EUMETSAT

EPS-SG IASI-NG Level 1D Auxiliary Data Specification

Doc.No.	:	EUM/LEO-EPSSG/SPE/14/776811
Issue	:	V3C e-signed
Date	:	21 February 2019
WBS/DBS	:	LEO-EPSSG-925010

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Document Change Record

Issue / Revision	Date	DCN No.	Description
v1 draft	16/10/2014	—	First draft version, in view of the V0 for System PDR
v1	19/12/2014	—	First version in view of the V0 as per EPS-SG Development Logic Plan, for internal review in view of the System PDR.
v1A draft	12/02/2015	—	Updates from internal review
v1B	05/03/2015	—	Intermediate version, editorial
v1C	05/03/2015	—	V0 in EPS-SG Development Logic
v2	17/09/2015	—	Changes in view of v1 as per ESP-SG Dev.Logic. Moved open issues out in a separate issue tracking document as per doc coordination meeting. Added G/R field in filenames
v2Adraft	15/12/2015	—	Includes changes from review
v2B	13/01/2016	—	Make read-only
v2D	17/10/2016	—	Delivery for v2 as per ESP-SG Dev.Logic.
v2E draft	5/12/2016	EPSG_DCR_501	Added 1D to Auxiliary Data ID of PCC and OUTL as well as other minor changes from review.
v3	29/09/2017	—	The XML file of AUX_OUTL is added.
v3A	07/03/2018	EPSG_DCR_832	The descriptions of the auxiliary data are changed. A table for each group and the dimensions of AUX_OUTL is defined. Addition of a missing auxiliary data in the table 2.2. Updates of the TBC/TBD tables.
v3B	27/09/2018	—	The type of Longitude and Latitude in AUX_OUTL is changed. New version of the XML file of AUX_OUTL. New reviewer added.
v3C	21/02/2019	EPSG_DCR_1135	The example of filename of the static aux data is changed. EPS-SG IASI-NG L2 Product generation specification is not a Reference Document. The format of the Netcdf and HDF5 tables are changed to include (if available) unit, valid_min and valid_max. The range is added for some variables.

CONTENTS

1 INTRODUCTION

1.1 Purpose and Scope

This document is the Auxiliary Data Specification for the EPS-SG IASI-NG Level 1D Auxiliary Data sets used or generated by the EPS-SG Ground Segment. It aims at specifying the detailed format of the IASI-NG Level 2 auxiliary data in agreement with the format and naming conventions set out in the Generic Auxiliary Data Specification [GADS] applicable to all EPS-SG Auxiliary Data.

1.2 Relation to other documents

The EPS-SG IASI-NG Level 1D Auxiliary Data Specification [IAS-L1D-ADS] is a System document in the EPS-SG System Specification Tree. It is applicable to the [SRD], [OGSRD], IASI-NG L1D Product Generation Specification [IAS-L1D-PGS], IASI-NG L2 Product Generation Specification [IAS-L2-PGS] and EPS-SG System and Ground Segment documents including ICDs/IRDs related to the IASI-NG L1D auxiliary data format and content.

This document is derived from and compliant to [GADS] for generic auxiliary data format, naming conventions and metadata applicable to all EPS-SG Auxiliary data files.

1.3 Applicable Documents

ID	Title	Reference
[GADS]	"EPS-SG Generic Auxiliary Data Specification (GADS)"	EUM/LEO-EPSSG/SPE/13/718291
[MCSD]	"EPS-SG Mission Conventions and Standards Document"	EUM/LEO-EPSSG/STD/14/745221
[DEV]	"Development Logic for EPS-SG L0-L1-L2 Processing Specifications"	EUM/LEO-EPSSG/TEN/14/763159
[HQBAS]	"EPS-SG Data and Products Generation, Archiving and Dissemination Baseline at EUMETSAT HQ"	EUM/LEO-EPSSG/SPE/15/819557

1.4 Reference Documents

ID	Title	Reference and version
[SRD]	EPS-SG System Requirements Document	EUM/LEO-EPSSG/SPE/13/735903
[OGSRD]	EPS-SG Overall Ground Segment Requirements Document	EUM/LEO-EPSSG/REQ/13/725156
[IAS-L1D-PGS]	EPS-SG IASI-NG L1D Product Generation Specification	EUM/LEO-EPSSG/SPE/14/776813

1.5 Acronyms

The definition of conventions, terms and abbreviations applicable to the EPS-SG programme can be found in [MCSD].

1.6 Document Structure

The document is structured as follows:

Chapter 1:	Introduction (this chapter). The scope and purpose of the ADS document is described, along with lists of Applicable and Reference documents.
Chapter 2:	A high-level overview on the IASI-NG Level L1D Auxiliary is presented in this section. The Auxiliary Data List and the Naming convention are also specified here.
Chapter 3:	The format and content of each IASI-NG Level L1D Auxiliary Data is described in this section.

