IASI Level 1: Product Guide

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Document Change Record

Issue / Revision	DCN. No	Changed Pages / Paragraphs
v1		First issue of the document.
v2		Corrected reference to figure, to "just discernible in Figure 4.4". Added reference after "EPS Native format". Added initial sentence specifying PFS and GPFS versions used.
v2A		Corrected reference to figure, to "just discernible in Figure 4.4". Added reference after "EPS Native format". Added initial sentence specifying PFS and GPFS versions used.
v2B		Added latest s/w version 4.0 to Table 3.2, and new auxiliary files Set 5 to Table 3.3. More description of GQisQualIndexLoc flag.
v2C		Added new auxiliary files Set 6 to Table 3.3. Webpage link added to "WMO Manual on Codes" reference.
v2D		Deleted reference RD59 which duplicates RD58. Details of older data added: S/W versions 3.5.5, 3.6.4, 3.6.5 & 3.6.6 to Table 3.2, and auxiliary files Sets 1, 2 & 3 to Table 3.3. Figure reference corrected (4.5 not 4.4). Tables added summarising record contents for each product format version. Table for Level 1c MDR record: Correct unit descriptions added to GCcsRadAnalMean and GCcsRadAnalStd for channels 1,2 and 3a. Other general layout improvements and typo corrections.
v2E		Table entries updated for document and PPF software versions.
v2F		Table 3-3 PPF auxiliary parameter file – Set 7 added. Bitfield GEPSIasiMode: Length values corrected. Bitfield IDefCcsMode: "*Length 4 bytes*" inserted.
v3 13/05/2009		Table 3-3 PPF auxiliary parameter file – Set 8 added. Document restructured - App. F & G renamed as Sec. 10 & 11, and common appendices removed to keep as separate document. Sec. 5: EPSView description replaced by text on available generic tools. Various minor editorial updates, correction of typos and hyperlinks.
v3A 01/09/2009		Updates for Day-2 product format: Sec. 10: Added tables for new record versions 5 for MDR-1a, MDR-1b, MDR-1c. For all three records, dimension change for field GQisFlagQual and addition of GQisFlagQualDetailed. Also for MDR-1c, addition of fields GIacVarImagIIS, GIacAvgImagIIS, GEUMAvhrr1BCldFrac, GEUMAvhrr1BLandFrac and GEUMAvhrr1BQual. Corresponding descriptive additions to Sec. 4.3.2 & 10 for bitfield quality flags GQisFlagQualDetailed & GEUMAvhrr1BQual. Other updates: Added reference RD23. Table 6-9: Descriptor Sequence codes updated. Several other editorial updates/corrections.
v3B		'Day 2' column and footnote added to Table 6-9. WMO codes hyperlink updated and note added to warn of typo.
v3C		Added document links for Day 2 WMO BUFR format descriptions. (Other minor textual and hyperlink updates.)

Issue / Revision	DCN. No	Changed Pages / Paragraphs
v3D		New entries in configuration history tables for introduction of Day 2 on 18/5/10. Inserted new subsection: Decoding of IASI spectra using scaling factors. Minor table/text updates relating to Day 2.
v3E		Tables 3-2 & 3-3: Set 10 aux files added.
v3F		Configuration History table updates: installation of v5.1 processor. Impact: mainly affects AVHRR projection into IASI FOV, which modifies slightly the radiances classification, and then (much more slightly) the cloud fraction. Section 8 merged with Section 9, and text updated to mention Day-2 PV Test Report (added as reference RD24 in Sec. 2.1) and daily monitoring reports. Description update to MDR.GEUMAvhrr1BQual. Other minor textual and hyperlink updates.[EUMETSAT internal: *delete this note from the Web version PDF:* Signature table updates: L. Fiedler --> D. Coppens, P. Schlüssel --> T. August.]
v3G		Configuration History Table 3-3: New auxiliary files: Set 11 (with apodisation functions and scan mirror reflectivity updates) and Set 12 (reduced spectra). Introduction of a paragraph warning about interband regions. New section about interpixel differences problem and solution. Table 6-1, Sec. 6.5 & Sec. 10: Extension of L1c subset product from 300 spectral channels to 366.
v3H		Configuration History Table 3-2: New PPF version. MDR-1a, -1b & -1c: Units correction from 'Avhrr pixels' to 'ms' for GEPSLocIasiAvhrr_IASI & GEPSLocIasiAvhrr_IIS. Likewise for GCcsImageClassifiedFirstLin in MDR-1c.
v3I		MDR-1a, -1b & -1c: Previous units correction from 'Avhrr pixels' to 'ms' for GEPSLocIasiAvhrr_IASI & GEPSLocIasiAvhrr_IIS in fact applies for the line only. Column stays in Avhrr pixels.
V3J		Update Table 3-2: New PPF v 6.2 fixing minor bugs. Update Table 3-3: set 13 with scan mirror reflectivity update.
V4		Introduction of **Metop-B** information. New Table 3-4 describing IASI Level 1 PPF auxiliary parameter file. versions for Metop-B.
V4A		Corrected signature table to reflect TSS approval standards.
V4B		Update Table 2 with new IASI L1 PPF version 7.1. Update tables 3 and 4 with new sets of auxiliary parameter files. Update Table 18 in section 10 concerning Spectral Channels used for IASI Level 1c Subset Product from 366 to 500 channels.
V4C		Changes to signature table.
V4D		Removed HDF5 as a possible format for IASI Level 1 products. Replaced with description of NetCDF and directions to the download. webpage. Section on HDF5 description (Section 6.1.4) was removed. Update Table 2 with new IASI L1 PPF version 7.2, 7.3, 7.4 and 8.0. Update tables 3 and 4 with new sets of auxiliary parameter files.
V4E		Update Table 3. Correct reference replacing Appendix D.

Issue / Revision	*DCN. No*	*Changed Pages / Paragraphs*
V5		Introduction of **Metop-C** information. New Table 5 describing IASI Level 1 PPF auxiliary parameter file versions for Metop-C. Correction of obsolete appendix reference. Rephrasing and formatting, hyperlinked update.

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1 INTRODUCTION

This user guide is intended for users of EUMETSAT Polar System (EPS) IASI Level 1 data products. It provides information about the products available, how to access them, and how to extract and interpret the data. It also aims to help the user in choosing a product for a particular application.

The products that will be addressed in this guide are as follows:

- IASI Level 1a (geolocated calibrated radiance spectra)
- IASI Level 1b (geolocated calibrated and resampled radiance spectra)
- IASI Level 1c (geolocated, calibrated, resampled and apodised radiance spectra)

For further questions not addressed in this guide on these or other EPS products, you are welcome to access the EUMETSAT Polar System pages on our website www.eumetsat.int, or to directly contact the EUMETSAT User Services Helpdesk. These pages should be the main interface for information on access to all EPS products.

A supplement of appendices applicable to all the Product Guides is also available. This contains a product summary and details of generic data, as well as information on the Metop operational orbit, and a list of acronyms and abbreviations. Within EUMETSAT, you can get this supplement from the DM tool: EUM/OPS-EPS/MAN/08/0034.

2 REFERENCE DOCUMENTS

The following documents have been used to compile the information in this guide. Some of them are referenced within the text, others are provided here for further reading.

2.1 EPS programme documents

No.	*Document Title*	*EUMETSAT Reference*
RD 1	EPS Generic Product Format Specification	EPS.GGS.SPE.96167
RD 2	IASI Level 1 Product Format Specification	EUM.EPS.SYS.SPE.990003
RD 3	IASI Level 2 Product Format Specification	EPS.MIS.SPE.980760
RD 4	IASI Instrument Specification	IA-SP-1000-201-CNE
RD 5	Spécification Technique de Besoin du logiciel opérationnel IASI	IA-SB-2100-9462-CNE
RD 6	Dossier de définition des algorithmes IASI	IA-DF-0000-2006-CNE
RD 7	IASI Level 2 Product Generation Specification	EPS.SYS.SPE.990013
RD 8	EPS Programme Calibration and Validation Overall Plan	EUM.EPS.SYS.PLN.02.004
RD 9	U-MARF LEO Format Descriptions	EUM/OPS/USR/06/1855
RD 10	U-MARF LEO Format Descriptions	EUM/OPS/USR/06/1855
RD 11	EUMET Cast Technical Description	EUM TD 15
RD 12	EPS Product file naming for EUMETCast	EUM/OPS-EPS/TEN/07/0012
RD 13	Metop Space to Ground Interface Specification	MO-IF-MMT-SY0001
RD 14	IASI Level 1 Day-2 Product Validation Test Report	EUM/OPS-EPS/REP/10/0069

See www.eumetsat.int for more information on the project.

2.2 SAF documents

See www.nwpsaf.eu/site/ for more information on the NWP SAF project.

2.3 Papers, reports and other technical documentation

No.	*Document Title*	*Reference*
RD 15	Manual on the Global Telecommunication System	WMO – No. 386
RD 16	World Meteorological Organization Manual on Codes	WMO – No. 306
RD 17	NOAA KLM User's Guide	www2.ncdc.noaa.gov/docs/klm
RD 18	U. Amato, V. Cuomo and C. Serio *Assessing the impact of radiometric noise on IASI performances*, Int. J. Remote Sensing	vol. 16, No.15, 2927-2938, 1995
RD 19	P. Prunet, J.-N. Thepaut, V. Casse, *The information content of clear sky IASI radiance and their potential for numerical weather prediction,* QJRMS	124, pp 211-241, 1998
RD 20	N. Jacquinet-Husson et al., *The GEISA system in 1996 : toward an operational tool for the second generation vertical sounders radiance simulation,* JSQRT	59, No. 3-5, 511-527, 1998
RD 21	J.R. Eyre, *The effects of nonlinearity on analysis and retrieval errors,* UKMO Forecasting Research Technical Report	No. 252
RD 22	A.D. Collard, *Notes on IASI Performance,* UKMO Forecasting Research Technical Report	No. 256
RD 23	V.J. Sherlock, *Result from the first UKMO IASI fast radiative transfer model intercomparison*, UKMO Forecasting Research Technical Report	No. 287
RD 24	V.J. Sherlock. ISEM-6: *Infrared Surface Emissivity Model for RTTOV-6,* UKMO Forecasting Research Technical Report	No. 299
RD 25	J. Hadji-Lazaro, C. Clerbaux and S. Thiria, *An inversion algorithm using neural networks to retrieve atmospheric CO total columns from high-resolution nadir radiances,* JGR	Vol 104, No D19, Pages 23, 841-23,854, 1999
RD 26	C. Clerbaux, J. Hadji-Lazaro, D. Hauglustaine, G. Mégie, B. Khattatov and J.F. Lamarque, *Assimilation of carbon monoxide measured from satellite in a three-dimensional chemistry-transport,* Geophys. Res	106, D14, 15, 385-394, 2001
RD 27	J. Hadji-Lazaro, C. Clerbaux, P. Couvert, P. Chazette and C. Boonne, *Cloud filter for CO retrieval from IMG infrared spectra using ECMWF temperature and POLDER cloud data,* Geophys. Res Lett	28,12, 2397-2400, 2001
RD 28	F. Rabier, N. Fourrié, D. Chafaï and P. Prunet, *Channel selection methods for Infrared Atmospheric Sounding Interferometer radiances,* Q.J. R. Meteorol. Soc	128, 1011-1027, 2002
RD 29	Y. Té, P. Jeseck, C. Camy Peyret, S. Payan, G. Perron and G. Aubertin, *Balloonborne calibrated spectroradiometer for atmospheric nadir sounding,* Applied Optics	Vol 41, No. 30, 6431-6441, 2002
RD 30	C. Clerbaux, J. Hadji-Lazaro, S. Payan, C. Camy-Peyret, J. Wang, D.P. Edwards and M. Lo, *Retrieval of CO from nadir remote-sensing measurements in the infrared by use of four different inversion algorithms,* Applied Optics	Vol. 41, No. 33, 7068-7078, 2002

No.	*Document Title*	*Reference*
RD 31	S. Turquety, J. Hadji-Lazaro and C. Clerbaux, *First satellite ozone distributions retrieved from nadir high-resolution infrared spectra,* Geophys. Res. Lett.	Vol. 29, No. 24, 2198, 2002
RD 32	F. Aires, W.B. Rossow, N.A. Scott and A. Chédin, *Remote Sensing from the infrared atmospheric sounding interferometer instrument. 1. compression, denoising and first-guess retrieval*, *algorithm*, J. Geophys. Res.	107, D22, 4619-4635, 2002
RD 33	F. Aires, A. Chédin, N.A. Scott and W.B. Rossow, *A Regularized Neural Net Approach for Retrieval of Atmospheric and Surface temperatures with the IASI instrument*, J. Appl. Meteor	41,144-158, 2002
RD 34	F. Aires, W.B. Rossow, N.A. Scott and A. Chédin, *Remote Sensing from the infrared atmospheric sounding interferometer instrument 2. Simultaneous retrieval of temperature, water vapor and ozone atmospheric profiles,* J. Geophys. Res.	107 , D22, 4620-4631, 2002
RD 35	R. Rizzi, M. Matricardi and F. Miskolczi, *Simulation of uplooking and downlooking high-resolution radiance spectra with two different radiative transfer model,* Applied Optics	41,6, 940-956, 2002
RD 36	A. Chédin, R. Saunders, A. Hollingworth, N. Scott, M. Matricardi, J. Etcheto, C. Clerbaux, R. Armante, C. Crevoisier, *The feasibility of monitoring CO2 from high resolution infrared sounders,* J. Geophys. Research	Vol. 108, No. D2, 4064-4083, 2003
RD 37	P.F. Coheur, C. Clerbaux and R. Rolin, *Spectroscopic measurements of halocarbons and hydrohalocarbons by satellite-borne remote sensors*, J. Geophysical Res.	Vol. 108, No. D4,4130, 2003
RD 38	S.A. Tjemkes, T. Patterson, R. Rizzi, M.W. Shephard, S.A. Clough, M. Matricardi, J. Haigh, M. Hopfner, S. Payan, et al, *ISSWG Line by Line Intercomparison Experiment,* J. Quant.Spectrosc. Rad. Transf	77(4),433-453, 2003
RD 39	A.D. Collard and M. Matricardi, *RTIASI-4, a new version of the ECMWF fast radiative transfer model for the infrared atmospheric sounding interferometer,* ECMWF Technical Memorandum	No. 425, 63pp, 2003
RD 40	A.D. Collard and M. Matricardi, Definition of an efficient interface to NWP for assimilating IASI radiances, *ECMWF report*	2005
RD 41	A.D. Collard and M. Matricardi, *Selection of a subset of IASI Channels for Near Real Time Dissemination, ECMWF report* Available on International TOVS Study Conference web site under: http ://cimss.ssec.wisc.edu/itwg/itsc/itsc14/proceedings/B21_Collard.pdf	
RD 42	*Additions to BUFR/CREX Tables for Pre-Operational Implementation Endorsed by CBS for full operational status on 7 November 2007* Available on WMO web site under: http ://www.wmo.int/pages/prog/www/WMOCodes/WMO306_vI2/2010edition/UpdateHistory/20100411/BUFRCREX/PREOPERATIONAL1008.pdf	*Obsolete*
RD 42a	*Information on the latest versions, 23(.0.0) (GRIB) and 32(.0.0) (BUFR and CREX), are effective as from 15 May 2019:* http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_vI2/LatestVERSION/LatestVERSION.html	
RD 43	*Update to the Meteorological Product Distribution on the GTS,* ***Note*** : EUMETSAT STG-OPSWG 20th Meeting, August 2006	EUM/STG-OPSWG/20/06/DOC/07 Cover

No.	*Document Title*	*Reference*
RD 44	Hilton, Fiona, et al. "Hyperspectral Earth observation from IASI: Five years of accomplishments." *Bulletin of the American Meteorological Society*.	93.3 (2012): 347-370
RD 45	Clerbaux, Cathy, et al. "Monitoring of atmospheric composition using the thermal infrared IASI/MetOp sounder." *Atmospheric Chemistry and Physics* .	9.16 (2009): 6041-6054
RD 46	Collard, A. D. "Selection of IASI channels for use in numerical weather prediction." *Quarterly Journal of the Royal Meteorological Society: A journal of the atmospheric sciences, applied meteorology and physical oceanography*	133.629 (2007): 1977-1991.
RD 47	Maraldi, Claire, et al. "IASI mini-TEC: a mini technical expertise center dedicated to IASI performance monitoring during MetOp-C thermal vacuum test." *2018 SpaceOps Conference*.	2018
RD 48	Clerbaux, Cathy, et al. "IASI satellite observations: best of 2017–2018." *Fourier Transform Spectroscopy*. Optical Society of America, 2018.	2018
RD 49	Buffet, Laurence, et al. "IASI instrument onboard Metop-A: lessons learned after almost two years in orbit." *International Conference on Space Optics*—International Society for Optics and Photonics, 2017.	*ICSO 2008*. Vol. 10566. 2017
RD 50	Theodore, Bertrand, et al. "Intercomparisons between IASI on METOP and infrared multi-spectral instruments." *Earth Observing Systems XXII*. International Society for Optics and Photonics, 2017.	Vol. 10402, 2017
RD 51	Guidard, V., et al. "Impact of IASI assimilation at global and convective scales and challenges for the assimilation of cloudy scenes." *Quarterly Journal of the Royal Meteorological Society*	137.661 (2011): 1975-1987.

3 IASI LEVEL 1 PRODUCTS CONFIGURATION HISTORY

In the following tables, the current versions on the operational Ground Segment are shown on a white background.

Date introduced	*Product Major number*	*format version Minor number*	*PFS version [RD 2]*	*PGS version [RD 6]*	*Comments*
19/10/2006	10	0	6.6	5.5	
22/08/2008	10	0	v7C	5.8	
14/12/2011	11	0	v9...v9E	6.5	

Table 1: IASI Level 1 document versions

IASI L1 PPF software version	*Date introduced on GS1*	*Comments*
3.5.5	18/06/2008	Launch configuration
3.6.4	19/01/2007	Cal/Val Phase
3.6.5	22/02/2007	Cal/Val Phase
3.6.6	22/03/2007	Cal/Val Phase
3.6.9	07/07/2007	Operational configuration
4.0.0	04/12/2007	Orbit 5835 sensing start time 10:03:00 UTC
4.0.3	29/09/2008	Orbit 10095 sensing start time 06:35:52 UTC
5.0.2	18/05/2010	Orbit 18563 sensing start time 07:44:59 UTC Day-2 Version of the IASI L1 PPF
5.0.3	23/06/2010	Orbit 19076 sensing start time 10:23:55 UTC
5.1	01/12/2010	Orbit 21364 sensing start time 11:29:54 UTC
6.1	29/09/2011	Orbit 25653 sensing start time 08:59:55 UTC Version compatible with Linux 32 bits
6.2	22/02/2012	Sensing time 15:20:52 UTC Minor bugs corrected
6.5	23/05/2013	Geolocation can be provided without AVHRR
7.0	08/08/2013	Sensing time 081159Z, orbit 35299 for M02 Sensing time 090554Z, orbit 4613 for M01 Version compatible with new spectral calibration check for global and regional processing
7.1	22/07/2014	Orbit 40243 of Metop-A (8:12 UTC sensing time) Orbit 9557 of Metop-B (9:06 UTC sensing time) Update of MDR_COUNT_DEGRADED_PROC and MDR_COUNT_DEGRADED_INST parameters in the product header.
7.2	27/05/2015	Correction of infinite loops of SVM files on CNES side Orbit 44635 of Metop-A (11:38 UTC sensing time) Orbit 13949 of Metop-B (12:32 UTC sensing time)
7.3	29/09/2015	Impact of CSQ flags on IIS images Orbit 46412 of Metop-A (13:32 UTC sensing time) Orbit 15725 of Metop-B (12:47 UTC sensing time)
7.4	25/01/2017	Migration of the IASI L1 PPF to AIX version 7.1 Orbit 53287 of Metop-A (12:26 UTC sensing time) Orbit 22601 of Metop-B

IASI L1 PPF software version	*Date introduced on GS1*	*Comments*
8.0	13/09/2017	Orbit 25884 of Metop-B (13:53 UTC sensing time) Orbit 56568 of Metop-A (08:36 UTC sensing time) Includes all patches since the full delivery of version 7.0 Reprocess files larger than 2 GB on CDRAIX01-09 Flag updated to allow a larger threshold of NedT values for cloud identification

Table 2: IASI Level 1 PPF software versions.

