

Polar Multi-Sensor Aerosol Product: Product Format Specification

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EUMETSAT
Eumetsat-Allee1, D-64295 Darmstadt, Germany
Tel: +49 6151 807-7
Fax: +49 6151 807 555
<http://www.eumetsat.int>

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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 [AD 1]. The conventions used by this document are defined in the EPS Product Conventions Document [AD 3].

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
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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 [RD 1]. 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

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
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

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
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

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
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

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

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

<i>Record</i>	<i>Occurrence</i>
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

<i>Record</i>	<i>Occurrence</i>
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.

<i>PFS Variable Name</i>	<i>Description Equivalent Variable Name in [AD2]</i>	<i>Value</i>	<i>Value Name in [AD2]</i>
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	ClearSkyFull
		1	CloudyLimited
		2	Alternate
		3	AlternateStokes
		15	NoAodRetrieval
AEROSOL_CLASS	Flag indicating the retrieved aerosol classification type	0	Fine mode / no dust
		1	Coarse mode
		2	VolcanicAsh / thick dust
		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.*

<i>PFS Variable Name</i>	<i>Description and Equivalent Variable Name in [AD2]</i>	<i>Value</i>	<i>Name for Value in [AD2]</i>
INPUT_INSTR	Input instrument flags indicating if an instrument is used for the retrieval	0	GOME
		1	AVHRR/3
		2	IASI
QUALITY_FLAGS_AOP	Flag indicating reduced accuracy of the AOD with respect to a specific known issue	0	BRIGHTCLOUD
		1	OBSGEO
		2	AODLIMITS
		3	LARGECLEARSKY
		4	IMPACTWINDSPEED
		5	BADFIT
		6	SUNGLINTAOD
QUALITY_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.

<i>Record Subclass</i>	<i>Format Version Number</i>	<i>Issue Defined</i>
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.

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Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
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Version 1 - 01.11.2012	[G. Polij] First version based on GOME-2 Level 1b Product Format Specification
Version 1A - 03.04.2013	[G. Polij] Changes in MDR-AOP for cloud optical properties retrieval
Version 1B - 28.05.2013	[G. Polij] Added description of co-location file