2 EPS-SG IASI-NG LEVEL 1D AUXILIARY DATA OVERVIEW

2.1 Structure of EPS-SG Auxiliary Data

All auxiliary data in the EPS-SG Ground Segment comply with the generic format and naming convention specified in the [GADS]. The format is a package (i.e. folder) including either a single XML file including the auxiliary data and any metadata or an XML header with metadata (defined as per [GADS]) plus a number of files including the auxiliary data.

Auxiliary data which originate outside the Ground Segment or produced by other Ground Segment functions is wrapped along with the XML header in the package upon entry in the GS. The content of the original file(s) is kept as it is (e.g. ECMWF forecast files in GRIB format).

2.2 Naming Convention

The naming convention of EPS-SG Auxiliary data files complies with the naming convention specified in [GADS].

Consider the following auxiliary data file name (for illustrative purpose only):

SGA1_IAS____AUX_EIGV___S20210101233000_E20510601120000_G20201215120000_CALV_OPE_OPER.SIP

In accordance with the naming conventions, this is an auxiliary file (AUX) to be used for both global and regional processing(_), for Metop-SG-A first satellite (SGA1) IASI-NG (IAS) Level 1D and Level 2 (__) product generation and containing the IASI-NG Eigenvectors (EIGV). The file is used within the operational environment (OPE) for routine operations (OPER), and originates from the Cal/Val function (CALV). The file has been generated (G) on the 15 December 2020 at 12:00:00 and is a static file valid for use in the period starting (S) on the 1st January 2021 at 23:30:00 and ending (E) on the 1st June 2051 at 12:00:00.

2.3 IASI-NG Level 1D Auxiliary Data List

The IASI-NG Level 1D PGF takes two static auxiliary data files (AUX_EIGV and AUX_PCC) as input and generates a dynamic auxiliary data file (AUX_OUTL) as output. An overview of the three auxiliary data files used or generated by the IASI-NG Level 1D PGF is given in table 2.2.

The IASI-NG PCC Outlier spectra (AUX_OUTL) shall be generated in both Global and Regional context.

AUX_EIGV and AUX_PCC, but not AUX_OUTL are reqired for local mission.

Note that the IASI-NG Eigenvectors (EIGV) are also required by the IASI-NG Level 2 PGS [IASI-L2-PGS].

File	G/R	I/E	S/D	Source	Generation Frequency	Format	Auxiliary Data ID	Size	Required for local mission
IASI-NG Eigenvectors	-	I	S	CALV	Infrequently (May be frequent during commisioning)	HDF5	IAS____AUX_EIGV	100 MB	Y
IASI-NG PCC Configuration	-	I	S	CALV	Infrequently (May be frequent during commisioning)	HDF5	IAS_1D_AUX_PCCC	0.02 MB	Y
IASI-NG PCC Outlier spectra	GR	I	D	PDP_	1 per granule	NetCDF	IAS_1D_AUX_OUTL	4.4 MB/orbit [a]	N

Table 2.2: EPS-SG IASI-NG Level 1D Auxiliary Data List

Note: The size is typically very small (i.e. 4.4 MB/orbit) but it can exceptionally increase up to the maximum of 5.000MB. It is expected that these strong increases (between 1GB and 5GB) will only happen approximately once a year whilst moderate increases (between 5 MB and 1GB) will happen more often (weekly).

3 EPS-SG IASI-NG LEVEL 1D AUXILIARY DATA DETAILED FORMAT

Each EPS-SG auxiliary data file is a collection of files aggregated and formatted as SIP (Submission Information Package) packages. Each package is a folder which contains two main file components:

- The manifest file, an XML file containing metadata information that describes the content, properties and structure of the auxiliary data files.
- The Auxiliary Data File(s), a file (or collection of files) that contains the specific information required for data processing. The exact content and format depend on the type of auxiliary data. This information is given in the following sections for the auxiliary files required by the IASI-NG L1D processor.

For more details see [GADS].

3.1 IASI-NG Eigenvectors (EIGV)

Name:	IASI-NG Eigenvectors
Example of filename:	SGA1_IAS____AUX_EIGV___S20201004000000- _Exxxxxxxxxxxx_G20170826174318_CALV_OPE_OPER.SIP
Description:	The eigenvector files used for the compression and the reconstruction of Level 1C radiances
Spacecraft:	SGA[1-3]
ADF-ID:	IAS____AUX_EIGV
Source:	CALV
Members:	4
Example of internal filename:	IASI-NG-Band-1-EigenvectorFile-1.0.h5
Format of internal file:	HDF5
Auxiliary Data Size:	100 MB
Generation Frequency:	Infrequently (May be frequent during commisioning)
Validity:	Entire mission

3.1.1 Format of internal files

The four eigenvector files (one for each IASI-NG band) share the same format. They are HDF5 files containing three Attributes and five Datasets (one of which is optional), all belonging to the root group, as detailed in the table below:

Attributes

Name	Data Type	Description
FirstChannel	int	Channel number of the first channel of the band
NbrChannels	int	Number of channels in the band.