IASI L1 auxiliary files set version	*IASI L1 auxiliary files – M02*	*Date introduced on GS1*	*Comments*
Set 1	IASI_BRD_xx_M02_20070329120000Z_xxxxxxxxxxxxxxZ_20070329083218Z_IAST_0000000004 IASI_GRD_xx_M02_20070329120000Z_xxxxxxxxxxxxxxZ_20070329084411Z_IAST_0000000008 IASI_ODB_xx_M02_20070329120000Z_xxxxxxxxxxxxxxZ_20070329083257Z_IAST_0000000004	29/03/2007	Cal/Val
	IASI_BRD_xx_M02_20070329120500Z_xxxxxxxxxxxxxxZ_20070329091915Z_IAST_0000000006		Activated with TOP 6 update on 02/04/2007
Set 2	IASI_BRD_xx_M02_20070621160000Z_xxxxxxxxxxxxxxZ_20070621082537Z_IAST_0000000006 IASI_GRD_xx_M02_20070621160000Z_xxxxxxxxxxxxxxZ_20070621082543Z_IAST_0000000013	26/06/2007 at 06:53 UTC	Cal/Val
	IASI_ODB_xx_M02_20070329120000Z_xxxxxxxxxxxxxxZ_20070329083257Z_IAST_0000000004		Same as Set 1
	IASI_BRD_xx_M02_20070621170000Z_xxxxxxxxxxxxxxZ_20070621114215Z_IAST_0000000008		Cal/Val, activated with TOP 8 update on 27/06/2007 at 13:24:26 UTC, Orbit 3564
Set 3	IASI_BRD_xx_M02_20070702180000Z_xxxxxxxxxxxxxxZ_20070702144154Z_IAST_0000000009	05/07/2007 at 11:40 UTC	Cal/Val, activated with TOP 9 update on 05/07/2007 at 12:17:32 UTC, Orbit 3677
	IASI_GRD_xx_M02_20070621160000Z_xxxxxxxxxxxxxxZ_20070621082543Z_IAST_0000000013 IASI_ODB_xx_M02_20070329120000Z_xxxxxxxxxxxxxxZ_20070329083257Z_IAST_0000000004		Same as Set 2 Same as Set 1
Set 4	IASI_BRD_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153454Z_IAST_0000000009 IASI_GRD_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153754Z_IAST_0000000015 IASI_ODB_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153529Z_IAST_0000000007	10/07/2007	
Set 5	IASI_BRD_xx_M02_20071022060000Z_xxxxxxxxxxxxxxZ_20071015123828Z_IAST_0000000010	22/10/2007 at 07:51 UTC	Activated with TOP update on 22/10/2007 at 13:02 UTC, orbit 5226
	IASI_GRD_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153754Z_IAST_0000000015 IASI_ODB_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153529Z_IAST_0000000007		Same as Set 4
Set 6	IASI_BRD_xx_M02_20080303060000Z_xxxxxxxxxxxxxxZ_20080227144358Z_IAST_0000000011	28/02/2008 at 11:30 UTC	Activated with TOP update on 03/03/2008 at 10:28 UTC, orbit 7114
	IASI_GRD_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153754Z_IAST_0000000015 IASI_ODB_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153529Z_IAST_0000000007		Same as Set 4

IASI L1 auxiliary files set version	*IASI L1 auxiliary files – M02*	*Date introduced on GS1*	*Comments*
Set 7	IASI_BRD_xx_M02_20090217060000Z_xxxxxxxxxxxxxxZ_20090216161614Z_IAST_0000000012	19/02/2009 at 10:39 UTC	Activated with TOP 12 on 24/02/2009 at 13:57 UTC, orbit 12202.
	IASI_GRD_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153754Z_IAST_0000000015 IASI_ODB_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153529Z_IAST_0000000007		Same as Set 4.
Set 8	IASI_BRD_xx_M02_20090415060000Z_xxxxxxxxxxxxxxZ_20090414125404Z_IAST_0000000012 IASI_GRD_xx_M02_20090415060000Z_xxxxxxxxxxxxxxZ_20090414125412Z_IAST_0000000017	12/05/2009 at 09:07 UTC	Activated on 12/05/2009 at 09:07 UTC with first PDU of orbit 13292.
	IASI_ODB_xx_M02_20070705200000Z_xxxxxxxxxxxxxxZ_20070705153529Z_IAST_0000000007		Same as Set 4.
Set 9	IASI_BRD_xx_M02_20100303160000Z_xxxxxxxxxxxxxxZ_20100303151426Z_IAST_0000000012 IASI_GRD_xx_M02_20100303160000Z_xxxxxxxxxxxxxxZ_20100303153132Z_IAST_0000000020 IASI_ODB_xx_M02_20100303160000Z_20100903160000Z_20100303151607Z_IAST_0000000008	18/05/2010 at 09:36 UTC	Activated on 18/05/2010 at 09:36 UTC with first PDU of orbit 18563.
Set 10	IASI_BRD_xx_M02_20100520091039Z_xxxxxxxxxxxxxxZ_20100520122037Z_IAST_0000000012 IASI_GRD_xx_M02_20100520091039Z_xxxxxxxxxxxxxxZ_20100520122048Z_IAST_0000000021 IASI_ODB_xx_M02_20100301171000Z_xxxxxxxxxxxxxxZ_20100301170923Z_IAST_0000000008	23/06/2010 at 12:08 UTC	Activated on 23/06/2010 at 12:08 UTC with first PDU of orbit 19076.
Set 11	IASI_BRD_xx_M02_20101222080000Z_xxxxxxxxxxxxxxZ_20101222072008Z_IAST_0000000012 IASI_GRD_xx_M02_20101220110000Z_xxxxxxxxxxxxxxZ_20101220101609Z_IAST_0000000022 IASI_ODB_xx_M02_20101222080000Z_xxxxxxxxxxxxxxZ_20101222072116Z_IAST_0000000010	07/02/2011 at 09:44 UTC (orbit 22328)	New apodisation functions and mirror reflectivity update → pixel radiance differences are reduced.
Set 12	IASI_BRD_xx_M02_20110413060000Z_xxxxxxxxxxxxxxZ_20110412131920Z_IAST_0000000013	20/04/2011 at 09:39 UTC (orbit 23352)	Reduced spectra update.
	IASI_GRD_xx_M02_20101220110000Z_xxxxxxxxxxxxxxZ_20101220101609Z_IAST_0000000022 IASI_ODB_xx_M02_20101222080000Z_xxxxxxxxxxxxxxZ_20101222072116Z_IAST_0000000010		Same as Set 11.
Set 13	IASI_BRD_xx_M02_20120601100000Z_xxxxxxxxxxxxxxZ_20120601071532Z_IAST_0000000013 IASI_GRD_xx_M02_20120601100000Z_xxxxxxxxxxxxxxZ_20120601071536Z_IAST_0000000023	18/07/2012 at 7:56 UTC (orbit 29815)	Scan mirror reflectivity update.
	IASI_ODB_xx_M02_20101222080000Z_xxxxxxxxxxxxxxZ_20101222072116Z_IAST_0000000010		Same as Set 11.
Set 14	IASI_BRD_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074812Z_IAST_0000000013 IASI_GRD_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417075057Z_IAST_0000000028 IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014	16/05/2013	IPSF tuning.

IASI L1 auxiliary files set version	*IASI L1 auxiliary files – M02*	*Date introduced on GS1*	*Comments*
Set 15	IASI_BRD_xx_M02_20130822131643Z_xxxxxxxxxxxxxxZ_20130822125646Z_IAST_0000000014	28/08/2013	Reduced spectra update.
	IASI_GRD_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417075057Z_IAST_0000000028 IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014		Same as set 14.
Set 16	IASI_BRD_xx_M02_20130822141643Z_xxxxxxxxxxxxxxZ_20130822135729Z_IAST_0000000014 IASI_GRD_xx_M02_20130822141643Z_xxxxxxxxxxxxxxZ_20130822135732Z_IAST_0000000029	16/09/2013	Scan mirror reflectivity update.
	IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014		Same as set 14.
Set 17	IASI_BRD_xx_M02_20140527150000Z_xxxxxxxxxxxxxxZ_20140527124036Z_IAST_0000000014 IASI_GRD_xx_M02_20140527150000Z_xxxxxxxxxxxxxxZ_20140527124041Z_IAST_0000000030	17/06/2014	Scan mirror reflectivity update.
	IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014		Same as set 14.
	IASI_BRD_xx_M02_20150522000000Z_xxxxxxxxxxxxxxZ_20150521083338Z_IAST_0000000014 IASI_GRD_xx_M02_20150522000000Z_xxxxxxxxxxxxxxZ_20150521083343Z_IAST_0000000031	24/06/2015	Scan mirror reflectivity update.
Set 18	IASI_BRD_xx_M02_20150717000000Z_xxxxxxxxxxxxxxZ_20150716125109Z_IAST_0000000015 IASI_GRD_xx_M02_20150522000000Z_xxxxxxxxxxxxxxZ_20150521083343Z_IAST_0000000031 IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014	05/08/2015	Activated with TOP update on the 05/08/2015 at ****.
Set 19	IASI_BRD_xx_M02_20150918000000Z_xxxxxxxxxxxxxxZ_20150917130533Z_IAST_0000000015 IASI_GRD_xx_M02_20150522000000Z_xxxxxxxxxxxxxxZ_20150521083343Z_IAST_0000000031 IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014	26/10/2015	IIS/AVHRR offset update.
Set 20	IASI_BRD_xx_M02_20170101000000Z_xxxxxxxxxxxxxxZ_20161216133209Z_IAST_0000000015 IASI_GRD_xx_M02_20170101000000Z_xxxxxxxxxxxxxxZ_20161216133227Z_IAST_0000000032 IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014	07/02/2017	Scan mirror reflectivity update.
Set 21	IASI_BRD_xx_M02_20170505000000Z_xxxxxxxxxxxxxxZ_20170504114610Z_IAST_0000000015 IASI_GRD_xx_M02_20170101000000Z_xxxxxxxxxxxxxxZ_20161216133227Z_IAST_0000000032 IASI_ODB_xx_M02_20130417080000Z_xxxxxxxxxxxxxxZ_20130417074829Z_IAST_0000000014	07/06/2017	On-ground update (NsErase parameter).
Set 22	IASI_BRD_xx_M02_20181001000000Z_xxxxxxxxxxxxxxZ_20180927130836Z_IAST_0000000015 IASI_GRD_xx_M02_20181001000000Z_xxxxxxxxxxxxxxZ_20180927130840Z_IAST_0000000033	31/10/2018	Scan mirror reflectivity update.
Set 23	IASI_BRD_xx_M02_20190629000000Z_xxxxxxxxxxxxxxZ_20190628130814Z_IAST_0000000017	30/09/2019	Non-linearity correction update

Table 3: IASI Level 1 PPF auxiliary parameter file versions for Metop-A.

IASI L1 auxiliary files set version	*IASI L1 auxiliary files – M01*	*Date introduced on GS1*	*Comments*
Set 1	IASI_BRD_xx_M01_20130308110000Z_xxxxxxxxxxxxxxZ_20130307164043Z_IAST_0000000007 IASI_GRD_xx_M01_20130308110000Z_xxxxxxxxxxxxxxZ_20130307164332Z_IAST_0000000014 IASI_ODB_xx_M01_20130308110000Z_xxxxxxxxxxxxxxZ_20130307164055Z_IAST_0000000010	14/03/2013	End of Cal/Val.
Set 2	IASI_BRD_xx_M01_20130319170000Z_xxxxxxxxxxxxxxZ_20130319162606Z_IAST_0000000008	21/03/2013	Cal/Val - Activated with TOP 8 update on 21/03/2013.
	IASI_GRD_xx_M01_20130308110000Z_xxxxxxxxxxxxxxZ_20130307164332Z_IAST_0000000014 IASI_ODB_xx_M01_20130308110000Z_xxxxxxxxxxxxxxZ_20130307164055Z_IAST_0000000010		Same as Set 1.
Set 3	IASI_BRD_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082452Z_IAST_0000000008 IASI_GRD_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082744Z_IAST_0000000016 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012	14/05/2013	IPSF tuning.
Set 4	IASI_BRD_xx_M01_20130704150000Z_xxxxxxxxxxxxxxZ_20130704141744Z_IAST_0000000009	10/07/2013	TOP 9 update on the 10/07/2013.
	IASI_GRD_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082744Z_IAST_0000000016 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012		Same as set 3.
Set 5	IASI_BRD_xx_M01_20130704150000Z_xxxxxxxxxxxxxxZ_20130704141744Z_IAST_0000000009 IASI_GRD_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082744Z_IAST_0000000016	26/09/2013	InterPixNZpd update, to improve availability of data in band 1 and 2.
	IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012		Same as set 3.
Set 6	IASI_BRD_xx_M01_20131120160000Z_xxxxxxxxxxxxxxZ_20131120152359Z_IAST_0000000010	21/11/2013	TOP 10 - On-board reduced spectra update.
	IASI_GRD_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082744Z_IAST_0000000016 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012		Same as set 5.
Set 7	IASI_BRD_xx_M01_20140415150000Z_xxxxxxxxxxxxxxZ_20140415132137Z_IAST_0000000010 IASI_GRD_xx_M01_20140415150000Z_xxxxxxxxxxxxxxZ_20140415132142Z_IAST_0000000019	22/05/2014	Scan mirror reflectivity update.
	IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012		Same as set 5.
Set 8	IASI_BRD_xx_M01_20150209000000Z_xxxxxxxxxxxxxxZ_20150206092356Z_IAST_0000000011 IASI_GRD_xx_M01_20150202000000Z_xxxxxxxxxxxxxxZ_20150130134220Z_IAST_0000000020 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012	19/02/2015	TOP 11- On-board reduced spectra update. + On-ground dead pixel table scan reflectivity update

IASI L1 auxiliary files set version	*IASI L1 auxiliary files – M01*	*Date introduced on GS1*	*Comments*
Set 9	IASI_BRD_xx_M01_20160601000000Z_xxxxxxxxxxxxxxZ_20160525091317Z_IAST_0000000011 IASI_GRD_xx_M01_20160601000000Z_xxxxxxxxxxxxxxZ_20160525091327Z_IAST_0000000021 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012	28/06/2016	Scan mirror reflectivity update.
Set 10	IASI_BRD_xx_M01_20170701000000Z_xxxxxxxxxxxxxxZ_20170629135844Z_IAST_0000000013 IASI_GRD_xx_M01_20160601000000Z_xxxxxxxxxxxxxxZ_20160525091327Z_IAST_0000000021 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012	02/08/2017	TOP 13 - non-linearity correction update.
Set 11	IASI_BRD_xx_M01_20170907000000Z_xxxxxxxxxxxxxxZ_20170906135816Z_IAST_0000000014 IASI_GRD_xx_M01_20160601000000Z_xxxxxxxxxxxxxxZ_20160525091327Z_IAST_0000000021 IASI_ODB_xx_M01_20130417100000Z_xxxxxxxxxxxxxxZ_20130417082506Z_IAST_0000000012	21/09/2017	TOP 14 - On-board reduced spectra update.
Set 12	IASI_BRD_xx_M01_20171004000000Z_xxxxxxxxxxxxxxZ_20171003081207Z_IAST_0000000014 IASI_GRD_xx_M01_20171004000000Z_xxxxxxxxxxxxxxZ_20171003081218Z_IAST_0000000022	02/11/2017	Scan mirror reflectivity update.
Set 13	IASI_BRD_xx_M01_20190628000000Z_xxxxxxxxxxxxxxZ_20190627074552Z_IAST_0000000014 IASI_GRD_xx_M01_20190628000000Z_xxxxxxxxxxxxxxZ_20190627074600Z_IAST_0000000023	30/07/2019	Scan mirror reflectivity update.
Set 14	IASI_BRD_xx_M01_20190706000000Z_xxxxxxxxxxxxxxZ_20190705085422Z_IAST_0000000015	08/08/2019	New coding tables for moon spectra acquisition

Table 4: IASI Level 1 PPF auxiliary parameter file versions for Metop-B.

IASI L1 auxiliary files set version	*IASI L1 auxiliary files – M03*	*Date introduced on GS1*	*Comments*
Set 1	IASI_BRD_xx_M03_20190529120000Z_xxxxxxxxxxxxxxZ_20190529080235Z_IAST_0000000013 IASI_GRD_xx_M03_20190326000000Z_xxxxxxxxxxxxxxZ_20190325144039Z_IAST_0000000004 IASI_ODB_xx_M03_20190326000000Z_xxxxxxxxxxxxxxZ_20190325143708Z_IAST_0000000004	06/06/2019	End of Cal/Val and new coding tables for moon spectra acquisition

Table 5: IASI Level 1 PPF auxiliary parameter file versions for Metop-C

4 IASI LEVEL 1 PRODUCTS OVERVIEW

4.1 The IASI instrument

The infrared atmospheric sounding interferometer (IASI) is a Fourier transform spectrometer based on the Michelson interferometer, associated with an integrated imaging system (IIS). The Fourier transform spectrometer provides infrared spectra with high resolution and the IIS imager is a broadband radiometer with a high spatial resolution.

The main goal of the IASI mission is to provide atmospheric emission spectra to derive temperature and humidity profiles with high vertical resolution and accuracy. The instrument is also designed to retrieve 1) trace gases profiles such as ozone, nitrous oxide, carbon dioxide and methane, 2) land and sea surface temperature and emissivity and 3) cloud properties among other applications.

4.1.1 Spectral characteristics of IASI

IASI has 8461 spectral samples, aligned in three bands between 645.0 cm^{-1} and 2760 cm^{-1} (15.5 µm and 3.63 µm), with a spectral resolution of 0.5 cm^{-1} (Full Width Half Maximum - FWHM) after apodisation (L1c spectra). The spectral sampling interval is 0.25 cm^{-1}. The IASI sounder is coupled with the IIS imager that measures between 833 cm^{-1} and 1000 cm^{-1} (12 µm and 10 µm). Table 6 summarises the spectral characteristics of IASI.

Band	*Wave numbers (cm^{-1})*	*Wavelength (µm)*
1	645.0 – 1210.0	8.26 – 15.50
2	1210.0 – 2000.0	5.00 – 8.26
3	2000.0 – 2760.0	3.62 – 5.00

Table 6: IASI's three spectral bands

The IIS is used for collocation between IASI and the AVHRR. It is only available during Level 1 processing. The full specification of the IASI instrument is given in [*RD 4]*.

Warning: The radiometric calibration performed during the on-board processing provides three real spectra corresponding to each of the three bands of the instrument presented in Table . They are then merged to give one full spectrum covering the entire useful band of IASI. In these two inter-band regions (1145 – 1190 cm^{-1} and 1925 – 1980 cm^{-1}), the measurement quality decreases at the edge of the band because the measurement noise increases due to the decrease in optical transmission and detector sensitivity.

4.1.2 Instrument modes

The instrument can be switched to two different modes in which scientific data are acquired:

- N*ominal mode (also called NormalOp)*: 30 Earth views (scan positions) and two calibration views (Black body and Cold space) are collected.
- *External calibration mode*: Specified targets are scanned (Earth View, Black Body, or one of the Cold Space can be selected) instead of the 30 Earth views.

4.1.3 IASI on-board processing

Considerable data rate reduction is achieved by pre-processing the calibration on board. The on-board processing consists of 1) the Fourier transformation of the measured interferograms, 2) the non-linearity correction for band B1, 3) the radiometric calibration and merging of the three different bands into one spectrum. Processing and quality information are generated to ensure the quality of L0 products. This approach reduces the raw data rate from about 45 Mbit/s to about 1.5 Mbit/s.

On ground, the IASI Level 1 processing is performed within the EUMETSAT Polar System (EPS) core ground segment (CGS). This includes the radiometric post-calibration of IASI based on additional information from the IIS and the IASI spectral database. The geolocation of the IASI products is performed with the help of AVHRR L1b products. The calibrated IASI L1c spectra are sampled onto an equidistant grid and are apodised.

4.1.4 Sampling characteristics of IASI

IASI is an across-track scanning system with scan range of ±48° 20′, symmetrically with respect to the nadir direction. A nominal scan line covers 30 scan positions towards the Earth and two calibration views. One calibration view is into deep space, the other is observing the internal black body. The scan starts on the left side with respect to the flight direction of the spacecraft.

The elementary (or effective) field of view (EFOV) is the useful field of view at each scan position. Each EFOV consists of a 2 × 2 matrix of so-called instantaneous fields of view (IFOV). Each IFOV has a diameter of 14.65 mrad, which corresponds to a ground resolution of 12 km at nadir and a satellite altitude of 819 km. The 2 × 2 matrix is centred on the viewing direction. The instrument points spread function (PSF) is defined as the horizontal sensitivity within an IFOV. The IFOV diameter (D = 14.65 mrad) is defined so that the integral of the PSF over this circular area is larger than 95 %. The non-uniformity within the inner 80 % of the IFOV (D=11.72 mrad) is not larger than ± 5 %. The IIS field of view is defined by a square area of 59.63 × 59.63 mrad, consisting of 64 × 64 pixels and covering the same area as the IASI EFOV.

The instrument scans in a step and stare modus. Each interferogram is acquired within 151 ms. The 30 Earth interferograms per scan line are taken in equally spaced time intervals every 8/37 seconds so that a synchronisation with AMSU is achieved. Figure 1 summarises the synchronisation of IASI with the ATOVS instruments AMSU and MHS.

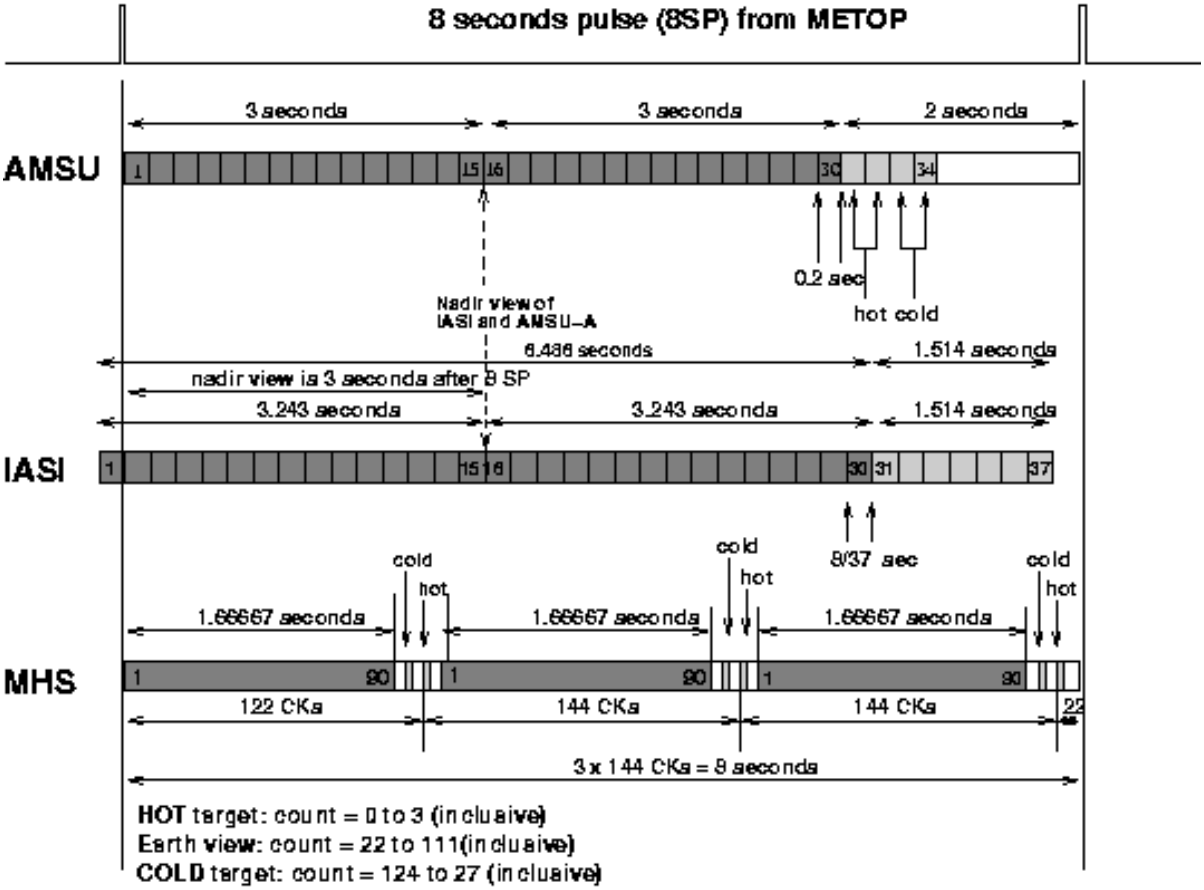

Figure 1: Synchronisation of IASI and ATOVS instruments on Metop

Characteristics	*Value*	*Unit*
Scan type	step and stare	–
Scan rate	8	second
Stare interval	151	ms
Step interval	8/37	second
Number of Earth scans / line - EFOV	30	–
Swath	± 48.333	degrees
Swath width	± 1100	km
IFOV - shape at nadir	circular	–
IFOV - size at nadir	12	km
IFOV - size at edge of scan line across track	39	km
IFOV - size at edge of scan line along track	20	km

Table 7: IASI scanning characteristics

The collocation between IASI and the ATOVS instruments is shown in the following figures. It can be recognised that IASI starts scanning shortly before AMSU (Figure 2); therefore, the IASI EFOV is not fully centred within the AMSU field of view at the beginning and end of the scan line (just discernible in Figure 3).

