3)
ECMWF
Subsystem 4 at KNMI, The Netherlands
ATO
Product generation services in the processing and validation centre at DMI
Near real-time products:
NRT UV index (NUV/CLEAR, NUV/CLOUD)
Validation of NUV
Data distribution (DMI web page, Google Earth & FTP)
Output services at DMI
USERS
Other AC SAF subsystems
Product generation service
Input data service
Scheduled by the NRTUV processor
Data delivery and access service
Validation service


AC SAF service architecture (subsystem 4)
EPS data via EUMETCast
Satellite data pre-processing
Input services located at KNMI
ECMWF
Subsystem 1 at FMI, Finland
Subsystem 2 at DLR, Germany
Subsystem 3 at DMI, Denmark
NTO
ATO
Product generation services in the processing and validation centre at KNMI
Near real-time products:
NRT ozone profiles (NHP)
NRT aerosols (NAR, NAP)
Assimilated total ozone (ATO)
(ATO is internal product)
Offline products:
Offline ozone profiles (OHP)
Aerosols (ARS, ARP)
Validation of ozone distribution (VOD)
OHP
ARS
ARP
Offline data distribution
EUMETCast, WMO GTS
Internet
Output services at KNMI
USERS
Other AC SAF subsystems
Product generation service
Input data service
Scheduled by OPERA processor
Data delivery and access service
Validation service