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Worksheet: SPHR

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	EQUIVALENT TYPE	ENCODED CHARS	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header (this is binary!)	NA		1	1	1	REC_HEAD	20	20	0
Scans Summary										
N_SCANS	Number of scans in the product	0		1	1	1	U-INTEGER	5	38	20
N_VALID_WITH_MISS_DP	Number of valid scans with missing data packets	0		1	1	1	U-INTEGER	5	38	58
N_MISS_DP	Number of missing data packets in valid scans	0		1	1	1	U-INTEGER	5	38	96
N_MISSING_SCANS	Number of missing scans	0		1	1	1	U-INTEGER	5	38	134
N_NADIR_SCAN	Number of scans in Nadir scanning observation mode	0		1	1	1	U-INTEGER	5	38	172
N_NTH_POLE_SCAN	Number of scans in North pole scanning observation mode	0		1	1	1	U-INTEGER	5	38	210
N_STH_POLE_SCAN	Number of scans in South pole scanning observation mode	0		1	1	1	U-INTEGER	5	38	248
N_NADIR_STATIC	Number of scans in Nadir static observation mode	0		1	1	1	U-INTEGER	5	38	286
N_OTHER_SCANSTATIC	Number of scans in Other scanning or Other Static observation mode (i.e. sum of N_OTHER_SCAN and N_OTHER_STATIC from level 1b SPHR)	0		1	1	1	U-INTEGER	5	38	324
N_MIN_INTENSITY_7	Number of scans where the minimum mean uncalibrated radiance is below a specified threshold, band PMD p	0		1	1	1	U-INTEGER	5	38	362
N_MIN_INTENSITY_8	Number of scans where the minimum mean uncalibrated radiance is below a specified threshold, band PMD s	0		1	1	1	U-INTEGER	5	38	400
N_SATURATED_7	Number of scans with saturated pixels, band PMD p	0		1	1	1	U-INTEGER	5	38	438
N_SATURATED_8	Number of scans with saturated pixels, band PMD s	0		1	1	1	U-INTEGER	5	38	476
N_HOT_7	Number of scans with hot pixels, band PMD p	0		1	1	1	U-INTEGER	5	38	514
N_HOT_8	Number of scans with hot pixels, band PMD s	0		1	1	1	U-INTEGER	5	38	552
N_SAA	Number of scans in the SAA	0		1	1	1	U-INTEGER	5	38	590
N_SUNGLINT	Number of scans with sunglint danger	0		1	1	1	U-INTEGER	5	38	628
N_RAINBOW	Number of scans with rainbow danger	0		1	1	1	U-INTEGER	5	38	666
N_MODE_GEOLOCATION	Number of scans with possible mismatch between observation mode and geolocation	0		1	1	1	U-INTEGER	5	38	704
N_MISS_STOKES_1	Number of scans with missing Stokes fractions, PMD band 1	0		1	1	1	U-INTEGER	5	38	742
N_MISS_STOKES_2	Number of scans with missing Stokes fractions, PMD band 2	0		1	1	1	U-INTEGER	5	38	780
N_MISS_STOKES_3	Number of scans with missing Stokes fractions, PMD band 3	0		1	1	1	U-INTEGER	5	38	818
N_MISS_STOKES_4	Number of scans with missing Stokes fractions, PMD band 4	0		1	1	1	U-INTEGER	5	38	856
N_MISS_STOKES_5	Number of scans with missing Stokes fractions, PMD band 5	0		1	1	1	U-INTEGER	5	38	894
N_MISS_STOKES_6	Number of scans with missing Stokes fractions, PMD band 6	0		1	1	1	U-INTEGER	5	38	932
N_MISS_STOKES_7	Number of scans with missing Stokes fractions, PMD band 7	0		1	1	1	U-INTEGER	5	38	970
N_MISS_STOKES_8	Number of scans with missing Stokes fractions, PMD band 8	0		1	1	1	U-INTEGER	5	38	1008
N_MISS_STOKES_9	Number of scans with missing Stokes fractions, PMD band 9	0		1	1	1	U-INTEGER	5	38	1046
N_MISS_STOKES_10	Number of scans with missing Stokes fractions, PMD band 10	0		1	1	1	U-INTEGER	5	38	1084