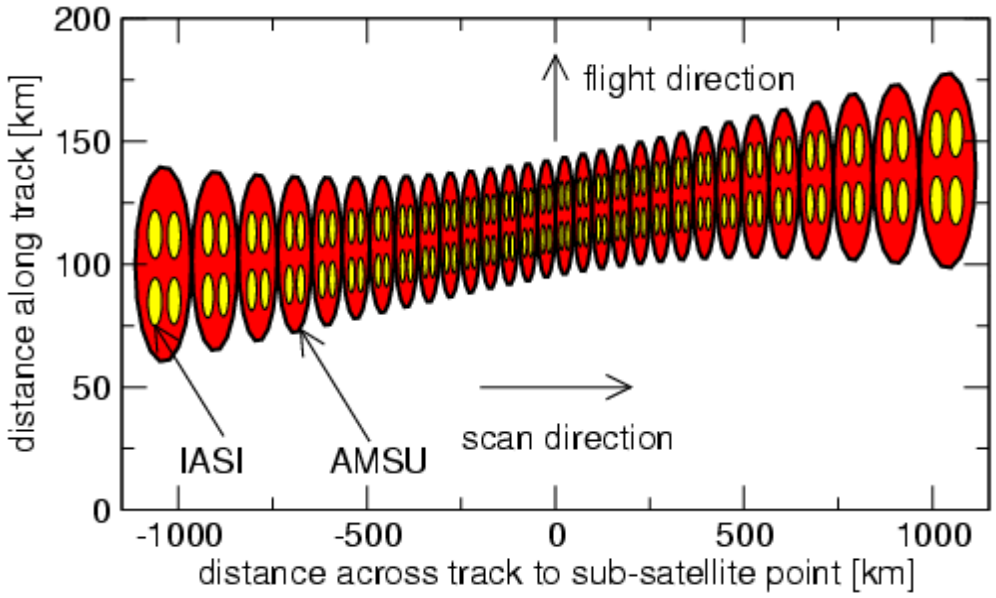

Figure 2: Collocation of IASI (yellow) and AMSU (red). The distance between adjacent pixels is given for one scan line in km.

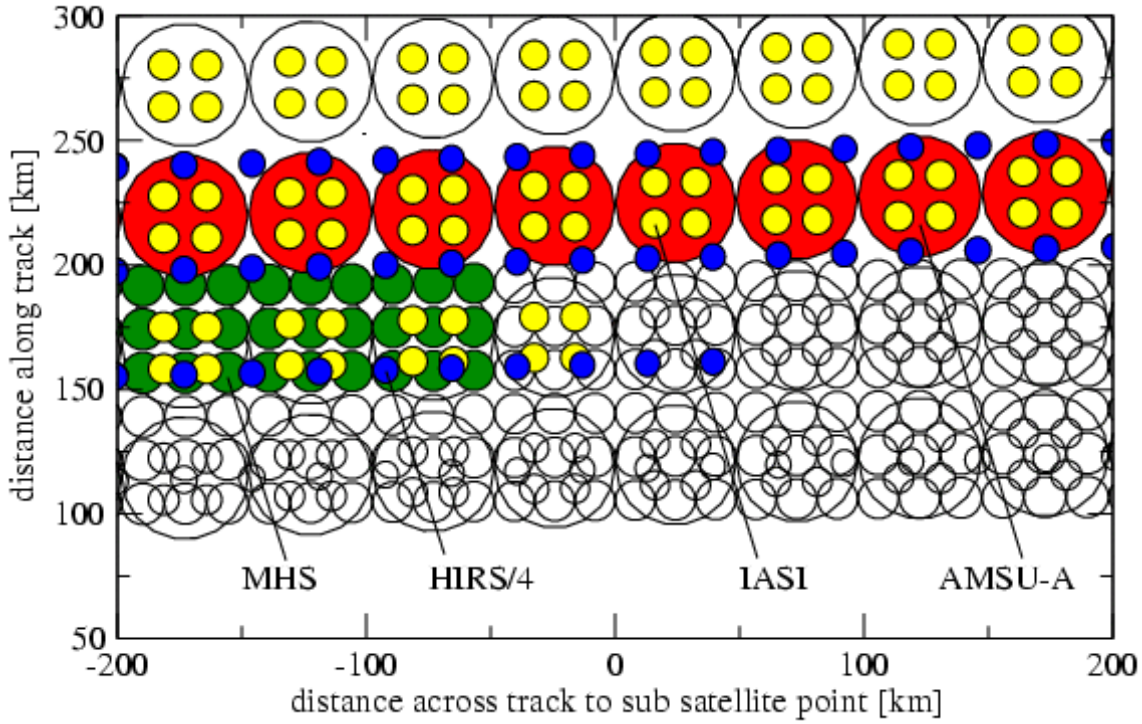

Figure 3: The collocation between IASI (yellow), AMSU (red), MHS (green) and HIRS (blue) is shown for four scan lines around nadir. The distance along and across track is given in km.

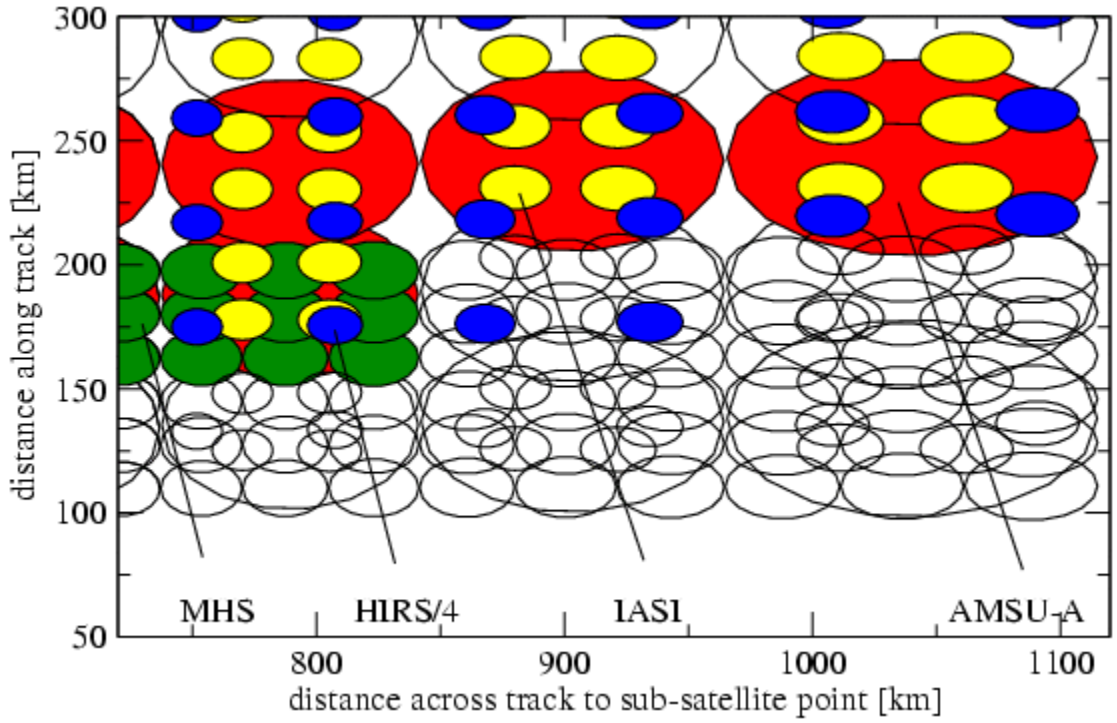

Figure 4: The collocation between IASI (yellow), AMSU (red), MHS (green) and HIRS (blue) is shown for four scan lines at the end of the IASI scan line. The distance along and across track is given in km.

4.2 Overview of the ground processing and calibration

The Level 1 ground processing of IASI is illustrated in Figure 5, below.

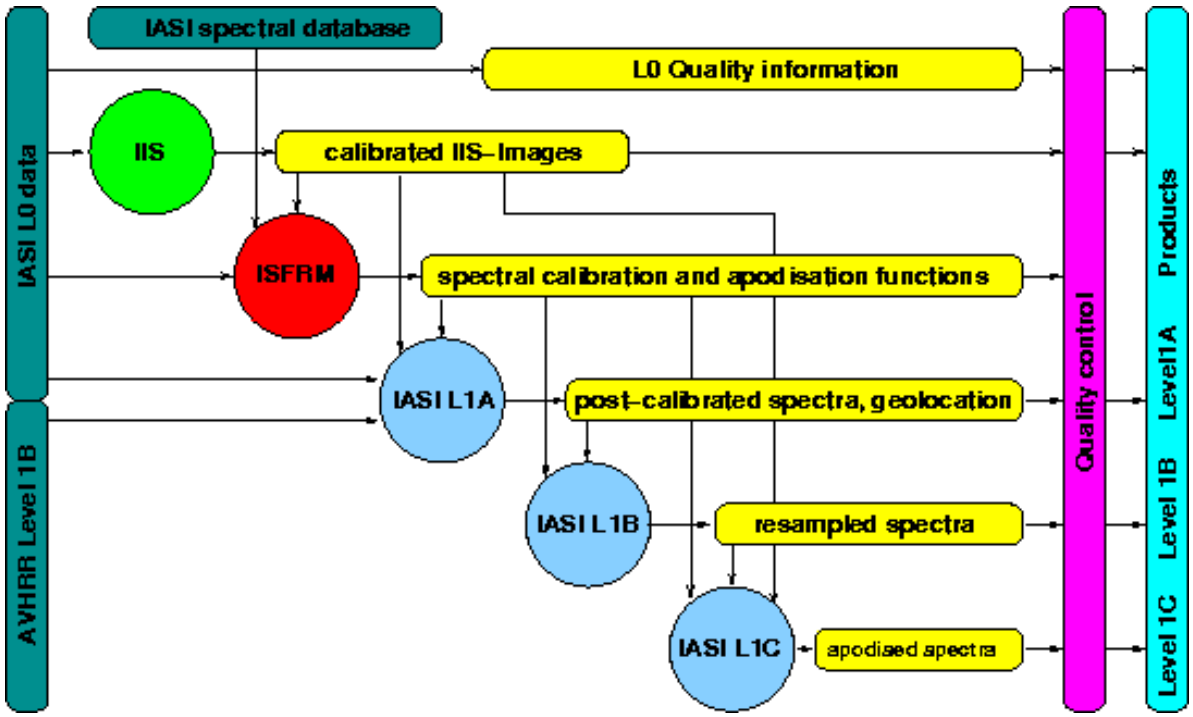

Figure 5: Level 1 processing chain including IASI L0, AVHRR L1b and the IASI spectral database

The IASI Level 1 is processed in three different chains, which have to be executed consecutively. It is important to note that the ISFRM chain has to be executed on a complete granule (22 lines) to obtain the spectral calibration and apodisation functions needed as input for the IASI chain. As the ISFRM chain uses the calibrated images from the IIS, the IIS chain must first be executed over a complete granule as well.

4.2.1 IIS chain

The IIS is calibrated using the deep space and the internal black body views. From these two readings the slope and the offset are generated and filtered. Finally, the images are calibrated by applying these on a pixel-by-pixel basis.

4.2.2 ISRFEM chain

The purpose of the ISRFEM chain is to supply the spectral calibration function, which is used to perform the spectral calibration within the IASI chain. Additionally, the apodisation function is generated. Both the spectral calibration and the apodisation function depend directly on the position of the interferometer axis in the detector plane. The actual interferometer axis is therefore calculated within this chain and the corresponding apodisation and calibration functions extracted and interpolated from the pre-calculated IASI spectral database.

4.2.3 IASI Level 1 chain

4.2.3.1 Level 1a

The spectra have been radiometrically calibrated during on-board (L0) processing. At this stage an approximation with respect to wave numbers used for the calculation of the Planck function is applied. Using the spectral calibration function from the ISRFEM chain, new Planck functions are calculated and an appropriate correction applied to the spectra.

As the emissivity of the internal black body is not unity, the contributions from the reflected radiance based on a model of radiant surfaces seen by the detector are taken into account.
The impact of the scanning mirror at different angles and its temperature dependency is accounted for. Finally, the geolocation of IASI is estimated based on the results from the correlation of AVHRR Level 1b data and the calibrated IIS image.

4.2.3.2 Level 1b

To perform the resampling, the IASI Level 1a spectra are over-sampled by a factor of five. The over-sampled spectra are finally interpolated on a new equidistant spectral grid by using a cubic spline interpolation.

4.2.3.3 Level 1c

The IASI Level 1b spectra are apodised using the apodisation function estimated within the ISRFEM chain. The Level 1 processing finishes with the generation of the radiance cluster analysis based on AVHRR within the IASI IFOV using the IASI point spread function (IPSF). The offset between the IASI sounder and IIS and the IIS-AVHRR offset is used to produce the IASI-AVHHR offset.

4.2.4 Quality control

An overall quality flag is generated from information supplied by the on-board and Level 1 processing as shown in Figure 5. The quality flag and the performance indicators of the IASI Level 1 products are described in detail in section 4.3.1.

4.2.4.1 On-board processor

Quality information and performance measurements gained during the on-board processing are ingested into the Level 1 processing and used for the generation of the Level 1 quality flag and the performance indicators.

4.2.4.2 Level 1 processor

The quality control chain as part of the Level 1 processor generates instrument performance information and the overall quality flag. In this chain not only L1 processing information is taken into account but quality information from on-board processing is incorporated as well.

4.3 IASI Level 1 product characteristics

4.3.1 Quality information in the product

The Boolean flags *DEGRADED_INST_MDR* and *DEGRADED_RPOC_MDR* give general quality information with respect to degradation due to instrument and/or processing. These variables are the generic quality indicators.
The new IASI L1 quality indicator (GQisFlagQualDetailed) provides further information if quality is degraded and provides the Boolean flag as a summary of all three bands (which is identical to the previous definition of the GQisFlagQual flag, for convenience). Please see the **Error! Reference source not found.** in Table 8 for a more detailed description.

A further quality flag and instrument noise indicators are generated during the Level 1 processing based on information gained during on-board and Level 1 processing (see Table 8). The Boolean quality flag (GQisFlagQual) indicates the quality of each of the three IASI spectral bands Table for every IASI spectrum (named "GS1cSpect" in the case of the L1C product). *GQisFlagQual* is established by evaluating the formerly derived quality flags and quality information from on-board and Level 1 processing, e.g. quality of the internal calibration black body temperature measurement.
The noise performance of the IASI sounder and the IIS is given by these performance indicators:

- GQisQualIndexSpect and GQisQualIndexRad,
- GQisQualIndex and GQisQualIndexIIS.

The contributions from the spectral calibration to the instrument noise relative to the nominal instrument noise are given by GQisQualIndexSpect. GQisQualIndexRad indicates the impact of the radiometric calibration of the noise level of the product. Contributions from both radiometric and spectral calibration on the instrument noise are given in GQisQualIndex, again relative to the nominal instrument noise. The performance of the IIS is indicated by GQisQualIndexIIS, which again measures the performances as the ratio between actual IIS noise and nominal IIS noise. These performance indicators are calculated on the basis of a complete scan line.

Performance indicators are meant to be used for updating the nominal instrument noise to its actual value rather than indicating the usability of the measurements itself. The usability of an IASI spectrum is indicated by the Boolean flag GQisFlagQual for each band of every IASI spectrum. The performance of the co-registration between IASI and AVHRR measurements is given by GQisQualIndexLoc. This value is the semi-major axis of the ellipse error in AVHRR pixel units (estimated by the Level 1 processing for each individual field of view). *GQisQualIndexLoc* indicates the co-registration error and therefore small values indicate good quality.
A list of the quality flags is given in Table 8 and Section 9.

Level 1 quality flag	*Description*	*Boolean*	*Occurrence*	*MDR*
DEGRADED_INST_MDR	Quality of MDR, degradation due to instrument	Yes 0=okay, 1=bad	line	1A, 1B, 1C
DEGRADED_RPOC_MDR	Quality of MDR, degradation due to processing	Yes 0=okay, 1=bad	line	1A, 1B, 1C
GQisFlagQual	Individual IASI-System quality flag	Yes 0=okay, 1=bad	Each spectral band of IFOV/ spectrum	1A, 1B, 1C
GQisFlagQualDetailed	Detailed IASI-System quality flag	Yes 0=okay, 1=bad	IFOV	1A, 1B,1C
GQisQualIndex	Indicator for instrument noise performance (contributions from spectral and radiometric)	No	line	1A, 1B, 1C
GQisQualIndexSpect	Indicator for instrument noise performance (contributions from spectral calibration)	No	line	1A, 1B, 1C
GQisQualIndexRad	Indicator for instrument noise performance (contributions from radiometric calibration)	No	line	1A, 1B, 1C
GQisQualIndexLoc	Indicator geometric quality index	No	line	1A, 1B, 1C
GQisQualIndexIIS	Indicator for IIS imager noise performance	No	line	1A, 1B, 1C

Table 8: IASI Level 1 quality flags and performance indicators.

4.3.2 Improvement of pixel differences observed in Level 1c radiances

4.3.2.1 Observations performed at EUMETSAT

Since July 2007, interpixel radiance differences at Level 1c have been observed in some parts of the spectra. These radiance differences were exceeding 0.1 K, though it should be noted that this is less than 0.1 % in terms of radiance.

This was not a non-conformance at instrument level because interpixel radiometry is specified on black body targets and atmospheric spectra have been analysed in this study. In any case, some applications, in particular Level 2 inversions using channels above 2000 cm^{-1}, suffered from this effect. It was therefore decided to analyse the problem and try to find a solution to fix it. This point is also worth addressing in the frame of Level 1c reprocessing in order to produce hyperspectral climatological data records. The Centre National d'Études Spatiales (CNES) has been conducting the study.

4.3.2.2 Analysis performed by CNES

After some investigation, it was found that the apodisation performed in the algorithm S1C described in [RD 6] is not able to fully correct the impact of the cube corner constant offset. The two main differences between the cube corner constant shear effect and others are the introduction of the following:

- A translation of the position of the zero path difference (ZPD) (x_{ZPD} is not 0), with the consequence that even after the normalisation, the contrast at ZPD is no longer one. A side effect of this normalisation is that all values of the apodisation function are affected. This normalisation is necessary to take into account the radiometric calibration in the instrument spectral response function (ISRF).
- An important asymmetry in the S1C apodisation function: this is not fully representative of the processing occurring before S1C. Indeed, assuming the radiometric calibration is done correctly in the on-board processing, the phase has been removed and the spectrum should be almost real (only noise introduces a residual imaginary part). Therefore, the interferogram is no longer dissymmetric. That means that the self-apodisation function considered in S1C processing should be symmetrical with respect to x_{ZPD}. This was not the case in operational ground processing.

4.3.2.3 Solution proposed by CNES

The solution was to symmetrise the self-apodisation function used to apodise the spectra in the algorithm S1C and to resample by taking into account the true x_{ZPD}, even if this last point does not have a strong effect. To avoid modifying the operational ground processing software, CNES has implemented the symmetrisation of the self-apodisation function and x_{ZPD} resampling through the Spectral Data Base (ODB), the one used since 7 February 2011.

4.3.2.4 Results of the modification

The interpixel signature has been largely reduced, especially in band 3. This has a positive impact on the retrieved CO in the IASI L2 products.
Note: A very small residual interpixel effect can still be observed, mostly in the difference between pixels one to two and pixels three to four. This is mostly due to the "ghost" effect–which cannot be corrected by the operational ground processing. The residual signatures are mostly seen in band 1 and band 3. The main reason for not correcting this effect is because its phase at ZPD is different for all spectra and cannot be simply and accurately estimated in flight.

4.4 Summary of IASI Level 1 product applications

The main purpose of the IASI Level 1 products are the assimilation of calibrated Level 1 radiance spectra at NWP centres and the input for the Level 2 processing chain for the retrieval of temperature and humidity profiles.

5 DATA VIEWING AND READING

5.1 Generic tools for data reading

Readers for the native EPS format IASI Level 1c products are available online at the EUMETSAT web page. See the page:
https://www.eumetsat.int/website/home/Data/DataDelivery/SupportSoftwareandTools/index.html.
All of the tools on this page can currently be used to read EUMETSAT data. The page lists both freeware software (no signed licence required) and licensed software (signed license required). The products can be read using netCDF version.

Note: Support of the HDF5 format has been discontinued for IASI Level 1c products.

NetCDF (network Common Data Form) is a set of interfaces for array-oriented data access and a freely distributed collection of data access libraries for C, Fortran, C++, Java, and other languages. The NetCDF libraries support a machine-independent format for representing scientific data. Together, the interfaces, libraries, and format support the creation, access, and sharing of scientific data. See the UCAR Community Programs NetCDF Downloads page for details and downloads. Software capable of reading the WMO formats is available from a variety of sources, including ECMWF.

5.2 BEAT for data reading

The Basic Envisat Atmospheric Toolbox (BEAT) provides a set of tools for ingesting, processing and analysing atmospheric remote sensing data. The primary instruments supported by BEAT are GOMOS, MIPAS and SCIAMACHY (flown on the Envisat satellite). However, BEAT also supports access to data from a wide range of other atmospheric instruments like IASI.

BEAT consists of several modules. These modules can be applications, libraries, interfaces to existing applications (such as IDL and MATLAB), or interfaces to other programming languages (such as Fortran and Python). More options are available in the last version, version 6.4.0, since November 2010. BEAT is provided by Science and Technology BV and can be downloaded free for non-commercial use via the following link: www.science-and-technology.nl/beat/.

6 IASI LEVEL 1 PRODUCT FORMATS AND DISSEMINATION

A description of the dissemination means for EPS products and formats is provided in the following paragraphs, focusing down on IASI products and their formats.

6.1 How EPS products will be disseminated

6.1.1 Satellite Direct Broadcast Service

Instrument and ancillary data acquired by the Metop satellites will be broadcast and received by authorised users in real-time via:

- ⇨ High Resolution Picture Transmission (HRPT) - transmission of data from all Metop instruments in full resolution;

The data will be received by local reception stations. It is the responsibility of the user to procure and install a local reception station. Specification documentation for a EUMETSAT-based HRPT Reference User Station is available for information on the EUMETSAT webpage https://www.eumetsat.int/website/home/Data/DataDelivery/DirectDissemination/index.html.
The output format of the EUMETSAT HRPT Reference User Station is Level 0 products in the EPS Native format [RD 11], [RD 13].

The broadcast data are encrypted. To get authorisation to access the data, users need to register with the EUMETSAT User Services and will receive the data decryption information.
Data from the NOAA payload are also broadcast and received by local users via the HRPT mechanism. For details on the NOAA HRPT system, the reader is referred to the NOAA KLM User's Guide [**Error! Reference source not found.**].

6.1.2 EUMETCast

Global EPS products at different levels will be distributed in near real-time via EUMETSAT's Data Distribution System (EUMETCast). EUMETCast utilises the services of a satellite operator and telecommunications provider to distribute data files using Digital Video Broadcast (DVB) to a wide audience located within the geographical coverage zone which includes most of Europe and certain areas in Africa.
Within the current EUMETCast configuration, the multicast system is based upon a client/server system with the server side implemented at the EUMETCast uplink site in Usingen, Germany and the client side installed on the individual EUMETCast reception stations. The telecommunications suppliers provide the DVB multicast distribution mechanism. Data/product files are transferred via a dedicated communications line from EUMETSAT to the uplink facility. These files are encoded and transmitted to a geostationary communications satellite for broadcast to user receiving stations. Each receiving station decodes the signal and recreates the data/products according to a defined directory and file name structure. A single reception station can receive any combination of the provided services.
A typical EUMETCast reception station comprises a standard PC with DVB card inserted and a satellite off-set antenna fitted with a digital universal V/H LNB. In addition, users require the multicast client software, which can be obtained via the EUMETSAT User Services.
More detailed information on this service can be found in the EUMETSAT webpage https://www.eumetsat.int/website/home/Data/DataDelivery/EUMETCast/index.html.
Products distributed on EUMETCast can be formatted in a variety of formats, including EPS native format and the WMO formats (BUFR and GRIB).

