EUMETSAT

Polar Multi-Sensor Aerosol Product: Product Format Specification

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Document Change Record

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v1	01/11/2012		First Issue
v1	06/02/2013		Added comment on use of SPHR parameters
v1A	11/07/2013		Added MDR co-location info
v1B	12/01/2014		Updated signature table
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v2	23/07/2015		For PMAp version 2 (PMAp over ocean and land)
v2A	01/12/2015		PMAp2: Some corrections for retrieval flags and aerosol classes.
v2B	21/04/2021		Update for the release of PMAp v2.2.4

Table of Contents

1   INTRODUCTION

1.1   Purpose and Scope

This document is the Global Ozone Monitoring Experiment-2 (GOME-2) Level 2 Polar Multi-Sensor Aerosol Product Format Specification.

The generic product format specification used by this document is defined in the EPS Generic Product Format Specification [**Error! Reference source not found.**]. The conventions used by this document are defined in the EPS Product Conventions Document [**Error! Reference source not found.**].

The structure and content of the products will be developed in the course of further EPS system design and nothing in this document (including the Annex) shall be taken as restricting this development of the product structures, the product or field sizes, or the time during processing at which content will be inserted into the structure of the product.

1.2   Structure of the Document

The document is organised in the following sections, including the introduction:

- Section 0 describes the scope of the document

- Section 2 details the product formats for GOME-2 Level 2 Product and GOME Co-location information product

- Section 3 details the occurrence rates of the various records within the GOME-2 Level 2 Product

- Section 4 lists the enumerated variables used within the level and their possible values and associated meanings

- Section 5 provides a history of version numbers for the records defined within the document

- Appendix A links to detailed tables describing the record formats

1.3   Applicable Documents

AD 1	EPS Generic Product Format Specification	EPS/GGS/SPE/96167
AD 2	EPS Ground Segment GOME-2 Polar Multi-Sensor Aerosol Product Generation Specification	EUM/TSS/SPE/13/728558
AD 3	EPS Product Conventions Document	EPS/SYS/TEN/990007

1.4   Reference Documents

RD 1	GOME-2 Level 1 Product Generation Specification	EPS.SYS.SPE.990011

2 STRUCTURE OF GOME-2 LEVEL 2 POLAR MULTI-SENSOR AEROSOL PRODUCT

2.1 Format

The format of GOME-2 Level 2 Polar Multi-Sensor Aerosol product is based on the generic product format as described in [AD 1]. This document details the instrument-specific and level-specific additions required for GOME-2 Level 2 product.

An array of Variable Scale Factor Integers are stored as an array of the compound data type, and not as an array of scale factors followed by an array of the integer type. This second solution is suggested but not strictly required in [AD 1]).

2.2 Generic Record Header Fields

All generic record header fields of the instrument-specific or level-specific records defined in this document shall have an INSTRUMENT_GROUP value of GOME as described in [AD 1].
The RECORD_SUBCLASS shall have the value **1** if there is only one record defined for the record class. For record classes with more than one subclass, RECORD_SUBCLASS is defined in the tables below.
The RECORD_START_TIME for a Measurement Data Record shall be the UTC time corresponding to the first scan position in this record, as specified in [RD 1]. See the description in Section 5.2.5.4.2 Module: Determine UTC Time Grid). The RECORD_END_TIME for a Measurement Data Record shall be the UTC: time corresponding to the last scan position in this record, as specified in [RD 1]. See the description in Section 5.2.5.4.2 Module: Determine UTC Time Grid).

2.3 GOME-2 Level 2 Product

2.3.1 Secondary Product Header Record

The Level 2 SPHR is detailed in the Annex (Appendix A) to this document. All numbers in SPHR fields shall be treated as additive for product reconstruction purposes.

2.3.2 Global External Auxiliary Data Record

The auxiliary datasets to be referenced by a GEADR shall include those auxiliary datasets used by the GOME-2 PGF but not written into the GOME-2 Level 2 product. This comprises for Level 1b to 2 processing the initialisation datasets, aerosol models, look-up tables, datasets and surface albedo and elevation datasets as detailed in [**Error! Reference source not found.**]. The referencing format is to be defined by the ASPI (Advanced SCSI Programming Interface).

There are three subclasses of GEADR for the GOME-2 Level 2 Product.

2.3.2.1   Record Subclasses

Subclass	Description	Subclass ID
GEADR-AIN	Initialisation parameters (AIN file)	1
GEADR-LUT	Reflectance and stokes fractions data (look-up tables) for 29 ocean aerosol types and 7 land aerosol types plus land cover information (land/sea mask) (LUT file)	2
GEADR-SRF	Land surface properties data: surface albedo, surface elevation (SRF file)	3

Table 1: Level 2 GEADR Subclasses

2.3.3   Variable External Auxiliary Data Record

There are no VEADRs defined for the GOME-2 Level 2 Product.