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N_MISS_STOKES_11	Number of scans with missing Stokes fractions, PMD band 11	0		1	1	1	U-INTEGER	5	38	1122
N_MISS_STOKES_12	Number of scans with missing Stokes fractions, PMD band 12	0		1	1	1	U-INTEGER	5	38	1160
N_MISS_STOKES_13	Number of scans with missing Stokes fractions, PMD band 13	0		1	1	1	U-INTEGER	5	38	1198
N_MISS_STOKES_14	Number of scans with missing Stokes fractions, PMD band 14	0		1	1	1	U-INTEGER	5	38	1236
N_MISS_STOKES_15	Number of scans with missing Stokes fractions, PMD band 15	0		1	1	1	U-INTEGER	5	38	1274
N_BAD_STOKES_1	Number of scans with bad Stokes fractions, PMD band 1	0		1	1	1	U-INTEGER	5	38	1312
N_BAD_STOKES_2	Number of scans with bad Stokes fractions, PMD band 2	0		1	1	1	U-INTEGER	5	38	1350
N_BAD_STOKES_3	Number of scans with bad Stokes fractions, PMD band 3	0		1	1	1	U-INTEGER	5	38	1388
N_BAD_STOKES_4	Number of scans with bad Stokes fractions, PMD band 4	0		1	1	1	U-INTEGER	5	38	1426
N_BAD_STOKES_5	Number of scans with bad Stokes fractions, PMD band 5	0		1	1	1	U-INTEGER	5	38	1464
N_BAD_STOKES_6	Number of scans with bad Stokes fractions, PMD band 6	0		1	1	1	U-INTEGER	5	38	1502
N_BAD_STOKES_7	Number of scans with bad Stokes fractions, PMD band 7	0		1	1	1	U-INTEGER	5	38	1540
N_BAD_STOKES_8	Number of scans with bad Stokes fractions, PMD band 8	0		1	1	1	U-INTEGER	5	38	1578
N_BAD_STOKES_9	Number of scans with bad Stokes fractions, PMD band 9	0		1	1	1	U-INTEGER	5	38	1616
N_BAD_STOKES_10	Number of scans with bad Stokes fractions, PMD band 10	0		1	1	1	U-INTEGER	5	38	1654
N_BAD_STOKES_11	Number of scans with bad Stokes fractions, PMD band 11	0		1	1	1	U-INTEGER	5	38	1692
N_BAD_STOKES_12	Number of scans with bad Stokes fractions, PMD band 12	0		1	1	1	U-INTEGER	5	38	1730
N_BAD_STOKES_13	Number of scans with bad Stokes fractions, PMD band 13	0		1	1	1	U-INTEGER	5	38	1768
N_BAD_STOKES_14	Number of scans with bad Stokes fractions, PMD band 14	0		1	1	1	U-INTEGER	5	38	1806
N_BAD_STOKES_15	Number of scans with bad Stokes fractions, PMD band 15	0		1	1	1	U-INTEGER	5	38	1844
N_AOP_QFLAG_1	Number of scans containing at least one PMD pixel with AOP quality flag 1 raised	0		1	1	1	U-INTEGER	5	38	1882
N_AOP_QFLAG_2	Number of scans containing at least one PMD pixel with AOP quality flag 2 raised	0		1	1	1	U-INTEGER	5	38	1920
N_AOP_QFLAG_3	Number of scans containing at least one PMD pixel with AOP quality flag 3 raised	0		1	1	1	U-INTEGER	5	38	1958
N_AOP_QFLAG_4	Number of scans containing at least one PMD pixel with AOP quality flag 4 raised	0		1	1	1	U-INTEGER	5	38	1996
N_AOP_QFLAG_5	Number of scans containing at least one PMD pixel with AOP quality flag 5 raised	0		1	1	1	U-INTEGER	5	38	2034
N_AOP_QFLAG_6	Number of scans containing at least one PMD pixel with AOP quality flag 6 raised	0		1	1	1	U-INTEGER	5	38	2072
N_AOP_QFLAG_7	Number of scans containing at least one PMD pixel with AOP quality flag 7 raised	0		1	1	1	U-INTEGER	5	38	2110
N_AOP_QFLAG_8	Number of scans containing at least one PMD pixel with AOP quality flag 8 raised	0		1	1	1	U-INTEGER	5	38	2148
N_AOP_QFLAG_9	Number of scans containing at least one PMD pixel with AOP quality flag 9 raised	0		1	1	1	U-INTEGER	5	38	2186