6.1.3 GTS/RMDCN

A subset of EPS products will be disseminated additionally in near real-time via the Global Telecommunication System (GTS). GTS is the World Meteorological Organization integrated network of point-to-point circuits, and multi-point circuits which interconnect meteorological telecommunication centres. Its purpose is to enable an efficient exchange of meteorological data and products in a timely and reliable way to meet the needs of World, Regional and National Meteorological Centres. The circuits of the GTS are composed of a combination of terrestrial and satellite telecommunication links. Meteorological Telecommunication Centres are responsible for receiving data and relaying them selectively on GTS circuits. The GTS is organised on a three-level basis, consisting of the following:

- The Main Telecommunication Network, linking together 3 World meteorological centres and 15 regional telecommunication hubs.
- The Regional Meteorological Telecommunication Networks, consisting of an integrated network of circuits interconnecting meteorological centres in a region, which are complemented by radio broadcasts where necessary. In Europe, the GTS network is supported by the Regional Meteorological Data Communication Network (RMDCN).
- The National Meteorological Telecommunication Networks, which extend the GTS network down to national level.

More detailed information on this service can be found in Section 10 and in the WMO Manual on Codes [RD 15].

Products distributed on the GTS are in official WMO formats, namely BUFR or GRIB.

6.1.4 EUMETSAT Data Centre

All EPS products and auxiliary data are normally archived and made available to users from the EUMETSAT Data Centre (formerly known as the UMARF or Archive Services) upon request.

The Data Centre can be accessed through the EUMETSAT webpage. See https://www.eumetsat.int/website/home/Data/DataDelivery/index.html. Access is through a web interface, the Online Ordering Application, through which the users are able to browse and order products, manage their user profile, retrieve products, documentation and software libraries, get help, etc. The Data Centre features include geographical and time sub-setting and image preview. EPS products archived in the Data Centre can be accessed in a variety of formats, including EPS native format and NetCDF.

6.2 IASI products dissemination

Table summarises the different dissemination means and formats for all IASI Level 1 products available to users.

Format	*Real-Time Direct Broadcast*	*Near-Real-Time dissemination on EUMETCast (timeliness)*	*Near-Real-Time dissemination on GTS (timeliness)*	*EUMETSAT Data Centre retrieval (timeliness)*
Metop raw data format	IASI HRPT raw data stream and Metop Admin message	--	--	--
EPS native format	--	--	--	IASI Level 1a IASI Level 1b IASI Level 1c IASI Verification data IASI Engineering data (8-9 h)
NetCDF	--	--	--	IASI Level 1c
WMO (BUFR)	--	IASI Level 1c (full product) (2 h 15 min)	IASI Level 1c (366 channel subset only)	--

Table9: Summary of dissemination means and formats for IASI Level 1 products.

Note: "Timeliness*" refers only to the elapsed time between sensing and dissemination.*

Real-time broadcast of IASI raw data is not covered in this guide. It is noted though for informational purposes that the raw data streams mentioned in the table above indicate what is broadcast by the platform. Depending on the reception system used (i.e., the HRPT local reception system), different formats of this raw data stream are produced. This depends on the local reception station provider. For MetOP HRPT stations, the Reference User Station has been developed to produce EPS Native Level 0 format products. Although available through the EUMETSAT Data Centre, IASI Level 0 products are not considered as an end-user product, hence they are not addressed in this guide either.

6.2.1 Near-real-time dissemination

The IASI Products disseminated to users in near real-time are IASI Level 1c products, with a timeliness of 2 hours 15 minutes from time of sensing. The dissemination granularity of the data is three minutes for Level 1c.

6.2.2 Archive retrieval

The IASI Level 1 products available from the EUMETSAT Data Centre are as follows:

- IASI Level 1a
- IASI Level 1b
- IASI Level 1c

The products are archived as full-dump products, but sub-setting capabilities are provided to the user in the retrieval step. The products are available for the users in the EUMETSAT Data Centre eight to nine hours after sensing.

6.3 IASI EPS native product formats

6.3.1 The EPS native formats

6.3.1.1 General overview of the EPS generic product format

All products in EPS native format are structured and defined according to an EPS Generic Product Format. This format is not IASI-specific. The general product section breakdown is given, and the following sections will focus on how this generic format is further applied to IASI products.
This description do not aimed at supporting the writing of reader software for the IASI or other EPS products, because readers and product extraction tools are already available (see also Section 5). The intention of this and the following sections is to provide enough information to be able to use such available tools and to interpret the retrieved information.

For users interested in writing their own product readers for one or several IASI products in EPS native format, we refer them to the detailed format specifications provided in [RD 1] and [RD 2].
The general structure of the products is broken down in sections, which contain one or more records of different classes. Every single record is accompanied by a Generic Record Header (GRH), which contains the metadata necessary to uniquely identify the record type and occurrence within the product. The following general structure is followed by all EPS products, where all the sections occur always in the given order.

Header Section	Contains metadata applicable to the entire product. The header section may contain two records, the Main Product Header Record (MPHR) and the Secondary Product Header Record (SPHR). This is the only section that contains ASCII records; the rest of the product is in binary

Pointer Section	Contains pointer information to navigate within the product. It consists of a series of Internal Pointer Records (IPR), which include pointers to records within the Global Auxiliary Data, Variable Auxiliary Data and Body Sections that follow.

Global Auxiliary Data Section	Contains information on the auxiliary data that have been used or produced during the process of the product and applies to the whole length of the product. There can be zero or more records in this section, and they can be of two classes: Global External Auxiliary Data Record (GEADR), containing an ASCII pointer to the source of the auxiliary data used, and Global Internal Auxiliary Data Record (GIADR), containing the auxiliary data used itself.

Variable Auxiliary Data Section	Contains information on the auxiliary data that have been used or produced during the process of the product and may vary within a product, but with a frequency in any case less than the measurement data itself. There can be zero or more records in this section, and they can be of two classes: Variable External Auxiliary Data Record (VEADR), containing an ASCII pointer to the source of the auxiliary data used, and Variable Internal Auxiliary Data Record (VIADR), containing the auxiliary data used itself.

Body Section	This is usually the main bulk of the product and contains the raw or processed instrument data and associated information. This section contains time-ordered Measurement Data Records (MDR). A particular type of MDR can occur to indicate the location of an unexpected data gap within any product, the Dummy Measurement Data Record (DMDR).

The format of the MPHR, IPRs, GEADR, VEADR and DMDRs is common to all products, while the other records can be of different formats and contents, and identified as of different sub-classes for different products. Every record consists of a series of fields, which can have different data types. See Generic PFS RD 1 Issue v8C for all possible data types.

It is important to note that GEADR and VEADR records are included in the products to support processing configuration control for EUMETSAT at product level. They point to the name of auxiliary data files used in the processing, but they are not of any interest or use to the end-user for the utilisation of the products.
Two types of records deserve special description, because they are key to navigating within the products, namely the GRH and the IPR. Their format and the meaning of their fields are detailed in Generic PFS RD 1 Issue v8C.
Table 10 gives an example of the general structure of the Generic Product Format.

Section	*Record Class*	*Record Subclass*	*Start Time*	*Stop Time*
HEADER SECTION	MAIN PRODUCT HEADER RECORD		T1	T6
	SECONDARY PRODUCT HEADER RECORD		T1	T6
INTERNAL POINTER SECTION	INTERNAL POINTER RECORD (GEADR Subclass A)		T1	T6
	INTERNAL POINTER RECORD (GEADR Subclass B)		T1	T6
	INTERNAL POINTER RECORD (GIADR Subclass A)		T1	T6
	INTERNAL POINTER RECORD (GIADR Subclass B)		T1	T6
	INTERNAL POINTER RECORD (GIADR Subclass C)		T1	T6
	INTERNAL POINTER RECORD (VEADR Subclass A)		T1	T6
	INTERNAL POINTER RECORD (VEADR Subclass B)		T1	T6
	INTERNAL POINTER RECORD (VEADR Subclass C)		T1	T6
	INTERNAL POINTER RECORD (VIADR Subclass A)		T1	T6
	INTERNAL POINTER RECORD (VIADR Subclass B)		T1	T6
	INTERNAL POINTER RECORD (VIADR Subclass C)		T1	T6
	INTERNAL POINTER RECORD (MDR Subclass A)		T1	T6
	INTERNAL POINTER RECORD (MDR Subclass B)		T1	T6
	INTERNAL POINTER RECORD (MDR DUMMY)		T1	T6
	INTERNAL POINTER RECORD (MDR Subclass A)		T1	T6
	INTERNAL POINTER RECORD (MDR Subclass B)		T1	T6
GLOBAL AUXILIARY DATA SECTION	GLOBAL INTERNAL AUXILIARY DATA RECORD	SUBCLASS A	T1	T6
	GLOBAL INTERNAL AUXILIARY DATA RECORD	SUBCLASS B	T1	T6
	GLOBAL INTERNAL AUXILIARY DATA RECORD	SUBCLASS A	T1	T6
	GLOBAL INTERNAL AUXILIARY DATA RECORD	SUBCLASS B	T1	T6
	GLOBAL INTERNAL AUXILIARY DATA RECORD	SUBCLASS C	T1	T6
VARIABLE AUXILIARY DATA SECTION	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS A	T1	T6
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS B	T1	T3
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS B	T3	T6
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS C	T1	T5
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS C	T5	T6
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS A	T1	T2
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS A	T2	T4
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS A	T4	T6
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS B	T1	T6
	VARIABLE INTERNAL AUXILIARY DATA RECORD	SUBCLASS C	T1	T6
BODY SECTION	MEASUREMENT DATA RECORD	SUBCLASS A	T1	T2
	MEASUREMENT DATA RECORD	SUBCLASS B	T2	T3
	MEASUREMENT DATA RECORD	DUMMY	T3	T4
	MEASUREMENT DATA RECORD	SUBCLASS A	T4	T5
	MEASUREMENT DATA RECORD	SUBCLASS B	T5	T6

Table 10: Generalised schematic of the generic product format.

6.3.1.2 Granularity of the EPS products

The Full EPS product is produced by processing a dump of data. This is the product size used to archive in the EUMETSAT Data Centre.
In addition, the Regional EPS product is a full product that has been passed through a geographical filter. This may happen, for example, during the retrieval of the product from the Data Centre.
Finally, a Product Dissemination Unit (PDU) is the near-real-time dissemination of the full product, and it is typically of three minutes. A PDU is often referred to as product *granule*.
The EPS Generic Product Format has been defined to apply to any length of sensing. That means that the same generic format described above applies to a three-minute duration granule, half an orbit or a full dump of data. The length in time of the product is contained in the MPHR.

6.3.1.3 Product format version control

Every record class and sub-class has an associated record version number contained in its corresponding GRH. In addition, each product has a format version number, which is stored in the MPHR.

6.3.1.4 Product naming convention

File naming convention for EPS products in EPS native format provides a product name that uniquely identifies any product and provides a summary of its contents. The field contents in a product name correspond to those in the MPHR.

<INSTRUMENT_ID>_
<PRODUCT_TYPE>_
<PROCESSING_LEVEL>_
<SPACECRAFT_ID>_
<SENSING_START>_
<SENSING_END>_
<PROCESSING_MODE>_
<DISPOSITION_MODE>_
<PROCESSING_ TIME>

Product Name Field / MPHR Field	*Description*	*Size in Characters*
INSTRUMENT_ID	Instrument identification	4
PRODUCT_TYPE	Product Type	3
PROCESSING_LEVEL	Processing Level Identification	2
PROCESSING_LEVEL	Processing Level Identification	2
SPACECRAFT_IUD	Spacecraft identification	3
SENSING_START	UTC Time of start of Sensing Data	15
SENSING_END	UTC Time of end of Sensing Data	15
PROCESSING_MODE	Identification of the mode of processing	1
DISPOSITION_MODE	Identification of the type of processing	1
PROCESSING_TIME	UTC time at start of processing for the product	15

Table 11: EPS product name fields and their correspondence with MPHR fields.

For the IASI products, the resulting product file names are as follows:

Product	*Product name*
IASI Level L1a	IASI_xxx_1A_Mnn_< ...>
IASI Level L1b	IASI_xxx_1B_Mnn_< ...>
IASI Level L1c	IASI_xxx_1C_Mnn_< ...>

Table 12: Generic IASI product names

6.3.2 The IASI Level 1 product formats

Records to be found in the IASI Level 1 a/b/c products are as follows:

Record Name	*Description*	*Usage*	*Subclass ID*
MPHR	Main Product Header Record	Main product identification details	0
GIADR-QUALITY	Global Internal Auxiliary Data Record - Quality flags	General Product quality information	0
GIADR-SCALEFACTORS	Global Internal Auxiliary Data Record - Scaling factors for the Level 1a/b/c spectra	Scaling factors are needed for the calculation of IASI Level 1 radiance spectra	1
GIADR-ENGINEERING	Global Internal Auxiliary Data Record	Quality parameters for conversion of on board time to UTC	2
MDR-1A	Measurement Data Record Level 1a		0
MDR-1B	Measurement Data Record Level 1b		1
MDR-1C	Measurement Data Record Level 1c		2
GIADR-SCALEFACTORS	Global Internal Auxiliary Data Record - Scaling factors for the Level 1a/b/c spectra	Scaling factors are needed for the calculation of IASI Level 1 radiance spectra	1

Table 13: The different records in the IASI L1 products.

The IASI Level 1 products are organised as successive scan lines. Each IASI Level 1 product contains one IASI scan line. The IFOVs within one scan line are referenced by the geolocation. The START/STOP timeshare is indicated in the MPHR.

6.3.2.1 IASI Level 1a

The MDR-1A contains the decoded and radiometrically calibrated IIS images for the 30 IASI EFOVs. A radiometric post-calibration has been applied to the IASI spectra. Additionally, the spectral calibration is appended to the spectra, and the geolocation based on the collocation of the IIS with AVHRR/3 is performed.
The occurrence of the different records in the Level 1a products is as follows:

Record	*Occurrence*
MPHR	Once per product
GIADRs	Once per product
MDR-1A	Once per scan line

Table 14: The occurrence of the different records in the IASI L1a product.

See Section 9.1 for more details on the contents and format of the IASI Level 1a products.

6.3.2.2 IASI Level 1b

The occurrence of the different records in the Level 1b full resolution product is as follows:

Record	*Occurrence*
MPHR	Once per product
GIADRs	Once per product
MDR-1B	Once per scan line

Table 5: The occurrence of the different records in the IASI L1b product.

See Section 9.2 for more details on the contents and format of the IASI Level 1b products.

6.3.2.3 IASI Level 1c

The occurrence of the different records in the Level 1c full resolution product is as follows:

Record	*Occurrence*
MPHR	Once per product
GIADRs	Once per product
MDR-1C	Once per scan line

Table 66: The occurrence of the different records in the IASI L1c product.

See Section 9.3 for more details on the contents and format of the IASI Level 1c products.

6.3.3 Decoding of IASI spectra using scaling factors

The scaling factors to be used for the calculation of the IASI radiance spectra vary according to the interferometer band. They are to be read from the GIADR-SCALEFACTORS records which are detailed in Sections 9.1, 9.2 and 9.3 for IASI 1a, 1b and 1c, respectively. The scaling factors are used to decode the spectra via the following algorithm:

```
FOR numScale=1 to IDefScaleSondNbScale DO
   SF = IDefScaleSondScaleFactor(numScale)
      FOR(chanNb=IDefScaleSondNsfirst(numscale) TO IDefScaleSondNslast(numscale) DO
            w=chanNb - IDefNsfirst + 1
              SpectDecoded(w) = Spect(w).10^-SF
```

where:

Spect = GSmcSpect in the case of Level 1a,
Spect = GS1bSpect in the case of Level 1b,
Spect = GS1cSpect in the case of Level 1c.

For more details on decoding IASI spectra and images, please refer to Section 2.8 of the IASI Level 1 PFS [RD 2].

6.3.4 The computation of wave numbers

The spectral position of the IIS filter function can be calculated based on the Spectral Response Function (SRF), which is provided in the product. The array can contain up to 100 samples. The calculation can be performed as follows:

$$wavenumber\_IIS(k) = IDefIISSrfDWn \times (IDefIISSrfNsfirst + k - 2)$$

The data IDefIISSrfNslast determines the actual size of the SRF description.

6.3.4.1 IASI Level 1a spectra

The wave number of Level 1a spectra at sample number k is computed as follows:

$$wavenumber\_1a(k) = IDefSpectrDWn \times (IDefNsfirst + k - 2) \times fcs(k)$$

where the spectral calibration function fcs(k) must be computed from information extracted from the IASI OPS spectral database. See section 0.

6.3.4.2 IASI Level 1b/c spectra

IASI Level 1b and 1c spectra are provided with a constant sampling. The wave number associated with the sample number k is given by the formula:

$$wavenumber\_1b(k) = IDefSpectDWn1b \times (IDefNsfirst1b + k - 2)$$

The data IDefNslast1b determines the actual size of the spectrum.

6.3.4.3 Interpolation in the sounder spectral database

The spectral calibration function fcs(w, p, CCD) and the IASI instrument spectral response function isrf(w, p, CCD) may be calculated from the sounder spectra database. The fcs() and isrf() depend on the IFOV (pixel) number (p=1,2,3,4), the corner cube direction (CCD=0,1) and on wave number (w(k)).
The spectral calibration function fcs(w,p,CCD) is calculated using the following equation:

$$fcs(k, p, CCD) = p1 \times fcs1 + p2 \times fsc2 + p3 \times fcs3 + p4 \times fsc4$$

where:

$$p1 = GIsfPds1,\ fcs1 = ISdbGridFcs(k, p, CCD, i0, j0)$$

$$p2 = GIsfPds2,\ fcs2 = ISdbGridFcs(k, p, CCD, i0, j0+1)$$

$$p3 = GIsfPds3,\ fcs3 = ISdbGridFcs(k, p, CCD, i0+1, j0+1)$$

$$p4 = GIsfPds4,\ fcs4 = ISdbGridFcs(k, p, CCD, i0+1, j0)$$

$$\text{with } i0 = GIsfLinOrigin,\ j0 = GIsfColOrigin$$

IsdbGridFcs and ISdbGridIsrf are extracted from the IASI spectral database provided to the users, while GIsfPds1, GIsfPds2, GIsfPds3, GIsfPds4, GIsfLinOrigin and GIsfColOrigin are part of the product itself.
The same computations can be used to derive the ISRF() function if ISdbGridIsrf() is used instead of IsdbGridFcs().
This computation provides an under-sampled spectral calibration function (typically sampled every 15 cm^{-1}). The wave number w(k) associated with fcs(k) is given by the following:

$$w(k) = IDefSafDWn \times (IDefSafNsfirst + k - 2)$$

This smooth function can now be used to oversample every needed wave number. IDefSafDWn and IDefSafNsfirst are part of the IASI spectral database.

6.4 The WMO formats

The IASI Level 1c products available in WMO (BUFR) format are summarised below.

Product	*Bulletin header*	*Originating station*	*Descriptor sequence (old 'Day 1')**	*Descriptor sequence (current 'Day 2')**
IASI Level 1c (full)	N/A	N/A	3-40-001	3-40-007
IASI Level 1c (366-channel subset)	N/A	N/A	N/A	3-40-008

Table 7: IASI Level 1c products available in WMO (BUFR) format.

Note: **Day 2** refers to products added or updated since the EUMETSAT Polar System was first specified. For IASI L1c, the Day-2 product updates were introduced on 18 May 2010.
Day 1 product information is only applicable when using archive data prior to 18 May 2010.

The Day 2 sequence format descriptions can be found in the following WMO documents:

For the 3-40-007 sequence, see pages 167 to 168 of the following reference:
http://www.wmo.int/pages/prog/www/ISS/Meetings/CT-MTDCF-ET-DRC_Geneva2008/jm_ct-mtdcf_et-drc_Geneva_2008_annexes.pdf

For the 3-40-008 sequence, see pages 61 to 63 of the following reference:
http://www.wmo.int/pages/prog/www/ISS/Meetings/IPET-DRC_Geneva2009/Report/Report_IPETDRC-I_Geneva2009.doc

The full format description of the older products (Day 1) is available in the WMO Manual on Codes [RD 16] and may also be accessed directly under:

http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_vI2/LatestVERSION/LatestVERSION.html.

***Note**:* There is a typo in the above document: On page 9, the entry "Fraction of clear pixels in HIRS FOV" should read "Fraction of clear pixels in IASI FOV".

The names of the IASI Level 1c products distributed on EUMETCast are specified in [RD 11]. They follow this pattern:

iasi_yyyymmdd_hhmmss_metopa_nnnnn_eps_o[_red].l1_bufr

where:

yyyymmdd	the UTC year, month, day of the data start sensing time
hhmmss	stands for the UTC hour, minute, second of the data start sensing time
nnnnn	is the orbit number
_red	denotes a reduced set of channels

The 366 spectral channels included in the subset product are listed in Section 10. A change from 300 to 366 channels took place on 6 April 2011. The previous 300 channels selection report submitted to the International TOVS Study Conference [RD 41] may be downloaded from the ITSC website: http://cimss.ssec.wisc.edu/itwg/itsc/itsc14/proceedings/B21_Collard.pdf

7 IASI LEVEL 1 PRODUCT PROCESSING ALGORITHMS

The detailed IASI Level 1 processing and algorithm description can be found in the reference documents [RD 5] and [RD 6].

8 IASI LEVEL 1 PRODUCTS VALIDATION AND MONITORING

Following the installation of the new 'Day-2' version 5.0.2 of the operational processor, the IASI Level 1 products were tested and validated. Full details are in the IASI Level 1 Day-2 Product Validation Test Report [RD 13].
An in-house IASI Level 1 monitoring at EUMESAT is currently performed within the Cal/Val Facility. The EUMETSAT IASI Level 1 Daily Monitoring Report is available directly on the EUMETSAT website:

http://oiswww.eumetsat.org/epsreports/html/index.php?instrument=IASI

IASI monitoring is also performed by the IASI TEC at CNES.

9 RECORD DESCRIPTION OF THE IASI LEVEL 1 PRODUCTS

This IASI L1 description corresponds to the IASI Level 1 PFS Issue v9E (PFV 11.0) [RD 2] and to the Generic PFS RD 1 Issue v8C.

The following three main sections provide descriptions for IASI Level 1a, IASI Level 1b and IASI Level 1c respectively.

9.1 IASI Level 1a

9.1.1 Summary of product format version record contents history

	PFV = 10.0	*PFV = 11.0*
Record name	***Record version***	***Record version***
mphr	2	2
giadr-quality	2	2
giadr-scalefactors	2	2
mdr-1a	4	5 (new version)

If more than one version of a record exists, all versions are described below.

9.1.2 Contents:

GIADR (name 'giadr-quality', class 5, subclass 0, version 2)
MDR (name 'mdr-1a', class 8, subclass 0, version 4)
MDR (name 'mdr-1a', class 8, subclass 0, version 5)

Certain record types with formats common to all products (IPR, DMDR, GEADR, VEADR) are not included below, since they are not relevant to the average user. If required, details of these records can be found in the Generic PFS [RD 1].