Name	Data Type	Description
NbrEigenvectors	int	Number of eigenvectors included in the file. Can be greater but not smaller than the number of PC scores (for the corresponding band) included in the L1 PCS product.

Dimensions

Dimension Name	Comment	Dimension length
NbrChannels	Number of channels in the band	
NbrEigenvectors	Number of eigenvectors included in the file. Can be greater but not smaller than the number of PC scores (for the corresponding band) included in the L1 PCS product.	

Variables

Variables Name	Description	Type	Range or Value	Dimension
Nedr	Random component of the instrument noise used for the computation of the noise normalised residual RMS	double	valid_min to valid_max	NbrChannels
long_name	Description of the variables	string	Random component of the instrument noise used for the computation of the noise normalised residual RMS	–
units	Physical Units	string	W $m^{-2}sr^{-1}m^{-1}$	–
missing_value	Missing value	double		–
CompressionOperator	The operator used for the compression of IASI-NG L1C radiances.	double	valid_min to valid_max	NbrEigenvectors NbrChannels
long_name	Description of the variables	string	The operator used for the compression of IASI-NG L1C radiances.	–
units	Physical Units	string	W $m^{-2}sr^{-1}m^{-1}$	–
missing_value	Missing value	double		–
ReconstructionOperator	The operator used for the reconstruction of IASI-NG L1C radiances.	double	valid_min to valid_max	NbrEigenvectors NbrChannels
long_name	Description of the variables	string	The operator used for the reconstruction of IASI-NG L1C radiances.	–
units	Physical Units	string	W $m^{-2}sr^{-1}m^{-1}$	–

Variables Name	Description	Type	Range or Value	Dimension
missing_value	Missing value	double		–

Table 3.3: AUX_EIGV: Variables

3.2 IASI-NG PCC Configuration (PCCC)

Name:	IASI-NG PCC Configuration
Example of filename:	SGA1_IAS_1D_AUX_PCCC___S20201004000000- _Exxxxxxxxxxxx Z_G20170826174318_CALV_OPE_OPER.SIP
Description:	The number of PC scores to be retained in each band, the coefficents needed for determination of outlier spectra and the quantization factors.
Spacecraft:	SGA[1-3]
ADF-ID:	IAS_1D_AUX_PCCC
Source:	CALV
Members:	1
Example of internal filename:	IASI-NG-PCC-ConfigurationFile-1.0.h5
Format of internal file:	HDF5
Auxiliary Data Size:	0.02 MB
Generation Frequency:	Infrequently (May be frequent during commisioning)
Validity:	Entire mission

3.2.1 Format of internal files

Dimension

Dimension Name	Comment	Dimension length
n_band	number of spectral band	4
n_fov	number of field of view	16

Variables

Variables Name	Description	Type	Range or Value	Dimension
quantisation_factor	PC score quantisation factor	double	valid_min to valid_max	1
long_name	Description of the variables	string	PC score quantisation factor	–
valid_min	Minimum value	double	0	–
missing_value	Missing value	double		–
slope	Slope for determination of outliers one for each band	double	valid_min to valid_max	n_band
long_name	Description of the variables	string	Slope for determination of outliers one for each band	–
missing_value	Missing value	double		–
threshold	Thresholds for determination of outliers for each band and detector	double	valid_min to valid_max	n_band n_fov

Variables Name	Description	Type	Range or Value	Dimension
long_name	Description of the variables	string	Thresholds for determination of outliers for each band and detector	–
missing_value	Missing value	double		–

Table 3.5: AUX_PCCC: Variables

3.3 IASI-NG PCC Outlier spectra (OUTL)

Name:	IASI-NG PCC Outlier spectra
Example of filename:	SGA1_IAS_1D_AUX_OUTL_G_S20241004231200-_E20241004231456_G20241004235959_PDP__OPE_OPER.SIP
Description:	Spectra for which the PC compression results in residual RMS which is higher than expected and granule statistics of the residuals are stored.
Spacecraft:	SGA[1-3]
ADF-ID:	IAS_1D_AUX_OUTL
Source:	PDP_
Members:	1
Example of internal filename:	SGA1_IAS_1D_AUX_OUTL_G_S20241004231200-_E20241004231456_G20241004235959.nc
Format of internal file:	NetCDF
Auxiliary Data Size:	4.4 MB/orbit [1]
Generation Frequency:	1 per granule
Validity:	ValidityStart = Start of sensing time of Granule; ValidityStop = End of sensing time of Granule; Validity Duration = 1 Granule

3.3.1 Format of internal files

It is an NetCDF file containing two groups: outliers and statistics. Furthermore the name of the input files are stored as global attributes.