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Worksheet: SPHR

N_AOP_QFLAG_10	Number of scans containing at least one PMD pixel with AOP quality flag 10 raised	0		1	1	1	U-INTEGER	5	38	2224
N_AOP_QFLAG_11	Number of scans containing at least one PMD pixel with AOP quality flag 11 raised	0		1	1	1	U-INTEGER	5	38	2262
N_AOP_QFLAG_12	Number of scans containing at least one PMD pixel with AOP quality flag 12 raised	0		1	1	1	U-INTEGER	5	38	2300
N_AOP_QFLAG_13	Number of scans containing at least one PMD pixel with AOP quality flag 13 raised	0		1	1	1	U-INTEGER	5	38	2338
N_AOP_QFLAG_14	Number of scans containing at least one PMD pixel with AOP quality flag 14 raised	0		1	1	1	U-INTEGER	5	38	2376
N_AOP_QFLAG_15	Number of scans containing at least one PMD pixel with AOP quality flag 15 raised	0		1	1	1	U-INTEGER	5	38	2414
N_AOP_QFLAG_16	Number of scans containing at least one PMD pixel with AOP quality flag 16 raised	0		1	1	1	U-INTEGER	5	38	2452
N_COP_QFLAG_1	Number of scans containing at least one PMD pixel with COP quality flag 1 raised	0		1	1	1	U-INTEGER	5	38	2490
N_COP_QFLAG_2	Number of scans containing at least one PMD pixel with COP quality flag 2 raised	0		1	1	1	U-INTEGER	5	38	2528
N_COP_QFLAG_3	Number of scans containing at least one PMD pixel with COP quality flag 3 raised	0		1	1	1	U-INTEGER	5	38	2566
N_COP_QFLAG_4	Number of scans containing at least one PMD pixel with COP quality flag 4 raised	0		1	1	1	U-INTEGER	5	38	2604
N_COP_QFLAG_5	Number of scans containing at least one PMD pixel with COP quality flag 5 raised	0		1	1	1	U-INTEGER	5	38	2642
N_COP_QFLAG_6	Number of scans containing at least one PMD pixel with COP quality flag 6 raised	0		1	1	1	U-INTEGER	5	38	2680
N_COP_QFLAG_7	Number of scans containing at least one PMD pixel with COP quality flag 7 raised	0		1	1	1	U-INTEGER	5	38	2718
N_COP_QFLAG_8	Number of scans containing at least one PMD pixel with COP quality flag 8 raised	0		1	1	1	U-INTEGER	5	38	2756
N_RET_ALGORITHM_1	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 1	0		1	1	1	U-INTEGER	5	38	2794
N_RET_ALGORITHM_2	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 2	0		1	1	1	U-INTEGER	5	38	2832
N_RET_ALGORITHM_3	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 3	0		1	1	1	U-INTEGER	5	38	2870
N_RET_ALGORITHM_4	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 4	0		1	1	1	U-INTEGER	5	38	2908
N_RET_ALGORITHM_5	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 5	0		1	1	1	U-INTEGER	5	38	2946
N_RET_ALGORITHM_6	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 6	0		1	1	1	U-INTEGER	5	38	2984
N_RET_ALGORITHM_7	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 7	0		1	1	1	U-INTEGER	5	38	3022
N_RET_ALGORITHM_8	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 8	0		1	1	1	U-INTEGER	5	38	3060
N_RET_ALGORITHM_9	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 9	0		1	1	1	U-INTEGER	5	38	3098
N_RET_ALGORITHM_10	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 10	0		1	1	1	U-INTEGER	5	38	3136
N_RET_ALGORITHM_11	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 11	0		1	1	1	U-INTEGER	5	38	3174

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Worksheet: SPHR

N_RET_ALGORITHM_12	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 12	0		1	1	1	<i>U-INTEGER</i>	5	38	3212
N_RET_ALGORITHM_13	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 13	0		1	1	1	<i>U-INTEGER</i>	5	38	3250
N_RET_ALGORITHM_14	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 14	0		1	1	1	<i>U-INTEGER</i>	5	38	3288
N_RET_ALGORITHM_15	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 15	0		1	1	1	<i>U-INTEGER</i>	5	38	3326
N_RET_ALGORITHM_16	Number of scans containing at least one PMD pixel processed with AOD retrieval algorithm 16	0		1	1	1	<i>U-INTEGER</i>	5	38	3364
N_LAND_PIXELS	Number of scans containing at least one PMD pixel classified as land	0		1	1	1	<i>U-INTEGER</i>	5	38	3402
N_AVHRR	Number of scans containing at least one PMD pixel processed with auxiliary AVHRR input data	0		1	1	1	<i>U-INTEGER</i>	5	38	3440
N_IASI	Number of scans containing at least one PMD pixel processed with auxiliary IASI input data	0		1	1	1	<i>U-INTEGER</i>	5	38	3478
N_ASH	Number of scans containing at least one PMD pixel for which ash has been detected	0		1	1	1	<i>U-INTEGER</i>	5	38	3516
N_AOD	Number of scans containing at least one PMD pixel for which a successful AOD retrieval has been performed	0		1	1	1	<i>U-INTEGER</i>	5	38	3554
N_COD	Number of scans containing at least one PMD pixel for which cloud optical depth is retrieved	0		1	1	1	<i>U-INTEGER</i>	5	38	3592
Size of the Record										3630
SPHR subclass version: 1										