9.1.3 MPHR (name 'mphr', class 1, subclass 0, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
Product Details											
PRODUCT_NAME	Complete name of the product			1	1	1	1	string	67	100	20
PARENT_PRODUCT_NAME_1	Name of the parent product from which this product has been produced. For Level 0 products, this field is filled with lower case x's.			1	1	1	1	string	67	100	120
PARENT_PRODUCT_NAME_2	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	220
PARENT_PRODUCT_NAME_3	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	320
PARENT_PRODUCT_NAME_4	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	420
INSTRUMENT_ID	Instrument identification			1	1	1	1	enumerated	4	37	520
INSTRUMENT_MODEL	Instrument Model identification			1	1	1	1	enumerated	3	36	557
PRODUCT_TYPE	Product Type			1	1	1	1	enumerated	3	36	593
PROCESSING_LEVEL	Processing Level Identification			1	1	1	1	enumerated	2	35	629
SPACECRAFT_ID	Spacecraft identification			1	1	1	1	enumerated	3	36	664
SENSING_START	UTC Time of start of sensing data in this object (PDU, ROI or Full Product)			1	1	1	1	time	15	48	700
SENSING_END	UTC Time of end of sensing data in this object (PDU, ROI or Full Product)			1	1	1	1	time	15	48	748

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
SENSING_START_THEORETICAL	Theoretical UTC Time of start of sensing data in the dump from which this object is derived. This data is the predicted start time at the MPF level.			1	1	1	1	time	15	48	796
SENSING_END_THEORETICAL	Theoretical UTC Time of end of sensing data in the dump from which this object is derived. This data is the predicted end time at the MPF level.			1	1	1	1	time	15	48	844
PROCESSING_CENTRE	Processing Centre Identification			1	1	1	1	enumerated	4	37	892
PROCESSOR_MAJOR_VERSION	Processing chain major version number			1	1	1	1	uinteger	5	38	929
PROCESSOR_MINOR_VERSION	Processing chain minor version number			1	1	1	1	uinteger	5	38	967
FORMAT_MAJOR_VERSION	Dataset Format Major Version number			1	1	1	1	uinteger	5	38	1005
FORMAT_MINOR_VERSION	Dataset Format Minor Version number			1	1	1	1	uinteger	5	38	1043
PROCESSING_TIME_START	UTC time of the processing at start of processing for the product			1	1	1	1	time	15	48	1081
PROCESSING_TIME_END	UTC time of the processing at end of processing for the product			1	1	1	1	time	15	48	1129
PROCESSING_MODE	Identification of the mode of processing			1	1	1	1	enumerated	1	34	1177
DISPOSITION_MODE	Identification of the disposition mode			1	1	1	1	enumerated	1	34	1211
RECEIVING_GROUND_STATION	Acquisition Station Identification			1	1	1	1	enumerated	3	36	1245
RECEIVE_TIME_START	UTC time of the reception at CDA for first Data Item			1	1	1	1	time	15	48	1281
RECEIVE_TIME_END	UTC time of the reception at CDA for last Data Item			1	1	1	1	time	15	48	1329
ORBIT_START	Start Orbit Number, counted incrementally since launch			1	1	1	1	uinteger	5	38	1377
ORBIT_END	Stop Orbit Number			1	1	1	1	uinteger	5	38	1415
ACTUAL_PRODUCT_SIZE	Size of the complete product		bytes	1	1	1	1	uinteger	11	44	1453

Name	Description	Scaling factor	Units	Dim1	Dim2	Dim3	Dim4	Type	Type size	Field size	Offset
Ascending node orbit parameters											
STATE_VECTOR_TIME	Epoch time (in UTC) of the orbital elements and the orbit state vector. this corresponds to the time of crossing the ascending node for ORBIT_START		UTC	1	1	1	1	longtime	18	51	1497
SEMI_MAJOR_AXIS	Semi major axis of orbit at time of the ascending node crossing.		mm	1	1	1	1	integer	11	44	1548
ECCENTRICITY	Orbit eccentricity at time of the ascending node crossing	10^6		1	1	1	1	integer	11	44	1592
INCLINATION	Orbit inclination at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1636
PERIGEE_ARGUMENT	Argument of perigee at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1680
RIGHT_ASCENSION	Right ascension at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1724
MEAN_ANOMALY	Mean anomaly at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1768
X_POSITION	X position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1812
Y_POSITION	Y position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1856
Z_POSITION	Z position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1900
X_VELOCITY	X velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	1944
Y_VELOCITY	Y velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	1988
Z_VELOCITY	Z velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	2032
EARTH_SUN_DISTANCE_RATIO	Earth-Sun distance ratio - ratio of current Earth-Sun distance to Mean Earth-Sun distance			1	1	1	1	integer	11	44	2076

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
LOCATION_TOLERANCE_RADIAL	Nadir Earth location tolerance radial		m	1	1	1	1	integer	11	44	2120
LOCATION_TOLERANCE_CROSSTRACK	Nadir Earth location tolerance cross-track		m	1	1	1	1	integer	11	44	2164
LOCATION_TOLERANCE_ALONGTRACK	Nadir Earth location tolerance along-track		m	1	1	1	1	integer	11	44	2208
YAW_ERROR	Constant Yaw attitude error	10^3	deg	1	1	1	1	integer	11	44	2252
ROLL_ERROR	Constant Roll attitude error	10^3	deg	1	1	1	1	integer	11	44	2296
PITCH_ERROR	Constant Pitch attitude error	10^3	deg	1	1	1	1	integer	11	44	2340
Location Summary											
SUBSAT_LATITUDE_START	Latitude of sub-satellite point at start of the data set	10^3	Deg	1	1	1	1	integer	11	44	2384
SUBSAT_LONGITUDE_START	Longitude of sub-satellite point at start of the data set	10^3	Deg	1	1	1	1	integer	11	44	2428
SUBSAT_LATITUDE_END	Latitude of sub-satellite point at end of the data set	10^3	Deg	1	1	1	1	integer	11	44	2472
SUBSAT_LONGITUDE_END	Longitude of sub-satellite point at end of the data set	10^3	Deg	1	1	1	1	integer	11	44	2516
Leap Second Information											
LEAP_SECOND	Occurrence of Leap second within the product. Field is set to -1, 0 or +1 dependent upon occurrence of leap second and direction.			1	1	1	1	integer	2	35	2560
LEAP_SECOND_UTC	UTC time of occurrence of the Leap Second (If no leap second in the product, value is null)			1	1	1	1	time	15	48	2595
Record counts											
TOTAL_RECORDS	Total count of all records in the product			1	1	1	1	uinteger	6	39	2643
TOTAL_MPHR	Total count of all MPHRs in product (should always be 1!)			1	1	1	1	uinteger	6	39	2682
TOTAL_SPHR	Total count of all SPHRs in product (should be 0 or 1 only)			1	1	1	1	uinteger	6	39	2721
TOTAL_IPR	Total count of all IPRs in the product			1	1	1	1	uinteger	6	39	2760
TOTAL_GEADR	Total count of all GEADRs in the product			1	1	1	1	uinteger	6	39	2799
TOTAL_GIADR	Total count of all GIADRs in the product			1	1	1	1	uinteger	6	39	2838
TOTAL_VEADR	Total count of all VEADRs in the product			1	1	1	1	uinteger	6	39	2877

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
TOTAL_VIADR	Total count of all VIADRs in the product			1	1	1	1	uinteger	6	39	2916
TOTAL_MDR	Total count of all MDRs in the product			1	1	1	1	uinteger	6	39	2955
Record Based Generic Quality Flags											
COUNT_DEGRADED_INST_MDR	Count of MDRs with degradation due to instrument problems			1	1	1	1	uinteger	6	39	2994
COUNT_DEGRADED_PROC_MDR	Count of MDRs with degradation due to processing problems			1	1	1	1	uinteger	6	39	3033
COUNT_DEGRADED_INST_MDR_BLOCKS	Count of the number of blocks of MDRs degraded due to degraded instrument			1	1	1	1	uinteger	6	39	3072
COUNT_DEGRADED_PROC_MDR_BLOCKS	Count of the number of blocks of MDRs degraded due to degraded processing			1	1	1	1	uinteger	6	39	3111
Time Based Generic Quality Flags											
DURATION_OF_PRODUCT	The duration of the product in milliseconds		ms	1	1	1	1	uinteger	8	41	3150
MILLISECONDS_OF_DATA_PRESENT	The total amount of data present in the product		ms	1	1	1	1	uinteger	8	41	3191
MILLISECONDS_OF_DATA_MISSING	The total amount of data missing from the product		ms	1	1	1	1	uinteger	8	41	3232
Regional Product Information											
SUBSETTED_PRODUCT	Set when product has been subset (e.g. geographically subset using a region of interest filter). Implies the presence of one or more EUMETSAT Data Centre GIADRs in GAD section for product retrieved from Data Centre.			1	1	1	1	boolean	1	34	3273
											Total: 3307

9.1.4 GIADR (name 'giadr-quality', class 5, subclass 0, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
QUALITY_PARAMETERS											
IDefPsfSondNbLin	Number of lines for sounder IPSF			PN	1	1	1	integer4	4	16	20
IDefPsfSondNbCol	Number of columns for sounder IPSF			PN	1	1	1	integer4	4	16	36
IDefPsfSondOverSampFactor	Oversampling factor for sounder IPSF			1	1	1	1	vinteger4	5	5	52
IDefPsfSondY	Y position of sounder IPSF in the cold plane	10^6	degrees	100	PN	1	1	integer4	4	1600	57
IDefPsfSondZ	Z position of sounder IPSF in the cold plane	10^6	degrees	100	PN	1	1	integer4	4	1600	1657
IDefPsfSondWgt	IPSF weight			100	100	PN	1	vinteger4	5	200000	3257
IDefllSSrfNsfirst	Number of first sample in spectral imager filter			1	1	1	1	integer4	4	4	203257
IDefllSSrfNslast	Number of last sample in spectral imager filter			1	1	1	1	integer4	4	4	203261
IDefllSSrf	Spectral response of spectral imager filter			100	1	1	1	vinteger4	5	500	203265
IDefllSSrfDWn	Sample width of spectral imager filter		m^{-1}	1	1	1	1	vinteger4	5	5	203765
IDefIISNeDT	IIS Noise		K	IMCO	IMLI	1	1	vinteger4	5	20480	203770
IDefDptIISDeadPix	Table of IASI imager dead pixels			IMCO	IMLI	1	1	boolean	1	4096	224250
											Total: 228346

9.1.5 GIADR (name 'giadr-scalefactors', class 5, subclass 1, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
Scale_Factors											
IDefScaleSondNbScale	Number of bands used for applying scale factors to spectra (up to a maximum of 10)			1	1	1	1	integer2	2	2	20
IDefScaleSondNsfirst	Begin channel number for each of the bands to which the scale factors are applied		channel number	10	1	1	1	integer2	2	20	22
IDefScaleSondNslast	End channel number for each of the bands to which the scale factors are applied		channel number	10	1	1	1	integer2	2	20	42
IDefScaleSondScaleFactor	Scale factors (power of 10) to be applied within each band defined above.			10	1	1	1	integer2	2	20	62
IDefScaleIISScaleFactor	Scale factor (power of 10) to be applied to the IIS imager.			1	1	1	1	integer2	2	2	82
											Total: 84

9.1.6 MDR (name 'mdr-1a', class 8, subclass 0, version 4)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	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			1	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation			1	1	1	1	boolean	1	1	21
Level_1_Data											
GEPSIasiMode	Instrument mode			1	1	1	1	bitfield (4)	4	4	22
GEPSOPSProcessingMode	Processing mode			1	1	1	1	bitfield (4)	4	4	26
GEPSIdConf	System configuration at line level: PTSI, TEC conf file ID,.....			1	1	1	1	bitfield (32)	32	32	30
GEPSLocIasiAvhrr_IASI	Measure positioning relatively to AVHRR: position of 4 IASI sounder pixels in AVHRR raster with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	PN	SNOT	1	vinteger4	5	1200	62
GEPSLocIasiAvhrr_IIS	Measure positioning relatively to AVHRR: position of IIS pixels for a subgrid 5*5 of IIS with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	SGI	SNOT	1	vinteger4	5	7500	1262
OBT	On Board Time (Coarse time + Fine time)			SNOT	1	1	1	bitfield (6)	6	180	8762
OnboardUTC	Date of IASI measure (on board UTC): Number of Days since 1 January 2000; Number of ms in the day			SNOT	1	1	1	time	6	180	8942
GEPSDatIasi	Date of IASI measure (Corrected UTC): Number of Days since 1 January 2000; Number of ms in day		UTC	SNOT	1	1	1	time	6	180	9122
GIsfLinOrigin	Zero point in line in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9302

Name	Description	Scaling factor	Units	Dim1	Dim2	Dim3	Dim4	Type	Type size	Field size	Offset
GIsfColOrigin	Zero point in column in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9310
GIsfPds1	Weight of interpolation point 1	10^6		CCD	1	1	1	integer4	4	8	9318
GIsfPds2	Weight of interpolation point 2	10^6		CCD	1	1	1	integer4	4	8	9326
GIsfPds3	Weight of interpolation point 3	10^6		CCD	1	1	1	integer4	4	8	9334
GIsfPds4	Weight of interpolation point 4	10^6		CCD	1	1	1	integer4	4	8	9342
GEPS_CCD	Corner Cube Direction for all observational targets			SNOT	1	1	1	boolean	1	30	9350
GEPS_SP	Scan position for all observational targets			SNOT	1	1	1	integer4	4	120	9380
GIrcImage	Calibrated IASI images		W/m2/sr/m-1	IMCO	IMLI	SNOT	1	uinteger2	2	245760	9500
GQisFlagQual	Quality flag for the system			PN	SNOT	1	1	boolean	1	120	255260
GQisQualIndex	System-IASI general quality index			1	1	1	1	vinteger4	5	5	255380
GQisQualIndexIIS	IIS imager quality index inside 1c [product			1	1	1	1	vinteger4	5	5	255385
GQisQualIndexLoc	Geometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255390
GQisQualIndexRad	Radiometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255395
GQisQualIndexSpect	Spectral quality index for sounder product			1	1	1	1	vinteger4	5	5	255400
GQisSysTecIISQual	System -TEC quality index for IIS			1	1	1	1	uinteger4	4	4	255405
GQisSysTecSondQual	System -TEC quality index for sounder			1	1	1	1	uinteger4	4	4	255409
GGeoSondLoc	Location of pixel centre in geodetic coordinates (long, lat) for each sounder pixel	10^6	degrees	2	PN	SNOT	1	integer4	4	960	255413
GGeoSondAnglesMETOP	Measurement angles for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	256373
GGeoIISAnglesMETOP	Measurement angles for a subgrid of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	257333
GGeoSondAnglesSUN	Solar angles at the surface for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	263333
GGeoIISAnglesSUN	Solar angles at the surface for a subgrid (5 × 5) of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	264293

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GGeoIISLoc	Location of pixel centre in geodetic coordinates for a sub grid (5x5) of the imager pixels	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	270293
EARTH_SATELLITE_DISTANCE	Distance of satellite from Earth centre		m	1	1	1	1	uinteger4	4	4	276293
Level_1a_Specific_Data											
IDefSpectrDWn	Sample width of IASI spectra		m-1	1	1	1	1	vinteger4	5	5	276297
IDefNsfirst	Number of the first sample of IASI spectra			1	1	1	1	integer4	4	4	276302
IDefNslast	Number of the last sample of IASI spectra			1	1	1	1	integer4	4	4	276306
GSmcSpect	Level 1a spectra		W/m2/sr/m-1	SS	PN	SNOT	1	integer2	2	2088000	276310
IDefCovarMatEigenVal1b	Level 1a noise variance-covariance matrix index. (IDefCovarMatEigenVal1b is the same for Level 1a and 1b.)			CCD	100	1	1	vinteger4	5	1000	2364310
											Total: 2365310

9.1.7 MDR (name 'mdr-1a', class 8, subclass 0, version 5)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	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			1	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation			1	1	1	1	boolean	1	1	21
Level_1_Data											
GEPSIasiMode	Instrument mode			1	1	1	1	bitfield (4)	4	4	22
GEPSOPSProcessingMode	Processing mode			1	1	1	1	bitfield (4)	4	4	26
GEPSIdConf	System configuration at line level: PTSI, TEC conf file ID,.....			1	1	1	1	bitfield (32)	32	32	30
GEPSLocIasiAvhrr_IASI	Measure positioning relatively to AVHRR: position of 4 IASI sounder pixels in AVHRR raster with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	PN	SNOT	1	vinteger4	5	1200	62
GEPSLocIasiAvhrr_IIS	Measure positioning relatively to AVHRR: position of IIS pixels for a subgrid 5*5 of IIS with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	SGI	SNOT	1	vinteger4	5	7500	1262
OBT	On Board Time (Coarse time + Fine time)			SNOT	1	1	1	bitfield (6)	6	180	8762
OnboardUTC	Date of IASI measure (on board UTC): Number of Days since 1 January 2000; Number of ms in the day			SNOT	1	1	1	time	6	180	8942
GEPSDatIasi	Date of IASI measure (Corrected UTC): Number of Days since 1 January 2000; Number of minutes in the day		UTC	SNOT	1	1	1	time	6	180	9122
GIsfLinOrigin	Zero point in line in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9302

Name	Description	Scaling factor	Units	Dim1	Dim2	Dim3	Dim4	Type	Type size	Field size	Offset
GIsfColOrigin	Zero point in column in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9310
GIsfPds1	Weight of interpolation point 1	10^6		CCD	1	1	1	integer4	4	8	9318
GIsfPds2	Weight of interpolation point 2	10^6		CCD	1	1	1	integer4	4	8	9326
GIsfPds3	Weight of interpolation point 3	10^6		CCD	1	1	1	integer4	4	8	9334
GIsfPds4	Weight of interpolation point 4	10^6		CCD	1	1	1	integer4	4	8	9342
GEPS_CCD	Corner Cube Direction for all observational targets			SNOT	1	1	1	boolean	1	30	9350
GEPS_SP	Scan position for all observational targets			SNOT	1	1	1	integer4	4	120	9380
GIrcImage	Calibrated IASI images		W/m2/sr/m-1	IMCO	IMLI	SNOT	1	uinteger2	2	245760	9500
GQisFlagQual	Quality flag for the system			SB	PN	SNOT	1	boolean	1	360	255260
GQisFlagQualDetailed	Detailed quality flag for the system			PN	SNOT	1	1	bitfield (2)	2	240	255620
GQisQualIndex	System-IASI general quality index			1	1	1	1	vinteger4	5	5	255860
GQisQualIndexIIS	IIS imager quality index inside 1c [product			1	1	1	1	vinteger4	5	5	255865
GQisQualIndexLoc	Geometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255870
GQisQualIndexRad	Radiometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255875
GQisQualIndexSpect	Spectral quality index for sounder product			1	1	1	1	vinteger4	5	5	255880
GQisSysTecIISQual	System -TEC quality index for IIS			1	1	1	1	uinteger4	4	4	255885
GQisSysTecSondQual	System -TEC quality index for sounder			1	1	1	1	uinteger4	4	4	255889
GGeoSondLoc	Location of pixel centre in geodetic coordinates (long, lat) for each sounder pixel	10^6	degrees	2	PN	SNOT	1	integer4	4	960	255893
GGeoSondAnglesMETOP	Measurement angles for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	256853
GGeoIISAnglesMETOP	Measurement angles for a subgrid of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	257813
GGeoSondAnglesSUN	Solar angles at the surface for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	263813
GGeoIISAnglesSUN	Solar angles at the surface for a subgrid (5x5) of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	264773

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GGeoIISLoc	Location of pixel centre in geodetic coordinates for a sub grid (5x5) of the imager pixels	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	270773
EARTH_SATELLITE_DISTANCE	Distance of satellite from Earth centre		m	1	1	1	1	uinteger4	4	4	276773
Level_1a_Specific_Data											
IDefSpectrDWn	Sample width of IASI spectra		m-1	1	1	1	1	vinteger4	5	5	276777
IDefNsfirst	Number of the first sample of IASI spectra			1	1	1	1	integer4	4	4	276782
IDefNslast	Number of the last sample of IASI spectra			1	1	1	1	integer4	4	4	276786
GSmcSpect	Level 1a spectra		W/m2/sr/m-1	SS	PN	SNOT	1	integer2	2	2088000	276790
IDefCovarMatEigenVal1b	Level 1a noise variance-covariance matrix index. (IDefCovarMatEigenVal1b is the same for Level 1a and 1b.)			CCD	100	1	1	vinteger4	5	1000	2364790
											Total: 2365790

9.2 IASI Level 1b

9.2.1 Summary of Product Format Version record contents history

	PFV = 10.0	*PFV = 11.0*
Record name	***Record version***	***Record version***
mphr	2	2
giadr-quality	2	2
giadr-scalefactors	2	2
mdr-1b	4	5 (new version)

If more than one version of a record exists, all versions are described below.

9.2.2 Contents

MPHR (name 'mphr', class 1, subclass 0, version 2)
GIADR (name 'giadr-quality', class 5, subclass 0, version 2)
GIADR (name 'giadr-scalefactors', class 5, subclass 1, version 2)
MDR (name 'mdr-1b', class 8, subclass 1, version 4)

Certain record types with formats common to all products (IPR, DMDR, GEADR, VEADR) are not included below, since they are not relevant to the average user. If required, details of these records can be found in the Generic PFS [RD 1].