Global attribute

Name	Data Type	Description
l1cfile		Name of parent IASI-NG L1C file.
ev1file		Name of IASI-NG Band 1 eigenvector file.
ev2file		Name of IASI-NG Band 2 eigenvector file.
ev3file		Name of IASI-NG Band 3 eigenvector file.
ev4file		Name of IASI-NG Band 4 eigenvector file.
pcccfile		Name of IASI-NG PCC Configuration file.

Global Dimension

[1] Note: The size is typically very small (i.e. 4.4 MB/orbit) but it can exceptionally increase up to the maximum of 5.000MB. It is expected that these strong increases (between 1GB and 5GB) will only happen approximately once a year whilst moderate increases (between 5 MB and 1GB) will happen more often (weekly).

Dimension Name	Comment	Dimension length
n_band	number of spectral band	4
n_wn	number of wave channels	16921
n_out	number of outlier spectra found in the granule	$\leq 383 \cdot 14 \cdot 16$

outliers group

Variables Name	Description	Type	Range or Value	Dimension
linenumber	Outlier spectra line number within the parent IASI-NG L1C file.	int	valid_min to valid_max	n_out
long_name	Description of the variables	string	Outlier spectra line number within the parent IASI-NG L1C file.	–
valid_min	Minimum value	int	0	–
missing_value	Missing value	int	2147483647	–
pixelnumber	Outlier spectra pixel number within the parent IASI-NG L1C file.	short	valid_min to valid_max	n_out
long_name	Description of the variables	string	Outlier spectra pixel number within the parent IASI-NG L1C file.	–
valid_min	Minimum value	short	0	–
valid_max	Maximum value	short	119	–
missing_value	Missing value	short	32768	–
sensingtime	Sensing time of outlier spectra.	double	valid_min to valid_max	n_out
long_name	Description of the variables	string	Sensing time of outlier spectra.	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	–
missing_value	Missing value	double	1.7e+308	–
longitude	Longitude of outlier spectra.	short	valid_min to valid_max	n_out
long_name	Description of the variables	string	Longitude of outlier spectra.	–
units	Physical Units	string	degrees_east	–
scale_factor	Scale factor	float	0.005493332	–
add_offset	Offset	float	0.0	–
missing_value	Missing value	short	32768	–
latitude	Latitude of outlier spectra.	short	valid_min to valid_max	n_out
long_name	Description of the variables	string	Latitude of outlier spectra.	–
units	Physical Units	string	degrees_north	–
scale_factor	Scale factor	float	0.002746666	–
add_offset	Offset	float	0.0	–
missing_value	Missing value	short	32768	–

Variables Name	Description	Type	Range or Value	Dimension
gqisflagqual	L1C quality flag of outlier spectra.	ubyte	valid_min to valid_max	n_out n_band
long_name	Description of the variables	string	L1C quality flag of outlier spectra.	–
missing_value	Missing value	ubyte	255	–
residualrms	Noise-normalised residual RMS per band for outlier spectra.	float	valid_min to valid_max	n_out n_band
long_name	Description of the variables	string	Noise-normalised residual RMS per band for outlier spectra.	–
missing_value	Missing value	float	3.4e+38	–
l1cradiance	Radiance of IASI-NG L1C outlier spectra.	float	valid_min to valid_max	n_out n_wn
long_name	Description of the variables	string	Radiance of IASI-NG L1C outlier spectra.	–
units	Physical Units	string	$W/(m^2 \cdot sr \cdot m^1)$	–
missing_value	Missing value	float	3.4e+38	–

Table 3.8: statistical_retrieval: Variables for outliers group

statistics group

Variables Name	Description	Type	Range or Value	Dimension
nbrcases	Number of spectra used for the residual statistics.	int	valid_min to valid_max	1
long_name	Description of the variables	string	Number of spectra used for the residual statistics.	–
missing_value	Missing value	int	2147483647	–
residualmean	Noise-normalised residual mean.	float	valid_min to valid_max	n_wn
long_name	Description of the variables	string	Noise-normalised residual mean.	–
missing_value	Missing value	float	3.4e+38	–
residualstdv	Noise-normalised residual standard deviation.	float	valid_min to valid_max	n_wn
long_name	Description of the variables	string	Noise-normalised residual standard deviation.	–
missing_value	Missing value	float	3.4e+38	–

Table 3.9: statistical_retrieval: Variables for statistics group

A XML DESCRIPTION OF AUX_OUTL

This appendix includes the XML description of AUX_OUTL.