Doc Ref: EUM/OPS-EPS/DOC/12/0639
Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
Worksheet: GIADR-GOME2

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	NA		1	1	1	REC_HEAD	20	20	0
Channels Information (from GOME L1b GIADR-Channels)										
CHANNEL_NUMBER	Channel number	NA		6	1	1	enumerated	1	6	20
START_VALID_WAVELENGTHS	Start wavelength of the valid data in the specified channel	6	nm	6	1	1	integer4	4	24	26
END_VALID_WAVELENGTHS	End wavelength of the valid data in the specified channel	6	nm	6	1	1	integer4	4	24	50
START_VALID_PIXELS	Approximate start pixel of the valid data in the specified channel	0		6	1	1	u-integer2	2	12	74
END_VALID_PIXELS	Approximate end pixel of the valid data in the specified channel	0		6	1	1	u-integer2	2	12	86
CHANNEL_READOUT_SEQ	Sequence of detector pixel read-out. 0: from short to long wavelength; 1: from long to short wavelength	NA		1	1	1	bitst(8)	1	1	98
Band Separation Information (from GOME L1b GIADR-1b-Bands)										
BAND_CHANNEL_NUMBER	Channel number per band	0		10	1	1	enumerated	1	10	99
BAND_NUMBER	Band number	0		10	1	1	enumerated	1	10	109
START_PIXEL	Start pixel of the band in the specified channel	0		10	1	1	u-integer2	2	20	119
NUMBER_OF_PIXELS	Number of pixels in the specified band	0		10	1	1	u-integer2	2	20	139
START_LAMBDA	Start wavelength	6	nm	10	1	1	integer4	4	40	159
END_LAMBDA	End wavelength	6	nm	10	1	1	integer4	4	40	199
PMD Band Definition Information (from GOME L1b GIADR-1b-PMDBandDef)										
START_PIXEL_PMD	PMD band start pixel, 15 bands, PMD-p first	0		15	2	1	u-integer2	2	60	239
LENGTH_PIXEL_PMD	PMD band length in pixels, 15 bands, PMD-p first	0		15	2	1	u-integer2	2	60	299
WAVELENGTH_PMD	PMD band wavelength (nm), 15 bands, PMD-p first	6	nm	15	2	1	integer4	4	120	359
Size of the Record										479
GIADR-GOME2 record subclass version: 1										

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Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
Worksheet: GIADR-AVHRR

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	NA		1	1	1	REC_HEAD	20	20	0
Calibration coefficients for IR bands 4 and 5										
CH4_CENTRAL_WAVENUMBER	AVHRR ch.4 central wavenumber (Gamma) for radiance to brightness temperature conversion	3	cm-1	1	1	1	integer4	4	4	20
CH4_CONSTANT1	AVHRR ch.4 offset correction coefficient 1 (A) for brightness temperature linear correction	5	K	1	1	1	integer4	4	4	24
CH4_CONSTANT2_SLOPE	AVHRR ch.4 slope correction coefficient 2 (B) for brightness temperature linear correction	6	K/K	1	1	1	integer4	4	4	28
CH5_CENTRAL_WAVENUMBER	AVHRR ch.5 central wavenumber (Gamma) for radiance to brightness temperature conversion	3	cm-1	1	1	1	integer4	4	4	32
CH5_CONSTANT1	AVHRR ch.5 offset correction coefficient 1 (A) for brightness temperature linear correction	5	K	1	1	1	integer4	4	4	36
CH5_CONSTANT2_SLOPE	AVHRR ch.5 slope correction coefficient 2 (B) for brightness temperature linear correction	6	K/K	1	1	1	integer4	4	4	40
CONSTANT_C1	Constant C1 for radiance to brightness temperature conversion (C1=2hc ² , h: Plank's constant, c: speed of light)	11	mW/(m ² sr cm-4)	1	1	1	integer4	4	4	44
CONSTANT_C2	Constant C2 for radiance to brightness temperature conversion (C2=hc/k, h: Plank's constant, k: Boltzmann's constant)	6	K/cm-1	1	1	1	integer4	4	4	48
Size of the Record										52
GIADR-AVHRR record subclass version: 1										