9.2.3 MPHR (name 'mphr', class 1, subclass 0, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
Product Details											
PRODUCT_NAME	Complete name of the product			1	1	1	1	string	67	100	20
PARENT_PRODUCT_NAME_1	Name of the parent product from which this product has been produced. For Level 0 products, this field is filled with lower case x's.			1	1	1	1	string	67	100	120
PARENT_PRODUCT_NAME_2	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	220
PARENT_PRODUCT_NAME_3	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	320
PARENT_PRODUCT_NAME_4	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	420
INSTRUMENT_ID	Instrument identification			1	1	1	1	enumerated	4	37	520
INSTRUMENT_MODEL	Instrument Model identification			1	1	1	1	enumerated	3	36	557
PRODUCT_TYPE	Product Type			1	1	1	1	enumerated	3	36	593
PROCESSING_LEVEL	Processing Level Identification			1	1	1	1	enumerated	2	35	629
SPACECRAFT_ID	Spacecraft identification			1	1	1	1	enumerated	3	36	664
SENSING_START	UTC Time of start of sensing data in this object (PDU, ROI or Full Product)			1	1	1	1	time	15	48	700
SENSING_END	UTC Time of end of sensing data in this object (PDU, ROI or Full Product)			1	1	1	1	time	15	48	748

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
SENSING_START_THEORETICAL	Theoretical UTC Time of start of sensing data in the dump from which this object is derived. This data is the predicted start time at the MPF level.			1	1	1	1	time	15	48	796
SENSING_END_THEORETICAL	Theoretical UTC Time of end of sensing data in the dump from which this object is derived. This data is the predicted end time at the MPF level.			1	1	1	1	time	15	48	844
PROCESSING_CENTRE	Processing Centre Identification			1	1	1	1	enumerated	4	37	892
PROCESSOR_MAJOR_VERSION	Processing chain major version number			1	1	1	1	uinteger	5	38	929
PROCESSOR_MINOR_VERSION	Processing chain minor version number			1	1	1	1	uinteger	5	38	967
FORMAT_MAJOR_VERSION	Dataset Format Major Version number			1	1	1	1	uinteger	5	38	1005
FORMAT_MINOR_VERSION	Dataset Format Minor Version number			1	1	1	1	uinteger	5	38	1043
PROCESSING_TIME_START	UTC time of the processing at start of processing for the product			1	1	1	1	time	15	48	1081
PROCESSING_TIME_END	UTC time of the processing at end of processing for the product			1	1	1	1	time	15	48	1129
PROCESSING_MODE	Identification of the mode of processing			1	1	1	1	enumerated	1	34	1177
DISPOSITION_MODE	Identification of the disposition mode			1	1	1	1	enumerated	1	34	1211
RECEIVING_GROUND_STATION	Acquisition Station Identification			1	1	1	1	enumerated	3	36	1245
RECEIVE_TIME_START	UTC time of the reception at CDA for first Data Item			1	1	1	1	time	15	48	1281
RECEIVE_TIME_END	UTC time of the reception at CDA for last Data Item			1	1	1	1	time	15	48	1329
ORBIT_START	Start Orbit Number, counted incrementally since launch			1	1	1	1	uinteger	5	38	1377
ORBIT_END	Stop Orbit Number			1	1	1	1	uinteger	5	38	1415
ACTUAL_PRODUCT_SIZE	Size of the complete product		bytes	1	1	1	1	uinteger	11	44	1453
ASCENDING NODE ORBIT PARAMETERS											
STATE_VECTOR_TIME	Epoch time (in UTC) of the orbital elements and the orbit state vector. this corresponds to the time of crossing the ascending node for ORBIT_START		UTC	1	1	1	1	longtime	18	51	1497
SEMI_MAJOR_AXIS	Semi major axis of orbit at time of the ascending node crossing.		mm	1	1	1	1	integer	11	44	1548

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
ECCENTRICITY	Orbit eccentricity at time of the ascending node crossing	10^6		1	1	1	1	integer	11	44	1592
INCLINATION	Orbit inclination at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1636
PERIGEE_ARGUMENT	Argument of perigee at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1680
RIGHT_ASCENSION	Right ascension at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1724
MEAN_ANOMALY	Mean anomaly at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1768
X_POSITION	X position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1812
Y_POSITION	Y position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1856
Z_POSITION	Z position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1900
X_VELOCITY	X velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	1944
Y_VELOCITY	Y velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	1988
Z_VELOCITY	Z velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	2032
EARTH_SUN_DISTANCE_RATIO	Earth-Sun distance ratio - ratio of current Earth-Sun distance to Mean Earth-Sun distance			1	1	1	1	integer	11	44	2076
LOCATION_TOLERANCE_RADIAL	Nadir Earth location tolerance radial		m	1	1	1	1	integer	11	44	2120
LOCATION_TOLERANCE_CROSSTRACK	Nadir Earth location tolerance cross-track		m	1	1	1	1	integer	11	44	2164
LOCATION_TOLERANCE_ALONGTRACK	Nadir Earth location tolerance along-track		m	1	1	1	1	integer	11	44	2208
YAW_ERROR	Constant Yaw attitude error	10^3	deg	1	1	1	1	integer	11	44	2252
ROLL_ERROR	Constant Roll attitude error	10^3	deg	1	1	1	1	integer	11	44	2296
PITCH_ERROR	Constant Pitch attitude error	10^3	deg	1	1	1	1	integer	11	44	2340
LOCATION SUMMARY											
SUBSAT_LATITUDE_START	Latitude of sub-satellite point at start of the data set	10^3	Deg	1	1	1	1	integer	11	44	2384
SUBSAT_LONGITUDE_START	Longitude of sub-satellite point at start of the data set	10^3	Deg	1	1	1	1	integer	11	44	2428

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
SUBSAT_LATITUDE_END	Latitude of sub-satellite point at end of the data set	10^3	Deg	1	1	1	1	integer	11	44	2472
SUBSAT_LONGITUDE_END	Longitude of sub-satellite point at end of the data set	10^3	Deg	1	1	1	1	integer	11	44	2516
Leap Second Information											
LEAP_SECOND	Occurrence of Leap second within the product. Field is set to -1, 0 or +1 dependent upon occurrence of leap second and direction.			1	1	1	1	integer	2	35	2560
LEAP_SECOND_UTC	UTC time of occurrence of the Leap Second (If no leap second in the product, value is null)			1	1	1	1	time	15	48	2595
Record counts											
TOTAL_RECORDS	Total count of all records in the product			1	1	1	1	uinteger	6	39	2643
TOTAL_MPHR	Total count of all MPHRs in product (This should always be 1.)			1	1	1	1	uinteger	6	39	2682
TOTAL_SPHR	Total count of all SPHRs in product (0 or 1 only)			1	1	1	1	uinteger	6	39	2721
TOTAL_IPR	Total count of all IPRs in the product			1	1	1	1	uinteger	6	39	2760
TOTAL_GEADR	Total count of all GEADRs in the product			1	1	1	1	uinteger	6	39	2799
TOTAL_GIADR	Total count of all GIADRs in the product			1	1	1	1	uinteger	6	39	2838
TOTAL_VEADR	Total count of all VEADRs in the product			1	1	1	1	uinteger	6	39	2877
TOTAL_VIADR	Total count of all VIADRs in the product			1	1	1	1	uinteger	6	39	2916
TOTAL_MDR	Total count of all MDRs in the product			1	1	1	1	uinteger	6	39	2955
Record Based Generic Quality Flags											
COUNT_DEGRADED_INST_MDR	Count of MDRs with degradation due to instrument problems			1	1	1	1	uinteger	6	39	2994
COUNT_DEGRADED_PROC_MDR	Count of MDRs with degradation due to processing problems			1	1	1	1	uinteger	6	39	3033
COUNT_DEGRADED_INST_MDR_BLOCKS	Count of the number of blocks of MDRs degraded due to degraded instrument			1	1	1	1	uinteger	6	39	3072
COUNT_DEGRADED_PROC_MDR_BLOCKS	Count of the number of blocks of MDRs degraded due to degraded processing			1	1	1	1	uinteger	6	39	3111
Time-Based Generic Quality Flags											

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
DURATION_OF_PRODUCT	The duration of the product in milliseconds		ms	1	1	1	1	uinteger	8	41	3150
MILLISECONDS_OF_DATA_PRESENT	The total amount of data present in the product		ms	1	1	1	1	uinteger	8	41	3191
MILLISECONDS_OF_DATA_MISSING	The total amount of data missing from the product		ms	1	1	1	1	uinteger	8	41	3232
Regional Product Information											
SUBSETTED_PRODUCT	Set when product has been subset (e.g. geographically subset using a region of interest filter). Implies the presence of one or more EUMETSAT Data Centre GIADRs in GAD section for product retrieved from Data Centre.			1	1	1	1	boolean	1	34	3273
											Total: 3307

9.2.4 GIADR (name 'giadr-quality', class 5, subclass 0, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
QUALITY_PARAMETERS											
IDefPsfSondNbLin	Number of lines for sounder IPSF			PN	1	1	1	integer4	4	16	20
IDefPsfSondNbCol	Number of columns for sounder IPSF			PN	1	1	1	integer4	4	16	36
IDefPsfSondOverSampFactor	Oversampling factor for sounder IPSF			1	1	1	1	vinteger4	5	5	52
IDefPsfSondY	Y position of sounder IPSF in the cold plane	10^6	degrees	100	PN	1	1	integer4	4	1600	57
IDefPsfSondZ	Z position of sounder IPSF in the cold plane	10^6	degrees	100	PN	1	1	integer4	4	1600	1657
IDefPsfSondWgt	IPSF weight			100	100	PN	1	vinteger4	5	200000	3257
IDefIISSrfNsfirst	Number of first sample in spectral imager filter			1	1	1	1	integer4	4	4	203257
IDefIISSrfNslast	Number of last sample in spectral imager filter			1	1	1	1	integer4	4	4	203261
IDefIISSrf	Spectral response of spectral imager filter			100	1	1	1	vinteger4	5	500	203265
IDefIISSrfDWn	Sample width of spectral imager filter		m-1	1	1	1	1	vinteger4	5	5	203765
IDefIISNeDT	IIS Noise		K	IMCO	IMLI	1	1	vinteger4	5	20480	203770
IDefDptIISDeadPix	Table of IASI imager dead pixels			IMCO	IMLI	1	1	boolean	1	4096	224250

Total: 228346

9.2.5 GIADR (name 'giadr-scalefactors', class 5, subclass 1, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
Scale_Factors											
IDefScaleSondNbScale	Number of bands used for applying scale factors to spectra (up to a maximum of 10)			1	1	1	1	integer2	2	2	20
IDefScaleSondNsfirst	Begin channel number for each of the bands to which the scale factors are applied		channel number	10	1	1	1	integer2	2	20	22
IDefScaleSondNslast	End channel number for each of the bands to which the scale factors are applied		channel number	10	1	1	1	integer2	2	20	42
IDefScaleSondScaleFactor	Scale factors (power of 10) to be applied within each band defined above.			10	1	1	1	integer2	2	20	62
IDefScaleIISScaleFactor	Scale factor (power of 10) to be applied to the IIS imager.			1	1	1	1	integer2	2	2	82
											Total: 84

9.2.6 MDR (name 'mdr-1b', class 8, subclass 1, version 4)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	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			1	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation			1	1	1	1	boolean	1	1	21
Level_1_Data											
GEPSIasiMode	Instrument mode			1	1	1	1	bitfield (4)	4	4	22
GEPSOPSProcessingMode	Processing mode			1	1	1	1	bitfield (4)	4	4	26
GEPSIdConf	System configuration at line level: PTSI, TEC conf file ID,.....			1	1	1	1	bitfield (32)	32	32	30
GEPSLocIasiAvhrr_IASI	Measure positioning relatively to AVHRR: position of 4 IASI sounder pixels in AVHRR raster with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	PN	SNOT	1	vinteger4	5	1200	62
GEPSLocIasiAvhrr_IIS	Measure positioning relatively to AVHRR: position of IIS pixels for a subgrid 5*5 of IIS with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	SGI	SNOT	1	vinteger4	5	7500	1262
OBT	On Board Time (Coarse time + Fine time)			SNOT	1	1	1	bitfield (6)	6	180	8762
OnboardUTC	Date of IASI measure (on board UTC): Number of Days since 1 January 2000; Number of ms in the day			SNOT	1	1	1	time	6	180	8942
GEPSDatIasi	Date of IASI measure (Corrected UTC): Number of Days since 1 January 2000; Number of ms in the day		UTC	SNOT	1	1	1	time	6	180	9122
GIsfLinOrigin	Zero point in line in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9302

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GIsfColOrigin	Zero point in column in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9310
GIsfPds1	Weight of interpolation point 1	10^6		CCD	1	1	1	integer4	4	8	9318
GIsfPds2	Weight of interpolation point 2	10^6		CCD	1	1	1	integer4	4	8	9326
GIsfPds3	Weight of interpolation point 3	10^6		CCD	1	1	1	integer4	4	8	9334
GIsfPds4	Weight of interpolation point 4	10^6		CCD	1	1	1	integer4	4	8	9342
GEPS_CCD	Corner Cube Direction for all observational targets			SNOT	1	1	1	boolean	1	30	9350
GEPS_SP	Scan position for all observational targets			SNOT	1	1	1	integer4	4	120	9380
GIrcImage	Calibrated IASI images		W/m2/sr/m-1	IMCO	IMLI	SNOT	1	uinteger2	2	245760	9500
GQisFlagQual	Quality flag for the system			PN	SNOT	1	1	boolean	1	120	255260
GQisQualIndex	System-IASI general quality index			1	1	1	1	vinteger4	5	5	255380
GQisQualIndexIIS	IIS imager quality index inside 1c [product			1	1	1	1	vinteger4	5	5	255385
GQisQualIndexLoc	Geometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255390
GQisQualIndexRad	Radiometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255395
GQisQualIndexSpect	Spectral quality index for sounder product			1	1	1	1	vinteger4	5	5	255400
GQisSysTecIISQual	System -TEC quality index for IIS			1	1	1	1	uinteger4	4	4	255405
GQisSysTecSondQual	System -TEC quality index for sounder			1	1	1	1	uinteger4	4	4	255409
GGeoSondLoc	Location of pixel centre in geodetic coordinates (long, lat) for each sounder pix	10^6	degrees	2	PN	SNOT	1	integer4	4	960	255413
GGeoSondAnglesMETOP	Measurement angles for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	256373
GGeoIISAnglesMETOP	Measurement angles for a subgrid of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	257333
GGeoSondAnglesSUN	Solar angles at the surface for each sounder pixel.	10^6	degrees	2	PN	SNOT	1	integer4	4	960	263333
GGeoIISAnglesSUN	Solar angles at the surface for a subgrid (5x5) of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	264293

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GGeoIISLoc	Location of pixel centre in geodetic coordinates for a sub grid (5x5) of the imager pixels	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	270293
EARTH_SATELLITE_DISTANCE	Distance of satellite from Earth centre		m	1	1	1	1	uinteger4	4	4	276293
Level_1b_Specific_Data											
IDefSpectDWn1b	Sample width of IASI 1B spectra		m-1	1	1	1	1	vinteger4	5	5	276297
IDefNsfirst1b	Number of the first sample of IASI 1B spectra			1	1	1	1	integer4	4	4	276302
IDefNslast1b	Number of the last sample of IASI 1B spectra			1	1	1	1	integer4	4	4	276306
GS1bSpect	Level 1B spectra		W/m2/sr/m-1	SS	PN	SNOT	1	integer2	2	2088000	276310
IDefCovarMatEigenVal1b	Level 1b noise variance-covariance matrix index (IDefCovarMatEigenVal1b is the same for Level 1a and 1b.)			CCD	100	1	1	vinteger4	5	1000	2364310
											Total: 2365310

9.2.7 MDR (name 'mdr-1b', class 8, subclass 1, version 5)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	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			1	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation			1	1	1	1	boolean	1	1	21
Level_1_Data											
GEPSIasiMode	Instrument mode			1	1	1	1	bitfield (4)	4	4	22
GEPSOPSProcessingMode	Processing mode			1	1	1	1	bitfield (4)	4	4	26
GEPSIdConf	System configuration at line level: PTSI, TEC conf file ID,.....			1	1	1	1	bitfield (32)	32	32	30
GEPSLocIasiAvhrr_IASI	Measure positioning relatively to AVHRR: position of 4 IASI sounder pixels in AVHRR raster with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	PN	SNOT	1	vinteger4	5	1200	62
GEPSLocIasiAvhrr_IIS	Measure positioning relatively to AVHRR: position of IIS pixels for a subgrid 5*5 of IIS with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	SGI	SNOT	1	vinteger4	5	7500	1262
OBT	On Board Time (Coarse time + Fine time)			SNOT	1	1	1	bitfield (6)	6	180	8762
OnboardUTC	Date of IASI measure (on board UTC): Number of Days since 1 January 2000; Number of ms in the day			SNOT	1	1	1	time	6	180	8942
GEPSDatIasi	Date of IASI measure (Corrected UTC): Number of Days since 1 January 2000; Number of ms in the day		UTC	SNOT	1	1	1	time	6	180	9122
GIsfLinOrigin	Zero point in line in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9302

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GIsfColOrigin	Zero point in column in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9310
GIsfPds1	Weight of interpolation point 1	10^6		CCD	1	1	1	integer4	4	8	9318
GIsfPds2	Weight of interpolation point 2	10^6		CCD	1	1	1	integer4	4	8	9326
GIsfPds3	Weight of interpolation point 3	10^6		CCD	1	1	1	integer4	4	8	9334
GIsfPds4	Weight of interpolation point 4	10^6		CCD	1	1	1	integer4	4	8	9342
GEPS_CCD	Corner Cube Direction for all observational targets			SNOT	1	1	1	boolean	1	30	9350
GEPS_SP	Scan position for all observational targets			SNOT	1	1	1	integer4	4	120	9380
GIrcImage	Calibrated IASI images		$W/m^2/sr/m^{-1}$	IMCO	IMLI	SNOT	1	uinteger2	2	245760	9500
GQisFlagQual	Quality flag for the system			SB	PN	SNOT	1	boolean	1	360	255260
GQisFlagQualDetailed	Detailed quality flag for the system			PN	SNOT	1	1	bitfield (2)	2	240	255620
GQisQualIndex	System-IASI general quality index			1	1	1	1	vinteger4	5	5	255860
GQisQualIndexIIS	IIS imager quality index inside 1c [product			1	1	1	1	vinteger4	5	5	255865
GQisQualIndexLoc	Geometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255870
GQisQualIndexRad	Radiometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255875
GQisQualIndexSpect	Spectral quality index for sounder product			1	1	1	1	vinteger4	5	5	255880
GQisSysTecIISQual	System -TEC quality index for IIS			1	1	1	1	uinteger4	4	4	255885
GQisSysTecSondQual	System -TEC quality index for sounder			1	1	1	1	uinteger4	4	4	255889
GGeoSondLoc	Location of pixel centre in geodetic coordinates (long, lat) for each sounder pixel	10^6	degrees	2	PN	SNOT	1	integer4	4	960	255893
GGeoSondAnglesMETOP	Measurement angles for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	256853
GGeoIISAnglesMETOP	Measurement angles for a subgrid of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	257813
GGeoSondAnglesSUN	Solar angles at the surface for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	263813

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GGeoIISAnglesSUN	Solar angles at the surface for a subgrid (5x5) of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	264773
GGeoIISLoc	Location of pixel centre in geodetic coordinates for a sub grid (5x5) of the imager pixels	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	270773
EARTH_SATELLITE_DISTANCE	Distance of satellite from Earth centre		m	1	1	1	1	uinteger4	4	4	276773
Level_1b_Specific_Data											
IDefSpectDWn1b	Sample width of IASI 1B spectra		m-1	1	1	1	1	vinteger4	5	5	276777
IDefNsfirst1b	Number of the first sample of IASI 1B spectra			1	1	1	1	integer4	4	4	276782
IDefNslast1b	Number of the last sample of IASI 1B spectra			1	1	1	1	integer4	4	4	276786
GS1bSpect	Level 1B spectra		W/m2/sr/m-1	SS	PN	SNOT	1	integer2	2	2088000	276790
IDefCovarMatEigenVal1b	Level 1b noise variance-covariance matrix index (IDefCovarMatEigenVal1b is the same for Level 1a and 1b.)			CCD	100	1	1	vinteger4	5	1000	2364790
											Total: 2365790

9.3 IASI Level 1c

9.3.1 Summary of Product Format Version record contents history

	PFV = 10.0	*PFV = 11.0*
Record name	***Record version***	***Record version***
mphr	2	2
giadr-quality	2	2
giadr-scalefactors	2	2
mdr-1c	4	5 (new version)

If more than one version of a record exists, all versions are described below.

9.3.2 Contents:

MPHR (name 'mphr', class 1, subclass 0, version 2)
GIADR (name 'giadr-scalefactors', class 5, subclass 1, version 2)
MDR (name 'mdr-1c', class 8, subclass 2, version 4)
MDR (name 'mdr-1b', class 8, subclass 1, version 4)
MDR (name 'mdr-1c', class 8, subclass 2, version 5)

Certain record types with formats common to all products (IPR, DMDR, GEADR, VEADR) are not included below, since they are not relevant to the average user. If required, details of these records can be found in the Generic PFS [RD 1].

9.3.3 MPHR (name 'mphr', class 1, subclass 0, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
Product Details											
PRODUCT_NAME	Complete name of the product			1	1	1	1	string	67	100	20
PARENT_PRODUCT_NAME_1	Name of the parent product from which this product has been produced. For Level 0 products, this field is filled with lower case x's.			1	1	1	1	string	67	100	120
PARENT_PRODUCT_NAME_2	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	220
PARENT_PRODUCT_NAME_3	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	320
PARENT_PRODUCT_NAME_4	Name of the parent product from which this product has been produced. For Level 0 products or products for which this is not appropriate, this field is filled with lower case x's.			1	1	1	1	string	67	100	420
INSTRUMENT_ID	Instrument identification			1	1	1	1	enumerated	4	37	520
INSTRUMENT_MODEL	Instrument Model identification			1	1	1	1	enumerated	3	36	557
PRODUCT_TYPE	Product Type			1	1	1	1	enumerated	3	36	593
PROCESSING_LEVEL	Processing Level Identification			1	1	1	1	enumerated	2	35	629
SPACECRAFT_ID	Spacecraft identification			1	1	1	1	enumerated	3	36	664
SENSING_START	UTC Time of start of sensing data in this object (PDU, ROI or Full Product)			1	1	1	1	time	15	48	700
SENSING_END	UTC Time of end of sensing data in this object (PDU, ROI or Full Product)			1	1	1	1	time	15	48	748

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
SENSING_START_THEORETICAL	Theoretical UTC Time of start of sensing data in the dump from which this object is derived. This data is the predicted start time at the MPF level.			1	1	1	1	time	15	48	796
SENSING_END_THEORETICAL	Theoretical UTC Time of end of sensing data in the dump from which this object is derived. This data is the predicted end time at the MPF level.			1	1	1	1	time	15	48	844
PROCESSING_CENTRE	Processing Centre Identification			1	1	1	1	enumerated	4	37	892
PROCESSOR_MAJOR_VERSION	Processing chain major version number			1	1	1	1	uinteger	5	38	929
PROCESSOR_MINOR_VERSION	Processing chain minor version number			1	1	1	1	uinteger	5	38	967
FORMAT_MAJOR_VERSION	Dataset Format Major Version number			1	1	1	1	uinteger	5	38	1005
FORMAT_MINOR_VERSION	Dataset Format Minor Version number			1	1	1	1	uinteger	5	38	1043
PROCESSING_TIME_START	UTC time of the processing at start of processing for the product			1	1	1	1	time	15	48	1081
PROCESSING_TIME_END	UTC time of the processing at end of processing for the product			1	1	1	1	time	15	48	1129
PROCESSING_MODE	Identification of the mode of processing			1	1	1	1	enumerated	1	34	1177
DISPOSITION_MODE	Identification of the disposition mode			1	1	1	1	enumerated	1	34	1211
RECEIVING_GROUND_STATION	Acquisition Station Identification			1	1	1	1	enumerated	3	36	1245
RECEIVE_TIME_START	UTC time of the reception at CDA for first Data Item			1	1	1	1	time	15	48	1281
RECEIVE_TIME_END	UTC time of the reception at CDA for last Data Item			1	1	1	1	time	15	48	1329
ORBIT_START	Start Orbit Number, counted incrementally since launch			1	1	1	1	uinteger	5	38	1377
ORBIT_END	Stop Orbit Number			1	1	1	1	uinteger	5	38	1415
ACTUAL_PRODUCT_SIZE	Size of the complete product		bytes	1	1	1	1	uinteger	11	44	1453
ASCENDING NODE ORBIT PARAMETERS											
STATE_VECTOR_TIME	Epoch time (in UTC) of the orbital elements and the orbit state vector. this corresponds to the time of crossing the ascending node for ORBIT_START		UTC	1	1	1	1	longtime	18	51	1497
SEMI_MAJOR_AXIS	Semi major axis of orbit at time of the ascending node crossing.		mm	1	1	1	1	integer	11	44	1548