2.3.4   Global Internal Auxiliary Data Record

There are three subclasses of GIADR for the GOME-2 Level 2 Product. These are detailed in the Annex (Appendix A) to this document.

2.3.4.1   Record Subclasses

Subclass	Description	Subclass ID
GIADR-GOME2	Information on GOME-2 channels (taken from Level 1b product): definition of wavelength (and corresponding pixel) ranges for valid data; band definition parameters; PMD band definition parameters	1
GIADR-AVHRR	Coefficients and constants for ch.4 and 5 radiance to brightness temperature conversion/correction	2
GIADR-IASI	Information on IASI input. In this first version, it contains only a flag indicating whether IASI input is used or not; the GIADR will be extended in the next PPF developments.	3

Table 2: Level 2 GIADR Subclasses

2.3.5   Variable Internal Auxiliary Data Record

There is one subclass of VIADR for the GOME-2 Level 2 Product. This is detailed in Appendix A of this document.

2.3.5.1   Record Subclasses

Subclass	Description	Subclass ID
VIADR-ECMWF	Information on ECMWF forecast model	1

Table 3: Level 2 VIADR Subclasses

2.3.6   Measurement Data Record

There are two subclasses of MDR for the GOME-2 Level 2 Product. They are detailed in the Annex to this document.

2.3.6.1   Record Subclasses

Subclass	Description	Subclass ID
MDR-2-AOP	Aerosol Optical Properties (AOP) retrievals; produced when the GOME observation mode is *obsNadirScan* and the PMD transfer mode is *bandMixed*	1
MDR-2-Other	Contains only the enumerated variable GOME_OBS_MODE coming from L1b when GOME observation mode value is not *obsNadirScan* or the PMD transfer mode is not *bandMixed,* i.e. processing is not performed	9

Table 4: GOME-2 Level 2 Product MDR Subclasses

Aerosol Optical Properties (AOP) and Cloud Optical Properties (COP) retrievals are performed for each GOME-2 PMD pixel and for forward scanning only. The PMD integration time is constant at 23.45 milliseconds over the full dayside orbit and consequently the number of PMD pixel is constant per GOME scan line (MDR). Hence, the number of AOP and COP retrievals per scan line is also constant (192 retrievals) and the size of MDR-2-AOP is, therefore, fixed.

2.4   GOME-2 Co-location Information Product

2.4.1   Secondary Product Header Record

There is no SPHR defined for the GOME-2 Co-location Information product.

2.4.2   Global and Variable External Auxiliary Data Record

There are no GEADRs or VEADRs defined for the GOME-2 Co-location Information product.

2.4.3   Global and Variable Internal Auxiliary Data Records

There are no GIADRs or VIADRs defined for the GOME-2 Co-location Information product.

2.4.4   Measurement Data Record

There are two subclasses of MDR for the Co-location Information product. They are detailed in the Annex to this document.

2.4.4.1   Record Subclasses

Subclass	Description	Subclass ID
MDR-COLINFO	Co-location information; produced when the GOME observation mode is *obsNadirScan* and the PMD transfer mode is *bandMixed*	2
MDR-CI-Other	Contains only the enumerated variable GOME_OBS_MODE coming from L1b when GOME observation mode value is not *obsNadirScan* or the PMD transfer mode is not *bandMixed,* i.e. processing is not performed	10

Table 5: Co-location Information product MDR Subclasses

AVHRR/IASI co-location information is stored for each GOME-2 PMD pixel for which AOP and COP retrievals have been performed. See Section 2.3.6.1. Hence, the size of MDR-2-COLINFO is also fixed.

3   OCCURRENCE INFORMATION

An example timeline illustrating the variability of the occurrence rate and size of the records identified is given in [AD 2]. Occurrence information for the GOME-2 L2 product and co-location information is in Table 6 and Table 7 below.

Note: The tables do NOT define the order of records within the product. The record order is defined by the EPS Generic Product Format Specification [AD 1].

3.1   GOME-2 Level 2 Product

Record	Occurrence
MPHR	Once per product
SPHR	Once per product
GEADR-AIN	Once per product
GEADR-LUT	Once per product
GEADR-SRF	Once per product
GIADR-GOME2	Maximum twice per product
GIADR-AVHRR	Maximum twice per product
GIADR-IASI	Maximum twice per product
VIADR-ECMWF	Variable occurrence rate
MDR-2-AOP	Variable occurrence rate
MDR-2-Other	Variable occurrence rate

Table 6: Occurrence Information GOME-2 Level Product

3.2   Co-location Information Product

Record	Occurrence
MPHR	Once per product
MDR-COLINFO	Variable occurrence rate
MDR-CI-Other	Variable occurrence rate

Table 7: Co-location Information for Product

4   ENUMERATION VARIABLES

The following tables list the enumeration variables used in the GOME-2 Level 2 product. All variables listed here have their possible values and associated meanings given. A reference to equivalent variable names used in [AD 2] is also provided.