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 Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
 Worksheet: GIADR-IASI

RECORD_HEADER	Generic Record Header	NA		1	1	1	REC_HEAD	20	20	0
IASI Information										
IASI_FLAG	IASI activation flag (0: IASI input is not used; 1: otherwise)			1	1	1	bitst(8)	1	1	20
Size of the Record										21
GIADR-IASI record subclass version: 1										

Doc Ref: EUM/OPS-EPS/DOC/12/0639
Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
Worksheet: MDR-AOP

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	NA		1	1	1	REC_HEAD	20	20	0
GENERIC QUALITY INDICATORS										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal (flag is true) due to an instrument degradation (flag is taken from input GOME L1B product)	NA		1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation (flag depends both from input GOME L1B product and L2 processing)	NA		1	1	1	boolean	1	1	21
Generic Geometrical Properties										
SCANNER_ANGLE	GOME-2 scanner viewing angle corresponding to PMD pixel	6	deg	192	1	1	integer4	4	768	22
SOLAR_ZENITH	Solar zenith angle at height h0 corresponding to PMD pixel centre, point F (topocentric CS)	6	deg	192	1	1	integer4	4	768	790
SOLAR_AZIMUTH	Solar azimuth angle at height h0 corresponding to PMD pixel centre, point F (topocentric CS)	6	deg	192	1	1	integer4	4	768	1558
SAT_ZENITH	Satellite zenith angle at height h0 corresponding to PMD pixel centre, point F (topocentric CS)	6	deg	192	1	1	integer4	4	768	2326
SAT_AZIMUTH	Satellite azimuth angle at height h0 corresponding to PMD pixel centre, point F (topocentric CS)	6	deg	192	1	1	integer4	4	768	3094
REL_AZIMUTH	Relative azimuth angle corresponding to PMD pixel centre, point F	6	deg	192	1	1	integer4	4	768	3862
SCATT_ANGLE	Scattering angle corresponding to PMD pixel centre, point F	6	deg	192	1	1	integer4	4	768	4630
INPUT_INSTR	Input instruments flag (bit 0: for GOME-2, bit 1: for AVHRR, bit 2: for IASI)			192	1	1	bitst(8)	1	192	5398
Aerosol Optical Properties										
CORNER_AOP	Geodetic latitude and geocentric longitude at ground of PMD pixel, points ABCD (earth-fixed CS), corrected according to the time shift of the reference PMD band used for aerosol properties retrieval	NA		4	192	1	COORD	8	6144	5590
CENTRE_AOP	Geodetic latitude and geocentric longitude at ground of PMD pixel centre, point F (earth-fixed CS), corrected according to the time shift of the reference PMD band used for aerosol properties retrieval	NA		192	1	1	COORD	8	1536	11734
READOUT_STARTTIME_AOP	UTC time associated with the read-out of the detector pixel of the reference PMD band used for aerosol properties retrieval	NA		192	1	1	short cds time	6	1152	13270
RETRIEVAL_ALGORITHM	Flag indicating the retrieval algorithm used (specifies also whether the retrieval is on Land or Sea)	NA		192	1	1	enumerated	1	192	14422
AOD	Aerosol Optical Depth at 550nm (AOD)	6	-	192	1	1	integer4	4	768	14614
ERR_AOD	Error on Aerosol Optical Depth (TBD)	6	-	192	1	1	integer4	4	768	15382
AEROSOL_CLASS	Flag indicating aerosol classification/type	NA		192	1	1	enumerated	1	192	16150
AVHRR_CLOUDFRAC_AOP	AVHRR cloud fraction co-located with PMD pixel (corners corrected according to the time shift of the reference PMD band used for aerosol properties retrieval)	6	-	192	1	1	integer4	4	768	16342