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
ECCENTRICITY	Orbit eccentricity at time of the ascending node crossing	10^6		1	1	1	1	integer	11	44	1592
INCLINATION	Orbit inclination at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1636
PERIGEE_ARGUMENT	Argument of perigee at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1680
RIGHT_ASCENSION	Right ascension at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1724
MEAN_ANOMALY	Mean anomaly at time of the ascending node crossing	10^3	deg	1	1	1	1	integer	11	44	1768
X_POSITION	X position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1812
Y_POSITION	Y position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1856
Z_POSITION	Z position of the orbit state vector in the orbit frame at ascending node	10^3	m	1	1	1	1	integer	11	44	1900
X_VELOCITY	X velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	1944
Y_VELOCITY	Y velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	1988
Z_VELOCITY	Z velocity of the orbit state vector in the orbit frame at ascending node	10^3	m/s	1	1	1	1	integer	11	44	2032
EARTH_SUN_DISTANCE_RATIO	Earth-Sun distance ratio - ratio of current Earth-Sun distance to Mean Earth-Sun distance			1	1	1	1	integer	11	44	2076
LOCATION_TOLERANCE_RADIAL	Nadir Earth location tolerance radial		m	1	1	1	1	integer	11	44	2120
LOCATION_TOLERANCE_CROSSTRACK	Nadir Earth location tolerance cross-track		m	1	1	1	1	integer	11	44	2164
LOCATION_TOLERANCE_ALONGTRACK	Nadir Earth location tolerance along-track		m	1	1	1	1	integer	11	44	2208
YAW_ERROR	Constant Yaw attitude error	10^3	deg	1	1	1	1	integer	11	44	2252
ROLL_ERROR	Constant Roll attitude error	10^3	deg	1	1	1	1	integer	11	44	2296
PITCH_ERROR	Constant Pitch attitude error	10^3	deg	1	1	1	1	integer	11	44	2340
LOCATION SUMMARY											
SUBSAT_LATITUDE_START	Latitude of sub-satellite point at start of the data set	10^3	Deg	1	1	1	1	integer	11	44	2384
SUBSAT_LONGITUDE_START	Longitude of sub-satellite point at start of the data set	10^3	Deg	1	1	1	1	integer	11	44	2428

Name	Description	Scaling factor	Units	Dim1	Dim2	Dim3	Dim4	Type	Type size	Field size	Offset
SUBSAT_LATITUDE_END	Latitude of sub-satellite point at end of the data set	10^3	Deg	1	1	1	1	integer	11	44	2472
SUBSAT_LONGITUDE_END	Longitude of sub-satellite point at end of the data set	10^3	Deg	1	1	1	1	integer	11	44	2516
Leap Second Information											
LEAP_SECOND	Occurrence of Leap second within the product. Field is set to -1, 0 or +1 dependent upon occurrence of leap second and direction.			1	1	1	1	integer	2	35	2560
LEAP_SECOND_UTC	UTC time of occurrence of the Leap Second (If no leap second in the product, value is null)			1	1	1	1	time	15	48	2595
Record counts											
TOTAL_RECORDS	Total count of all records in the product			1	1	1	1	uinteger	6	39	2643
TOTAL_MPHR	Total count of all MPHRs in product (should always be 1!)			1	1	1	1	uinteger	6	39	2682
TOTAL_SPHR	Total count of all SPHRs in product (should be 0 or 1 only)			1	1	1	1	uinteger	6	39	2721
TOTAL_IPR	Total count of all IPRs in the product			1	1	1	1	uinteger	6	39	2760
TOTAL_GEADR	Total count of all GEADRs in the product			1	1	1	1	uinteger	6	39	2799
TOTAL_GIADR	Total count of all GIADRs in the product			1	1	1	1	uinteger	6	39	2838
TOTAL_VEADR	Total count of all VEADRs in the product			1	1	1	1	uinteger	6	39	2877
TOTAL_VIADR	Total count of all VIADRs in the product			1	1	1	1	uinteger	6	39	2916
TOTAL_MDR	Total count of all MDRs in the product			1	1	1	1	uinteger	6	39	2955
Record Based Generic Quality Flags											
COUNT_DEGRADED_INST_MDR	Count of MDRs with degradation due to instrument problems			1	1	1	1	uinteger	6	39	2994
COUNT_DEGRADED_PROC_MDR	Count of MDRs with degradation due to processing problems			1	1	1	1	uinteger	6	39	3033
COUNT_DEGRADED_INST_MDR_BLOCKS	Count of the number of blocks of MDRs degraded due to degraded instrument			1	1	1	1	uinteger	6	39	3072
COUNT_DEGRADED_PROC_MDR_BLOCKS	Count of the number of blocks of MDRs degraded due to degraded processing			1	1	1	1	uinteger	6	39	3111

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
Time Based Generic Quality Flags											
DURATION_OF_PRODUCT	The duration of the product in milliseconds		ms	1	1	1	1	uinteger	8	41	3150
MILLISECONDS_OF_DATA_PRESENT	The total amount of data present in the product		ms	1	1	1	1	uinteger	8	41	3191
MILLISECONDS_OF_DATA_MISSING	The total amount of data missing from the product		ms	1	1	1	1	uinteger	8	41	3232
Regional Product Information											
SUBSETTED_PRODUCT	Set when product has been subset (e.g. geographically subset using a region of interest filter). Implies the presence of one or more EUMETSAT Data Centre GIADRs in GAD section for product retrieved from Data Centre.			1	1	1	1	boolean	1	34	3273
											Total: 3307

9.3.4 GIADR (name 'giadr-quality', class 5, subclass 0, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
QUALITY_PARAMETERS											
IDefPsfSondNbLin	Number of lines for sounder IPSF			PN	1	1	1	integer4	4	16	20
IDefPsfSondNbCol	Number of columns for sounder IPSF			PN	1	1	1	integer4	4	16	36
IDefPsfSondOverSampFactor	Oversampling factor for sounder IPSF			1	1	1	1	vinteger4	5	5	52
IDefPsfSondY	Y position of sounder IPSF in the cold plane	10^6	degrees	100	PN	1	1	integer4	4	1600	57
IDefPsfSondZ	Z position of sounder IPSF in the cold plane	10^6	degrees	100	PN	1	1	integer4	4	1600	1657
IDefPsfSondWgt	IPSF weight			100	100	PN	1	vinteger4	5	200000	3257
IDefIISSrfNsfirst	Number of first sample in spectral imager filter			1	1	1	1	integer4	4	4	203257
IDefIISSrfNslast	Number of last sample in spectral imager filter			1	1	1	1	integer4	4	4	203261
IDefIISSrf	Spectral response of spectral imager filter			100	1	1	1	vinteger4	5	500	203265
IDefIISSrfDWn	Sample width of spectral imager filter		m^{-1}	1	1	1	1	vinteger4	5	5	203765
IDefIISNeDT	IIS Noise		K	IMCO	IMLI	1	1	vinteger4	5	20480	203770
IDefDptIISDeadPix	Table of IASI imager dead pixels			IMCO	IMLI	1	1	boolean	1	4096	224250
											Total: 228346

9.3.5 GIADR (name 'giadr-scalefactors', class 5, subclass 1, version 2)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	1	1	1	REC_HEAD	20	20	0
Scale_Factors											
IDefScaleSondNbScale	Number of bands used for applying scale factors to spectra (up to a maximum of 10)			1	1	1	1	integer2	2	2	20
IDefScaleSondNsfirst	Begin channel number for each of the bands to which the scale factors are applied		channel number	10	1	1	1	integer2	2	20	22
IDefScaleSondNslast	End channel number for each of the bands to which the scale factors are applied		channel number	10	1	1	1	integer2	2	20	42
IDefScaleSondScaleFactor	Scale factors (power of 10) to be applied within each band defined above.			10	1	1	1	integer2	2	20	62
IDefScaleIISScaleFactor	Scale factor (power of 10) to be applied to the IIS imager.			1	1	1	1	integer2	2	2	82
											Total: 84

9.3.6 MDR (name 'mdr-1c', class 8, subclass 2, version 4)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	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			1	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation			1	1	1	1	boolean	1	1	21
Level_1_Data											
GEPSIasiMode	Instrument mode			1	1	1	1	bitfield (4)	4	4	22
GEPSOPSProcessingMode	Processing mode			1	1	1	1	bitfield (4)	4	4	26
GEPSIdConf	System configuration at line level: PTSI, TEC conf file ID,.....			1	1	1	1	bitfield (32)	32	32	30
GEPSLocIasiAvhrr_IASI	Measure positioning relatively to AVHRR: position of 4 IASI sounder pixels in AVHRR raster with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	PN	SNOT	1	vinteger4	5	1200	62
GEPSLocIasiAvhrr_IIS	Measure positioning relatively to AVHRR: position of IIS pixels for a subgrid 5*5 of IIS with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	SGI	SNOT	1	vinteger4	5	7500	1262
OBT	On Board Time (Coarse time + Fine time)			SNOT	1	1	1	bitfield (6)	6	180	8762
OnboardUTC	Date of IASI measure (on board UTC): Number of Days since 1 January 2000; Number of minutes in the day			SNOT	1	1	1	time	6	180	8942

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GEPSDatIasi	Date of IASI measure (Corrected UTC): Number of Days since 1 January 2000; Number of ms in the day		UTC	SNOT	1	1	1	time	6	180	9122
GIsfLinOrigin	Zero point in line in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9302
GIsfColOrigin	Zero point in column in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9310
GIsfPds1	Weight of interpolation point 1	10^6		CCD	1	1	1	integer4	4	8	9318
GIsfPds2	Weight of interpolation point 2	10^6		CCD	1	1	1	integer4	4	8	9326
GIsfPds3	Weight of interpolation point 3	10^6		CCD	1	1	1	integer4	4	8	9334
GIsfPds4	Weight of interpolation point 4	10^6		CCD	1	1	1	integer4	4	8	9342
GEPS_CCD	Corner Cube Direction for all observational targets			SNOT	1	1	1	boolean	1	30	9350
GEPS_SP	Scan position for all observational targets			SNOT	1	1	1	integer4	4	120	9380
GIrcImage	Calibrated IASI images		$W/m^2/sr/m^{-1}$	IMCO	IMLI	SNOT	1	uinteger2	2	245760	9500
GQisFlagQual	Quality flag for the system			PN	SNOT	1	1	boolean	1	120	255260
GQisQualIndex	System-IASI general quality index			1	1	1	1	vinteger4	5	5	255380
GQisQualIndexIIS	IIS imager quality index inside 1c product			1	1	1	1	vinteger4	5	5	255385
GQisQualIndexLoc	Geometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255390
GQisQualIndexRad	Radiometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255395
GQisQualIndexSpect	Spectral quality index for sounder product			1	1	1	1	vinteger4	5	5	255400
GQisSysTecIISQual	System -TEC quality index for IIS			1	1	1	1	uinteger4	4	4	255405

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GQisSysTecSondQual	System -TEC quality index sounder			1	1	1	1	uinteger4	4	4	255409
GGeoSondLoc	Location of pixel centre in geodetic coordinates (long, lat) for each sounder pixel	10^6	degrees	2	PN	SNOT	1	integer4	4	960	255413
GGeoSondAnglesMETOP	Measurement angles for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	256373
GGeoIISAnglesMETOP	Measurement angles for a subgrid of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	257333
GGeoSondAnglesSUN	Solar angles at the surface for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	263333
GGeoIISAnglesSUN	Solar angles at the surface for a subgrid (5x5) of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	264293
GGeoIISLoc	Location of pixel centre in geodetic coordinates for a sub grid (5x5) of the imager pixels	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	270293
EARTH_SATELLITE_DISTANCE	Distance of satellite from Earth centre		m	1	1	1	1	uinteger4	4	4	276293
Level_1c_Specific_Data											
IDefSpectDWn1b	Sample width of IASI 1C spectra (same as 1B)		m^{-1}	1	1	1	1	vinteger4	5	5	276297
IDefNsfirst1b	Number of the first sample of IASI 1C spectra (same as 1B)			1	1	1	1	integer4	4	4	276302
IDefNslast1b	Number of the last sample of IASI 1C spectra (same as 1B)			1	1	1	1	integer4	4	4	276306
GS1cSpect	Level 1C spectra		$W/m^2/sr/m^{-1}$	SS	PN	SNOT	1	integer2	2	2088000	276310
IDefCovarMatEigenVal1c	Level 1c noise variance-covariance matrix index			CCD	100	1	1	vinteger4	5	1000	2364310
IDefCcsChannelId	Radiance Analysis: Identification of the AVHRR channel or pseudo-			NBK	1	1	1	integer4	4	24	2365310

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
	channels used for Radiance Analysis										
GCcsRadAnalNbClass	Radiance Analysis: Number of identified classes in the sounder FOV			PN	SNOT	1	1	integer4	4	480	2365334
GCcsRadAnalWgt	Radiance Analysis: sounder FOV Radiance Analysis (% covered by each class)			NCL	PN	SNOT	1	vinteger4	5	4200	2365814
GCcsRadAnalY	Radiance Analysis: Y Angular position of the centre of gravity	10^6	degrees	NCL	PN	SNOT	1	integer4	4	3360	2370014
GCcsRadAnalZ	Radiance Analysis: Z Angular position of the centre of gravity	10^6	degrees	NCL	PN	SNOT	1	integer4	4	3360	2373374
GCcsRadAnalMean	Radiance Analysis: Mean AVHRR radiances (all channels) of the sounder FOV classes		W/(m^2 * sr) for channel 1,2,3a and W/(m^2*sr*m^-1) for 3b,4,5	NBK	NCL	PN	SNOT	vinteger4	5	25200	2376734
GCcsRadAnalStd	Radiance Analysis: Standard deviation AVHRR radiances (all channels) of the sounder FOV classes		W/(m^2 * sr) for channel 1,2,3a and W/(m^2*sr*m^-1) for 3b,4,5	NBK	NCL	PN	SNOT	vinteger4	5	25200	2401934
GCcsImageClassified	Radiance Analysis: Image AVHRR or IIS classified			AMCO	AMLI	SNOT	1	u-byte	1	300000	2427134
IDefCcsMode	Radiance Analysis: Image used is from AVHRR or IIS imager (degraded cases)			1	1	1	1	bitfield (4)	4	4	2727134
GCcsImageClassifiedNbLin	Radiance Analysis: Number of useful lines			SNOT	1	1	1	integer2	2	60	2727138
GCcsImageClassifiedNbCol	Radiance Analysis: Number of useful columns			SNOT	1	1	1	integer2	2	60	2727198

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GCcsImageClassifiedFirstLin	First line of the classified image (number in the Avhrr raster, as per section 2.5)		ms	SNOT	1	1	1	vinteger4	5	150	2727258
GCcsImageClassifiedFirstCol	First column of the classified image (number in the Avhrr raster, as per section 2.5)		Avhrr pixels	SNOT	1	1	1	vinteger4	5	150	2727408
GCcsRadAnalType	Radiance Analysis: boolean reporting if classes are of extreme type			NCL	SNOT	1	1	boolean	1	210	2727558
											Total: 2727768

9.3.7 MDR (name 'mdr-1c', class 8, subclass 2, version 5)

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
RECORD_HEADER	Generic Record Header			1	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			1	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation			1	1	1	1	boolean	1	1	21
Level_1_Data											
GEPSIasiMode	Instrument mode			1	1	1	1	bitfield (4)	4	4	22
GEPSOPSProcessingMode	Processing mode			1	1	1	1	bitfield (4)	4	4	26
GEPSIdConf	System configuration at line level: PTSI, TEC conf file ID,.....			1	1	1	1	bitfield (32)	32	32	30
GEPSLocIasiAvhrr_IASI	Measure positioning relatively to AVHRR: position of 4 IASI sounder pixels in AVHRR raster with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	PN	SNOT	1	vinteger4	5	1200	62
GEPSLocIasiAvhrr_IIS	Measure positioning relatively to AVHRR: position of IIS pixels for a subgrid 5*5 of IIS with DIM1 equal to 2 corresponding to (line, column)		ms in line, Avhrr pixels in column	2	SGI	SNOT	1	vinteger4	5	7500	1262
OBT	On Board Time (Coarse time + Fine time)			SNOT	1	1	1	bitfield (6)	6	180	8762
OnboardUTC	Date of IASI measure (on board UTC): Number of Days since 1 January 2000; Number of ms in the day			SNOT	1	1	1	time	6	180	8942

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GEPSDatIasi	Date of IASI measure (Corrected UTC): Number of Days since 1 January 2000; Number of ms in the day		UTC	SNOT	1	1	1	time	6	180	9122
GIsfLinOrigin	Zero point in line in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9302
GIsfColOrigin	Zero point in column in the interpolation grid of the spectral database			CCD	1	1	1	integer4	4	8	9310
GIsfPds1	Weight of interpolation point 1	10^6		CCD	1	1	1	integer4	4	8	9318
GIsfPds2	Weight of interpolation point 2	10^6		CCD	1	1	1	integer4	4	8	9326
GIsfPds3	Weight of interpolation point 3	10^6		CCD	1	1	1	integer4	4	8	9334
GIsfPds4	Weight of interpolation point 4	10^6		CCD	1	1	1	integer4	4	8	9342
GEPS_CCD	Corner Cube Direction for all observational targets			SNOT	1	1	1	boolean	1	30	9350
GEPS_SP	Scan position for all observational targets			SNOT	1	1	1	integer4	4	120	9380
GIrcImage	Calibrated IASI images		$W/m^2/sr/m^{-1}$	IMCO	IMLI	SNOT	1	uinteger2	2	245760	9500
GQisFlagQual	Quality flag for the system			SB	PN	SNOT	1	boolean	1	360	255260
GQisFlagQualDetailed	Detailed quality flag for the system			PN	SNOT	1	1	bitfield (2)	2	240	255620
GQisQualIndex	System-IASI general quality index			1	1	1	1	vinteger4	5	5	255860
GQisQualIndexIIS	IIS imager quality index inside 1c [product			1	1	1	1	vinteger4	5	5	255865
GQisQualIndexLoc	Geometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255870
GQisQualIndexRad	Radiometric quality index for sounder product			1	1	1	1	vinteger4	5	5	255875
GQisQualIndexSpect	Spectral quality index for sounder product			1	1	1	1	vinteger4	5	5	255880

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GQisSysTecIISQual	System -TEC quality index for IIS			1	1	1	1	uinteger4	4	4	255885
GQisSysTecSondQual	System -TEC quality index for sounder			1	1	1	1	uinteger4	4	4	255889
GGeoSondLoc	Location of pixel centre in geodetic coordinates (long, lat) for each sounder pixel	10^6	degrees	2	PN	SNOT	1	integer4	4	960	255893
GGeoSondAnglesMETOP	Measurement angles for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	256853
GGeoIISAnglesMETOP	Measurement angles for a subgrid of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	257813
GGeoSondAnglesSUN	Solar angles at the surface for each sounder pixel (zenith, azimuth)	10^6	degrees	2	PN	SNOT	1	integer4	4	960	263813
GGeoIISAnglesSUN	Solar angles at the surface for a subgrid (5x5) of IASI imager (zenith, azimuth)	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	264773
GGeoIISLoc	Location of pixel centre in geodetic coordinates for a sub grid (5x5) of the imager pixels	10^6	degrees	2	SGI	SNOT	1	integer4	4	6000	270773
EARTH_SATELLITE_DISTANCE	Distance of satellite from Earth centre		m	1	1	1	1	uinteger4	4	4	276773
Level_1c_Specific_Data											
IDefSpectDWn1b	Sample width of IASI 1C spectra (same as 1B)		m-1	1	1	1	1	vinteger4	5	5	276777
IDefNsfirst1b	Number of the first sample of IASI 1C spectra (same as 1B)			1	1	1	1	integer4	4	4	276782
IDefNslast1b	Number of the last sample of IASI 1C spectra (same as 1B)			1	1	1	1	integer4	4	4	276786
GS1cSpect	Level 1C spectra		W/m2/sr/m-1	SS	PN	SNOT	1	integer2	2	2088000	276790
IDefCovarMatEigenVal1c	Level 1c noise variance-covariance matrix index			CCD	100	1	1	vinteger4	5	1000	2364790

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
IDefCcsChannelId	Radiance Analysis: Identification of the AVHRR channel or pseudo-channels used for Radiance Analysis			NBK	1	1	1	integer4	4	24	2365790
GCcsRadAnalNbClass	Radiance Analysis: Number of identified classes in the sounder FOV			PN	SNOT	1	1	integer4	4	480	2365814
GCcsRadAnalWgt	Radiance Analysis: sounder FOV Radiance Analysis (% covered by each class)			NCL	PN	SNOT	1	vinteger4	5	4200	2366294
GCcsRadAnalY	Radiance Analysis: Y Angular position of the centre of gravity	10^6	degrees	NCL	PN	SNOT	1	integer4	4	3360	2370494
GCcsRadAnalZ	Radiance Analysis: Z Angular position of the centre of gravity	10^6	degrees	NCL	PN	SNOT	1	integer4	4	3360	2373854
GCcsRadAnalMean	Radiance Analysis: Mean AVHRR radiances (all channels) of the sounder FOV classes		W/(m^2 * sr) for channel 1,2,3a and W/(m^2*sr*m^-1) for 3b,4,5	NBK	NCL	PN	SNOT	vinteger4	5	25200	2377214
GCcsRadAnalStd	Radiance Analysis: Standard deviation AVHRR radiances (all channels) of the sounder FOV classes		W/(m^2 * sr) for channel 1,2,3a and W/(m^2*sr*m^-1) for 3b,4,5	NBK	NCL	PN	SNOT	vinteger4	5	25200	2402414
GCcsImageClassified	Radiance Analysis: Image AVHRR or IIS classified			AMCO	AMLI	SNOT	1	u-byte	1	300000	2427614
IDefCcsMode	Radiance Analysis: Image used is from AVHRR or IIS imager (degraded cases)			1	1	1	1	bitfield (4)	4	4	2727614
GCcsImageClassifiedNbLin	Radiance Analysis: Number of useful lines			SNOT	1	1	1	integer2	2	60	2727618
GCcsImageClassifiedNbCol	Radiance Analysis: Number of useful columns			SNOT	1	1	1	integer2	2	60	2727678

Name	*Description*	*Scaling factor*	*Units*	*Dim1*	*Dim2*	*Dim3*	*Dim4*	*Type*	*Type size*	*Field size*	*Offset*
GCcsImageClassifiedFirstLin	First line of the classified image (number in the Avhrr raster, as per section 2.5)		ms	SNOT	1	1	1	vinteger4	5	150	2727738
GCcsImageClassifiedFirstCol	First column of the classified image (number in the Avhrr raster, as per section 2.5)		Avhrr pixels	SNOT	1	1	1	vinteger4	5	150	2727888
GCcsRadAnalType	Radiance Analysis: boolean reporting if classes are of extreme type			NCL	SNOT	1	1	boolean	1	210	2728038
GIacVarImagIIS	Variance of IIS image		W/(m² sr m^-1)	SNOT	1	1	1	vinteger4	5	150	2728248
GIacAvgImagIIS	Average of IIS image		W/(m² sr m^-1)	SNOT	1	1	1	vinteger4	5	150	2728398
GEUMAvhrr1BCldFrac	Cloud fraction in IASI FOV from AVHRR 1B in IASI FOV		%	PN	SNOT	1	1	u-byte	1	120	2728548
GEUMAvhrr1BLandFrac	Land and Coast fraction in IASI FOV from AVHRR 1B		%	PN	SNOT	1	1	u-byte	1	120	2728668
GEUMAvhrr1BQual	Quality indicator. If the quality is good, it gives the coverage of snow/ice.			PN	SNOT	1	1	bitfield (1)	1	120	2728788
											Total: 2728908

9.3.8 Enumeration INSTRUMENT_MODEL

Value	*Name*
0	Reserved
1	Flight Model 1
2	Flight Model 2
3	Engineering Model
4	Protoflight Model