PFS Variable Name	*Description Equivalent Variable Name in [AD2]*	*Value*	*Value Name in [AD2]*
GOME_OBS_MODE	GOME Observation mode	0	obsNadirScan
		1	obsNthPoleScan
		2	obsSthPoleScan
		3	obsOtherScan
		4	obsNadirStatic
		5	obsOtherStatic
		6	obsDark
		7	obsLED
		8	obsWLS
		9	obsSLS
		10	obsSLSDiff
		11	obsSun
		12	obsMoon
		13	obsIdle
		14	obsTest
		15	obsDump
		16	obsInvalid
RETRIEVAL_ALGORITHM	Flag indicating the algorithm type used for Aerosol properties retrieval	0	OCEANCLEARSKYFULL
		1	OCEANCLOUDYLIMITED
		2	OCEANALTERNATE
		3	OCEANALTERNATESTOKES
		4	LANDCLOUDFREEDARK
		5	LANDCLOUDFREESTD
		6	LANDCLOUDFREEBRIGHT
		7	LANDCLOUDYDARK
		8	LANDCLOUDYSTD
		9	LANDCLOUDFREEBRIGHT
		15	NOAODRETRIEVAL
AEROSOL_CLASS	Flag indicating the retrieved aerosol classification type	0	FINE
		1	COARSE
		2	THICK BIOMASS
		3	DESERT DUST
		4	VOLCANICASH/THICK DUST
		5	VOLCANIC ASH SO2
		10	AEROSOL CONTAMINATED CLOUD

PFS Variable Name	Description Equivalent Variable Name in [AD2]	Value	Value Name in [AD2]
		11	ASH CONTAMINATED CLOUD
		15	NO CLASSIFICATION

Table 8: Enumerated variables used in the GOME-2 PFS.

5   BITSTRING VARIABLES

The following table lists the bitstring variables used in the GOME-2 Level 2 product. For all variables listed here, possible values and associated meanings are given. A reference to equivalent variable names used in [AD 2] is also provided.

Note: Variables of type *bitstring* are represented by an integer. The integer has to be converted to the binary system to receive a set of quality flags.

Example 1: *INPUT_INSTR = 3 = 011 GOME and AVHRR used*

Example 2: *QUALITY_FLAGS_AOD* = 50 = 0110010**, quality flags OBSGEO, IMPACTWINDSPEED and BADFIT raised.

PFS Variable Name	*Description and Equivalent Variable Name in [AD2]*	*Value*	*Name for Value in [AD2]*
INPUT_INSTR	Input instrument flags indicating if an instrument is used for the retrieval	0	GOME
		1	AVHRR/3
		2	IASI
RETRIEVAL_FLAGS_AOP	Flag indicating reduced accuracy of the AOD with respect to a specific known issue	0	BRIGHTCLOUD
		1	OBSGEO
		2	MODELLIMITED
		3	AODLIMITS
		4	IMPACTWINDSPEED
		5	BADFIT
		6	THICKEVENT
RETRIEVAL_FLAGS_COP	Flag indicating reduced accuracy of the COD with respect to a specific known issue	0	OBSGEOCLOUD
		1	ALBEDOAPRIORI
		2	CLEARIMPACT
		3	SUNGLINTCOD

Table 9: GOME-2 Level 2 product, bitstring variables.

6   RECORD FORMAT VERSION CONTROL

This section provides version numbers for the records defined within this document.

Record Subclass	Format Version Number	Issue Defined
SPHR	1	1.0
GEADR-APInit	1	1.0
GEADR-LUT	1	1.0
GEADR-Surface	1	1.0
GIADR-GOME2	1	1.0
GIADR-AVHRR	1	1.0
GIADR-IASI	1	1.0
VIADR-ECMWF	1	1.0
MDR-2-AOP	1	1.0
MDR-2-Other	1	1.0
MDR-COLINFO	1	1.0
MDR-CI-Other	1	1.0

Table 10: Record Format Version Numbers

APPENDIX A DETAILED SPECIFICATION OF GOME-2 LEVEL 2 DATA RECORDS

In the following Annex, detailed format specifications for all the Variable Internal and Measurement Data Records in GOME-2 Level 2 product are included, as listed in the previous section.

The Annex is accessible under Document Reference: EUM/OPS-EPS/DOC/12/0639 or electronically via the following EUMETSAT DM Tool link:

[DOCSLIB-#436226-GOME-2 Polar Multi-Sensor Aerosol Product Format Specification - Annex](#)

This annex is attached to this document as a PDF when on the web page. Page forward to see this GOME-2 Polar Multi-Sensor Aerosol Product Format Specification - Annex.