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Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
Worksheet: MDR-AOP

AVHRR_AVT4T5DIFF	AVHRR T4-T5 averaged difference co-located with PMD pixel (corners corrected according to the time shift of the reference PMD band used for aerosol properties retrieval)	6	K	192	1	1	integer4	4	768	17110
CHLOROPHYLL_LOAD	Chlorophyll load	6	mg/m3	192	1	1	integer4	4	768	17878
WIND_SPEED	10 meter wind speed, taken from ECMWF forecast databases	6	m/s	192	1	1	integer4	4	768	18646
ASH_TEMP	Temperature of ash plumes	1	K	192	1	1	u-integer2	2	384	19414
LAND_FRACT_AOP	Land fraction co-located with PMD pixel (corners corrected according to the time shift of the reference PMD band used for aerosol properties retrieval)	6	-	192	1	1	integer4	4	768	19798
RAD_INHOMOGENEITY_AOP	Radiance inhomogeneity (land processing) (corners corrected according to the time shift of the reference PMD band used for aerosol properties retrieval)	6	-	192	1	1	integer4	4	768	20566
QUALITY_FLAGS_AOP	Product quality flags related to aerosol optical properties retrieval	NA		192	1	1	bitst(16)	2	384	21334
Cloud Optical Properties										
CORNER_COP	Geodetic latitude and geocentric longitude at ground of PMD pixel, points ABCD (earth-fixed CS), corrected according to the time shift of the reference PMD band used for cloud properties retrieval	NA		4	192	1	COORD	8	6144	21718
CENTRE_COP	Geodetic latitude and geocentric longitude at ground of PMD pixel centre, point F (earth-fixed CS), corrected according to the time shift of the reference PMD band used for cloud properties retrieval	NA		192	1	1	COORD	8	1536	27862
READOUT_STARTTIME_COP	UTC time associated with the read-out of the detector pixel of the reference PMD band used for cloud properties retrieval	NA		192	1	1	short cds time	6	1152	29398
CLOUD_OD	Cloud optical depth	6	-	192	1	1	integer4	4	768	30550
AVHRR_CLOUDFRAC_COP	AVHRR cloud fraction collocated on PMD pixel (corners corrected according to the time shift of the reference PMD band used for cloud properties retrieval)	6	-	192	1	1	integer4	4	768	31318
CLOUD_TOP_TEMP	Cloud top temperature	1	K	192	1	1	u-integer2	2	384	32086
LAND_FRACT_COP	Land fraction co-located with PMD pixel (corners corrected according to the time shift of the reference PMD band used for cloud properties retrieval)	6	-	192	1	1	integer4	4	768	32470
RAD_INHOMOGENEITY_COP	Radiance inhomogeneity (land processing) (corners corrected according to the time shift of the reference PMD band used for cloud properties retrieval)	6	-	192	1	1	integer4	4	768	33238
QUALITY_FLAGS_COP	Product quality flags related to cloud optical properties retrieval	NA		192	1	1	bitst(8)	1	192	34006
Size of the Record										34198
MDR-AOP record subclass version: 1										
Product	size per PDU (30 MDRs) [MB]									

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Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
Worksheet: MDR-2-Other

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	NA		1	1	1	REC_HEAD	20	20	0
GENERIC QUALITY INDICATORS										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal due to an instrument degradation (the flag is taken from the input level 1b product)	NA		1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation	NA		1	1	1	boolean	1	1	21
MDR-2-Other										
GOME_OBS_MODE	GOME-2 Observation mode	NA		1	1	1	enumerated	1	1	22
Size of the Record										23