9.3.9 Enumeration PROCESSING_CENTRE

Value	*Description*
CGS1	First EUMETSAT EPS Core Ground Segment
CGS2	Second EUMETSAT EPS Core Ground Segment
NSSx	NOAA/NESDIS
RUSx	Reference User Station
DMIx	DMI, Copenhagen (GRAS SAF)
DWDx	DWD, Offenbach (Climate SAF)
FMIx	FMI , Helsinki (Ozone SAF)
IMPx	IMP, Lisbon (Land SAF)
INMx	INM, Madrid (NCW SAF)
MFxx	MF, Lannion (OSI SAF)
UKMO	UKMO, Bracknell (NWP SAF)

9.3.10 Enumeration PROCESSING_LEVEL

Value	*Name*
00	Level 0
01	Level 1
1A	Level 1a
1B	Level 1b
1C	Level 1c
02	Level 2
03	Level 3
xx	No Specific Level

9.3.11 Enumeration PROCESSING_MODE

Value	*Name*	*Description*
N	Nominal	NRT processing
B	Backlog Processing	
R	Reprocessing	
V	Validation	

9.3.12 Enumeration PRODUCT_TYPE

Value	*Name*
ENG	IASI engineering data
GAC	NOAC Global Area Coverage AVHRR data
SND	Sounding Data
SZF	ASCAT calibrated s0 data at full resolution
SZO	ASCAT calibrated s0 data at operational resolution (50 km)
SZR	ASCAT calibrated s0 data at research resolution (25 km)
VER	IASI verification data
xxx	No specific product type specified
AIP	NOAA AIP/SAIP data
TIP	NOAA TIP/STIP data
HRP	HRPT data
LRP	LRPT data

9.3.13 Enumeration RECEIVING_GROUND_STATION

Value	*Description*
SVL	Svalbard
WAL	Wallops Island, Virginia
FBK	Fairbanks, Alaska
SOC	SOCC (NESDIS Satellite Operations Control Centre), Suitland, Maryland
RUS	Reference User Station
SVL	Svalbard

9.3.14 Enumeration SPACECRAFT_ID

Value	*Description*
xxx	No specific spacecraft
M01	METOP 01
M02	METOP 02
M03	METOP 03
N15	NOAA-K
N16	NOAA-L
N17	NOAA-M
N18	NOAA-N
N19	NOAA-N'

9.3.14.1 Bitfield GEPSIasiMode

Length: 4 bytes

Description	*Bit position*	*Length*
Instrument mode: word 19 of instrument packet	Bit 0 - 15	16
When in external calibration mode, scan position SP (see word 12 of instrument packet). 00 if not during external calibration mode	Bit 16 - 23	8
not used	Bit 24 - 31	8

9.3.14.2 Bitfield GEPSIdConf

Length: 32 bytes

Description	*Bit position*	*Length*
PTSI (word 16 and 17 of the instrument packet)	Bit 0 - 31	32
IDefIDConf: ID of the algorithm configuration	Bit 32 - 63	32
Normal processing mode (0 = off, 1 = On)	Bit 64	1
Backlog processing mode (0 = off, 1 = On)	Bit 65	1
Re-processing mode (0 = off, 1 = On)	Bit 66	1
Parallel validation (0 = off, 1 = On)	Bit 67	1
In-plane satellite manoeuvre (0 = no manoeuvre, 1 = manoeuvre)	Bit 68	1
GOPSFlaPixMiss (degraded case at line level)	Bit 69	1
GOPSFlaDataGap (degraded case at line level)	Bit 70	1
GOPSFltIsrfemOff (degraded case at line level)	Bit 71	1
GOPSFltBandMiss (degraded case at line level)	Bit 72	1
GOPSFltBBTMiss (degraded case at line level)	Bit 73	1
GOPSFltImgEWMiss (degraded case at line level)	Bit 74	1
GOPSFltImgBBMiss (degraded case at line level)	Bit 75	1
GOPSFltImgCSMiss (degraded case at line level)	Bit 76	1
GOPSFlagPacketVPMiss (degraded case at line level)	Bit 77	1
GOPSFlagPacketAPMiss (degraded case at line level)	Bit 78	1
GOPSFlagPacketPXMiss (degraded case at line level)	Bit 79	1
GOPSFlagPacketIPMiss (degraded case at line level)	Bit 80	1
not used	Bit 82 - 255	174

9.3.14.3 Bitfield GEPSOPSProcessingMode

Length: 4 bytes

Description	*Bit position*	*Length*
00 = Level 0, 01 = Level 1, 11 = Level 2	Bit 0 - 1	2
0 = normal/auxiliary instrument mode, 1 = external calibration mode	Bit 2	1
debug mode; 0 = debug mode off, 1 = debug mode on	Bit 3	1
interface mode; 0 = granule per granule, 1 = dump per dump	Bit 4	1
target type during external calibration mode; 0 = Earth, 1 = not Earth	Bit 5	1
not used	Bit 6 - 31	26

9.3.14.4 Bitfield OBT

Length: 6 bytes

Description	*Bit position*	*Length*
On Board time counter (coarse time + fine time)	Bit 0 - 47	48

9.3.14.5 Bitfield IDefCcsMode

Length: 4 bytes

Description	*Bit position*	*Length*
Image used for radiance analysis; 0 = AVHRR, 1 = IIS	Bit 0	1
not used	Bit 1 - 31	31

9.3.14.6 Bitfield GQisFlagQualDetailed

Length: 2 bytes with the most significant bit in the last position

Description	*Bit position*	*Length*
Hardware (BIMSCSQ, BIMSSQ1, BIMSSQ2)	Bit 0	1
Band 1 affected by Spikes (BspkFlagSpik B1)	Bit 1	1
Band 2 affected by Spikes (BspkFlagSpik B2)	Bit 2	1
Band 3 affected by Spikes (BspkFlagSpik B3)	Bit 3	1
NZPD and complex calibration error (BZpdFlagNZpdNonQual, BArcFlagCalSpectNonQual	Bit 4	1
On-board general quality flag (BBofFlagSpectNonQual)	Bit 5	1
Overflow/Underflow (GDocFlagUnderOverFlow)	Bit 6	1
Spectral calibration error (GFaxFlagAxeNonQual, GIsfFlagPdsNonValid, GOPSFltIsrfemOff)	Bit 7	1
Radiometric post-calibration error (GFtbFlagBBTNonQual, GHecFlagDateNonOK)	Bit 8	1
GQisFlagQual summary flag for all bands (old flag)	Bit 9	1
Missing sounder data (GOPSFlagPixMiss, GOPSFlagBandMiss)	Bit 10	1
Missing IIS data (GOPSFltImgEWMiss)	Bit 11	1
Missing AVHRR data (GOPSFltRadAvhrrMiss)	Bit 12	1
not used	Bit 13 - 15	3

9.3.14.7 Bitfield GEUMAvhrr1BQual

Length: 1 byte

Description	*Bit position*	*Length*
If Bit7 = 0: Fraction in % (0-100) of weighted AVHRR pixel in IASI FOV covered with snow/ice. If Bit7 = 1: Number of missing, bad or failed AVHRR pixels (0-126).	Bit 0 - 6	7
0 = no missing or bad AVHRR pixels 1 = missing/bad AVHRR pixel(s)	Bit 7	1

9.3.15 Parameters Table

Parameter	*Value*	*Description*
AMCO	100	Number of columns for AVHR image pixel

AMLI	100	Number of lines for AVHRR image pixel
CCD	2	Number of corner cube directions
IMCO	64	Number of columns for IASi imager pixel
IMLI	64	Number of lines for IASI imager pixel
MAXBA	3600	Maximum number of samples in one IASI band
NBK	6	Number of AVHRR channels
NCL	7	Number of classes for FOV sounder analysis
NIM	28	Number of samples used to represent the imaginary part of the IASI spectrum
PN	4	Number of sounder pixels
SB	3	Number of spectral bands
SGI	25	5 × 5 - Number of pixels of the subgrid imager
SNOT	30	Number of steps for observational target
SNOT+4	34	
SS	8700	Number of samples in an IASI spectrum
VP	1	Number of verification packets per IASI line

10 SPECTRAL CHANNELS USED FOR IASI LEVEL 1C SUBSET PRODUCT

The following 500 GTS-BUFR channels are included in the IASI Level 1c subset product which became operational on 15 October 2014.

Following the evolution of NWP assimilation systems, EUMETSAT requested approval by the IASI Sounding Science Working Group (ISSWG). Approval was granted. Approval by the EUMETSAT Scientific and Technical Group (STG-SWG) followed, but the STG-SWG suggested that we add 134 channels to the previous 366 IASI GTS-BUFR channels. Table 8 which starts below includes these additional 134 channels marked in red text.

Historically, the original list of 300 channels was the result of a recommendation in [RD 40] *Definition of an efficient interface to NWP for assimilating IASI radiances* (A.D. Collard and M. Matricardi, ECMWF report, 2005). Later, 66 additional channels were added. These include 14 for the IASI monitoring, 10 for the consistent set of monitoring channels for AIRS and IASI. Also, 42 channels were added in the region from 675 cm^{-1} to 740 cm^{-1} to maximise the number of channels in this important temperature-sounding region.

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
16	648.75	Main	63
38	654.25	Main	179
49	657.00	Main	153
51	657.50	Main	167
55	658.50	Main	165
57	659.00	Main	121
59	659.50	Main	180
61	660.00	Main	134
63	660.50	Main	130
66	661.25	Main	156
70	662.25	Main	160
72	662.75	Temp	15
74	663.25	Main	122
79	664.50	Main	149
81	665.00	Main	97
83	665.50	Main	144
85	666.00	Main	78
87	666.50	Temp	18
89	667.00	Temp	11
92	667.75	Temp	2
95	668.50	Temp	5
97	669.00	Temp	7

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
99	669.50	Temp	10
101	670.00	Main	73
104	670.75	Main	58
106	671.25	Main	100
109	672.00	Main	70
111	672.50	Main	90
113	673.00	Main	68
116	673.75	Main	50
119	674.50	Main	39
122	675.25	Main	29
125	676.00	Temp	24
128	676.75	Main	35
131	677.50	Main	45
133	678.00	Main	128
135	678.50	Temp	27
138	679.25	Temp	30
141	680.00	Temp	16
144	680.75	Main	31
146	681.25	Main	113
148	681.75	Temp	21
151	682.50	Main	55
154	683.25	Temp	13
157	684.00	Main	87
159	684.50	Main	103
161	685.00	Main	43
163	685.50	Main	105
165	686.00	Temp	
167	686.50	Temp	23
170	687.25	Main	116
173	688.00	Main	32
176	688.75	Main	175
178	689.25	Temp	
179	689.50	Temp	
180	689.75	Main	56
183	690.50	Temp	
185	691.00	Main	83

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
187	691.50	Main	65
189	692.00	Temp	
191	692.50	Temp	
193	693.00	Main	37
195	693.50	Temp	
197	694.00	Temp	
199	694.50	Temp	22
201	695.00	Temp	
203	695.50	Temp	
205	696.00	Temp	28
207	696.50	Main	98
210	697.25	Main	177
212	697.75	Main	42
214	698.25	Main	161
217	699.00	Main	115
219	699.50	Main	49
222	700.25	Main	141
224	700.75	Main	95
226	701.25	Main	61
228	701.75	Temp	
230	702.25	Main	76
232	702.75	Main	91
234	703.25	Temp	
236	703.75	Main	106
239	704.50	Main	69
241	705.00	Temp	
242	705.25	Temp	
243	705.50	Temp	17
246	706.25	Main	84
249	707.00	Temp	25
252	707.75	Temp	29
254	708.25	Temp	43
256	708.75	Temp	
258	709.25	Temp	
260	709.75	Temp	45
262	710.25	Temp	35

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
265	711.00	Temp	32
267	711.50	Temp	40
269	712.00	Temp	47
271	712.50	Temp	
272	712.75	Temp	
273	713.00	Temp	
275	713.50	Temp	14
278	714.25	Temp	
280	714.75	Temp	
282	715.25	Temp	49
284	715.75	Temp	
286	716.25	Temp	
288	716.75	Temp	
290	717.25	Temp	
292	717.75	Temp	
294	718.25	Temp	42
296	718.75	Temp	36
299	719.50	Main	152
301	720.00	Temp	
303	720.50	Temp	20
306	721.25	Temp	39
308	721.75	Temp	
310	722.25	Temp	
312	722.75	Temp	
314	723.25	Temp	
316	723.75	Temp	
318	724.25	Temp	
320	724.75	Temp	
323	725.50	Temp	64
325	726.00	Temp	
327	726.50	Temp	53
329	727.00	Temp	61
331	727.50	Temp	
333	728.00	Temp	
335	728.50	Temp	57
337	729.00	Temp	

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
339	729.50	Temp	
341	730.00	Temp	
343	730.50	Temp	
345	731.00	Temp	3
347	731.50	Temp	50
350	732.25	Temp	38
352	732.75	Temp	
354	733.25	Temp	55
356	733.75	Temp	44
358	734.25	Temp	
360	734.75	Temp	58
362	735.25	Temp	
364	735.75	Temp	
366	736.25	Temp	59
369	737.00	Temp	
371	737.50	Temp	63
373	738.00	Temp	54
375	738.50	Temp	41
377	739.00	Temp	60
379	739.50	Temp	52
381	740.00	Temp	26
383	740.50	Temp	34
386	741.25	Temp	33
389	742.00	Temp	37
398	744.25	Temp	8
401	745.00	Temp	12
404	745.75	Temp	62
407	746.50	Temp	65
410	747.25	Temp	48
414	748.25	Temp	46
416	748.75	Temp	19
426	751.25	Temp	66
428	751.75	Temp	9
432	752.75	Temp	51
434	753.25	Temp	4
439	754.50	Temp	6

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
445	756.00	Temp	56
457	759.00	Temp	31
515	773.50	Main	109
546	781.25	Main	12
552	782.75	Main	26
559	784.50	Main	119
566	786.25	Main	86
571	787.50	Main	54
573	788.00	Main	137
638	**804.25**		
641	**805**		
643	**805.5**		
646	806.25	Extra window channel	
649	**807**		
657	**809**		
662	810.25	Main	183
666	**811.25**		
668	811.75	Main	159
670	**812.25**		
673	**813**		
686	**816.25**		
742	**830.25**		
745	**831**		
748	**831.75**		
750	**832.25**		
752	**832.75**		
754	**833.25**		
756	833.75	Extra window channel	
759	**834.5**		
767	**836.5**		
769	**837**		
818	**849.25**		
820	**849.75**		
829	**852**		
834	**853.25**		
838	**854.25**		

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
840	**854.75**		
867	861.50	Extra window channel	
882	**865.25**		
906	871.25	Extra window channel	
921	875.00	Extra window channel	
935	**878.5**		
994	**893.25**		
996	**893.75**		
998	**894.25**		
1000	**894.75**		
1002	**895.25**		
1009	**897**		
1016	**898.75**		
1018	**899.25**		
1020	**899.75**		
1027	901.50	Extra window channel	
1044	**905.75**		
1046	906.25	Extra window channel	
1052	**907.75**		
1056	**908.75**		
1058	**909.25**		
1064	**910.75**		
1079	**914.5**		
1090	917.25	Extra window channel	
1105	**921**		
1110	**922.25**		
1119	**924.5**		
1121	925.00	Extra window channel	
1130	**927.25**		
1133	928.00	Extra window channel	
1137	**929**		
1140	**929.75**		
1142	**930.25**		
1144	**930.75**		
1147	**931.5**		
1149	**932**		

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
1151	**932.5**		
1156	**933.75**		
1158	**934.25**		
1191	942.50	Extra window channel	
1194	943.25	Extra window channel	
1213	**948**		
1271	962.50	Extra window channel	
1300	**969.75**		
1352	**982.75**		
1361	**985**		
1369	**987**		
1374	**988.25**		
1385	**991**		
1479	1014.50	Ozone	5
1509	1022.00	Ozone	4
1513	1023.00	Ozone	2
1521	1025.00	Ozone	1
1536	1028.75	Ozone	11
1574	1038.25	Ozone	15
1578	1039.25	Ozone	
1579	1039.50	Ozone	10
1585	1041.00	Ozone	13
1587	1041.50	Ozone	6
1626	1051.25	Ozone	3
1639	1054.50	Ozone	7
1643	1055.50	Ozone	8
1652	1057.75	Ozone	12
1658	1059.25	Ozone	14
1671	1062.50	Ozone	9
1752	**1082.75**		
1757	**1084**		
1779	**1089.5**		
1786	1091.25	Extra window channel	
1792	**1092.75**		
1805	1096.00	Extra window channel	
1814	**1098.25**		

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
1884	1115.75	Extra window channel	
1946	1131.25	Extra window channel	
1991	1142.50	Extra window channel	
2019	1149.50	Extra window channel	
2094	1168.25	Extra window channel	
2119	1174.50	Main	154
2123	**1175.5**		
2213	1198.00	Main	88
2239	1204.50	Temp	1
2245	1206.00	Temp	
2271	1212.50	Main	129
2289	**1217**		
2321	1225.00	Main	57
2398	1244.25	Main	72
2701	1320.00	Main	126
2741	1330.00	Main	145
2745	1331.00		
2819	1349.50	Main	140
2889	1367.00	Main	8
2907	1371.50	Main	33
2910	1372.25	Main	114
2919	1374.50	Main	157
2939	1379.50	Main	47
2944	1380.75	Main	53
2948	1381.75	Main	176
2951	1382.50	Main	108
2958	1384.25	Main	17
2977	1389.00	Main	107
2985	1391.00	Main	136
2988	1391.75	Main	150
2991	1392.50	Main	23
2993	1393.00	Main	11
3002	1395.25	Main	6
3008	1396.75	Main	123
3014	1398.25	Main	60
3027	1401.50	Main	77
3029	1402.00	Main	52

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
3036	1403.75	Main	59
3047	1406.50	Main	184
3049	1407.00	Main	3
3053	1408.00	Main	135
3058	1409.25	Main	93
3064	1410.75	Main	117
3069	1412.00	Main	71
3087	1416.50	Main	185
3093	1418.00	Main	14
3098	1419.25	Main	13
3105	1421.00	Main	2
3107	1421.50	Main	46
3110	1422.25	Main	18
3127	1426.50	Main	170
3136	1428.75	Main	169
3151	1432.50	Main	94
3160	1434.75	Main	27
3165	1436.00	Main	38
3168	1436.75	Main	44
3175	1438.50	Main	81
3178	1439.25	Main	146
3207	1446.50	Main	111
3228	1451.75	Main	162
3244	1455.75	Main	1
3248	1456.75	Main	22
3252	1457.75	Main	7
3256	1458.75	Main	85
3263	1460.50	Main	104
3281	1465.00	Main	110
3303	1470.50	Main	125
3309	1472.00	Main	143
3312	1472.75	Main	15
3322	1475.25	Main	41
3339	1479.50		
3375	1488.50	Main	92
3378	1489.25	Main	181

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
3411	1497.50	Main	21
3438	1504.25	Main	132
3440	1504.75	Main	147
3442	1505.25	Main	151
3444	1505.75	Main	89
3446	1506.25	Main	4
3448	1506.75	Main	19
3450	1507.25	Main	82
3452	1507.75	Main	20
3454	1508.25	Main	164
3458	1509.25	Main	102
3467	1511.50	Main	178
3476	1513.75	Main	139
3484	1515.75	Main	62
3491	1517.50	Main	168
3497	1519.00	Main	79
3499	1519.50	Main	173
3504	1520.75	Main	101
3506	1521.25	Main	186
3509	1522.00	Main	34
3518	1524.25	Main	155
3522	1525.25		
3527	1526.50	Main	112
3540	1529.75		
3555	1533.50	Main	127
3575	1538.50	Main	30
3577	1539.00	Main	131
3580	1539.75	Main	9
3582	1540.25	Main	120
3586	1541.25	Main	66
3589	1542.00	Main	163
3599	1544.50	Main	124
3645	1556.00		
3653	1558.00	Main	36
3658	1559.25	Main	51
3661	1560.00	Main	64

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
3943	1630.50		
4032	1652.75	Main	174
5130	1927.25		
5165	**1936**		
5234	**1953.25**		
5259	**1959.5**		
5273	**1963**		
5275	**1963.5**		
5303	**1970.5**		
5308	**1971.75**		
5310	**1972.25**		
5315	**1973.5**		
5317	**1974**		
5319	**1974.5**		
5321	**1975**		
5330	**1977.25**		
5333	**1978**		
5335	**1978.5**		
5338	**1979.25**		
5340	**1979.75**		
5342	**1980.25**		
5346	**1981.25**		
5348	**1981.75**		
5351	**1982.5**		
5354	**1983.25**		
5356	**1983.75**		
5359	**1984.5**		
5362	**1985.25**		
5365	**1986**		
5368	1986.75	Main	138
5371	1987.50	Main	148
5379	1989.50	Main	24
5381	1990.00	Main	5
5383	1990.50	Main	40
5397	1994.00	Main	96
5399	1994.50	Main	16

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
5401	1995.00	Main	28
5403	1995.50	Main	48
5405	1996.00	Main	118
5426	**2001.25**		
5428	**2001.75**		
5430	**2002.25**		
5432	**2002.75**		
5434	**2003.25**		
5437	**2004**		
5439	**2004.5**		
5441	**2005**		
5446	**2006.25**		
5449	**2007**		
5455	2008.50	Main	171
5464	**2010.75**		
5466	**2011.25**		
5468	**2011.75**		
5471	**2012.5**		
5473	**2013**		
5476	**2013.75**		
5480	2014.75	Main	10
5483	2015.50	Main	67
5485	2016.00	Main	172
5492	2017.75	Main	80
5502	2020.25	Main	99
5507	2021.50	Main	158
5509	2022.00	Main	75
5517	2024.00	Main	133
5522	**2025.25**		
5524	**2025.75**		
5532	**2027.75**		
5535	**2028.5**		
5537	**2029**		
5539	**2029.5**		
5541	**2030**		
5543	**2030.5**		

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
5545	**2031**		
5547	**2031.5**		
5549	**2032**		
5551	**2032.5**		
5553	**2033**		
5558	2034.25	Main	182
5560	**2034.75**		
5565	**2036**		
5567	**2036.5**		
5614	**2048.25**		
5621	**2050**		
5626	**2051.25**		
5700	**2069.75**		
5706	**2071.25**		
5752	**2082.75**		
5874	**2113.25**		
5972	**2137.75**		
5988	2141.75	Main	142
5992	2142.75	Main	74
5994	2143.25	Main	25
6003	2145.50	Main	166
6350	2232.25		
6458	2259.25		
6463	2260.50		
6601	2295.00		
6962	2385.25		
6978	2389.25		
6980	2389.75		
6982	2390.25	Solar	13
6985	2391.00	Solar	11
6987	2391.50	Solar	9
6989	2392.00	Solar	7
6991	2392.50	Solar	5
6993	2393.00	Solar	8
6995	2393.50	Solar	4
6997	2394.00	Solar	12

Channel No.	*Wave number (cm^{-1})*	*Application*	*Order chosen*
7001	2395.00		
7267	2461.50	Solar	3
7269	2462.00	Solar	1
7389	2492.00		
7424	2500.75	Solar	2
7426	2501.25	Solar	6
7428	2501.75	Solar	10
7885	2616.00	Extra window channel	
8007	2646.50	Extra window channel	

Table 88: Spectral Channels used for IASI Level 1c Subset Product.