MDR-2-Other record subclass version: 1

Doc Ref: EUM/OPS-EPS/DOC/12/0639
Polar_Multi-Sensor_Aerosol_Product_Format_Specification_-_Annex[1].xls
Worksheet: MDR-COLINFO

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	NA		1	1	1	REC_HEAD	20	20	0
GENERIC QUALITY INDICATORS										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal (flag is true) due to an instrument degradation (flag is taken from input GOME L1B product)	NA		1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation (flag is taken from input GOME L1B product and depends also from L2 processing)	NA		1	1	1	boolean	1	1	21
Generic Information										
GOME_PMDP_BANDS	Binary flag indicating which GOME PMD-P bands the stored AVHRR co-location information is related to (e.g. bit 0: PMD-P band 1, ..., bit 14: PMD-P band 15)	NA		192	1	1	bitst(16)	2	384	22
GOME_PMDS_BANDS	Binary flag indicating which GOME PMD-S bands the stored AVHRR co-location information is related to (e.g. bit 0: PMD-P band 1, ..., bit 14: PMD-P band 15)	NA		192	1	1	bitst(16)	2	384	406
N_AVHRR_COLOCPIX_P	Number of AVHRR pixel co-located in the GOME PMD pixel (PMD-P bands)	0	-	15	192	1	u-integer2	2	5760	790
N_AVHRR_COLOCPIX_S	Number of AVHRR pixel co-located in the GOME PMD pixel (PMD-S bands)	0	-	15	192	1	u-integer2	2	5760	6550
GOME PMD pixels Outer Bound (in terms of AVHRR pixels)										
STARTTIME_EARLIEST_O	Time stamp before which there are no AVHRR co-located pixel (independently of AVHRR pixel index), i.e.: for $t < \text{startTimeEarliest_O}$ no AVHRR scan line contains pixels co-located to the GOME PMD pixel	NA		192	1	1	short cds time	6	1152	12310
STARTTIME_LATEST_O	Time stamp after which there are no AVHRR co-located pixel (independently of AVHRR pixel index), i.e.: for $t > \text{startTimeLatest_O}$ no AVHRR scan line contains pixels co-located to the GOME PMD pixel	NA		192	1	1	short cds time	6	1152	13462
NE_INF_O	Pixel index below which there are no AVHRR co-located pixel (independently of AVHRR scan startTime), i.e.: for $ne < neInf_O$ no AVHRR scan line contains pixels co-located to the GOME PMD pixel	0	-	192	1	1	integer2	2	384	14614
NE_SUP_O	Pixel index above which there are no AVHRR co-located pixel (independently of scan startTime), i.e.: for $ne > neSup_O$ no AVHRR scan line contains pixels co-located to the GOME PMD pixel	0	-	192	1	1	integer2	2	384	14998
GOME PMD pixels Inner Bound (in terms of AVHRR pixels)										
STARTTIME_EARLIEST_I	Together with <code>startTimeLatestI</code> , defines a closed time interval [<code>startTimeEarliest_I</code> , <code>startTimeLatest_I</code>] of AVHRR scans which contain at least one AVHRR co-located pixel	NA		192	1	1	short cds time	6	1152	15382

FIELD	DESCRIPTION	SF	UNITS	DIM1
RECORD_HEADER	Generic Record Header	NA		1
GENERIC QUALITY INDICATORS				
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal due to an instrument degradation (the flag is taken from the input level 1b product)	NA		1
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation	NA		1
MDR-CI-Other				
GOME_OBS_MODE	GOME-2 Observation mode	NA		1
Size of the Record				

MDR-CI-Other record subclass version: 1

DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
1	1	REC_HEAD	20	20	0
1	1	boolean	1	1	20
1	1	boolean	1	1	21
1	1	enumerated	1	1	22
					23

Field Type	Size in Bytes		
bitst(16)	2		
bitst(8)	1		
boolean	1		
COORD	8		
enumerated	1		
integer2	2		
integer4	4		
REC_HEAD	20		
short cds time	6		
u-integer2	2		
u-integer4	4		