



CGMS-39 EUM-WP-34
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Prepared by EUMETSAT
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EUMETSAT REPORT ON THE EVOLUTION OF DATA DISSEMINATION

In response to CGMS action/recommendation A38.45

EUMETSAT is operating a multi-mission dissemination system consisting of EUMETCast, RMDCN and Internet.

This paper presents to CGMS in more detail the planned evolution of the EUMETSAT multi-mission dissemination system to accommodate future high data volume demand of MTG and other services. The upgrade of EUMETCast Europe to the DVB-S2 standard will provide the flexibility to add the MTG near real time data in a cost efficient way to the satellite dissemination. This will make MTG data available to all users in the EUMETCast Europe footprint. A subset of these products will be available to users in the EUMETCast Africa footprint. RMDCN is still the appropriate network for operational dissemination of WMO coordinated data for global exchange. A high rate terrestrial dissemination path using DANTE research networks is also explored.

A preliminary MTG dissemination baseline is presented. Updates to the baseline will be published in future papers as they become available.

EUMETSAT Report on the Evolution of Data Dissemination

1 INTRODUCTION

The current EUMETSAT dissemination system is composed of near-real-time dissemination using DVB-S broadcast via EUMETCast, point-to-point file based dissemination to the GTS and other organisations via RMDCN, point-to-point file based dissemination to Internet users and also downloads initiated from Internet users. It also includes data download from the Data Centre.

The baseline near real time dissemination system is EUMETCast and is currently operated on EUROIRD-9A with a bandwidth of 16.5 Mbps (Mbit/sec) which includes all polar and geostationary EUMETSAT missions, foreign satellite data and a range of other data sets and products. With the introduction of Metop-B and NPP data the bandwidth will rise to 20.5 Mbps in 2012.

2 PROJECTED FUTURE DISSEMINATION NEEDS

The following launch dates are assumed in this document and form in conjunction with the expected associated data volumes the future needs. It should be noted that the overall outcome of the consolidated approach presented in this document is independent of the accuracy of the launch schedule. The launch schedule and the resulting needs for dissemination mainly impact the timing of the evolutionary steps but not the overall architecture.

Table 1 Future needs

Satellite	Bandwidth Need Date	Assumed NRT Dissemination Data Rate
MSG3	Q2 2012	1 Mbit/s temporary
Metop-B	Q2 2012	1 Mbit/s
NPP	Q1 2012	3-4 Mbit/s
GMES Sentinel-3a	2013 or later	30 Mbit/s
MSG4	2014	1 Mbit/s temporary
GMES Sentinel-3b	2015 or later	30 Mbit/s
MTG Imager 1	2017	40 Mbit/s
MTG Sounder 1	2018	40 Mbit/s
MTG Imager 2	2022	20 Mbit/s

The given data rates are the current best estimates including assumptions made for product and data compression and are therefore still subject to change.

Regarding the dissemination system characteristics the necessity of two generic types of services had been identified:

a common service catering broadly speaking for the Now-Casting needs and also addressing the mass amount of users, with focus on very cheap commercial-of-the-shelf equipment (and small antenna sizes in case of satellite broadcast);

a high volume service catering for the NWP needs and broadly speaking for specialised users with focus on maximum volume dissemination;

3 TERRESTRIAL DISSEMINATION EVOLUTION

3.1 RMDCN

RMDCN is still and will remain the appropriate network for operational dissemination of WMO coordinated data for global exchange.

Therefore, having a time scale of 5 – 10 years in mind, the following list of future requirements for future RMDCN emerged from a EUMETSAT point of view and have been presented, discussed and agreed within the RMDCN workshop held at ECMWF:

Dissemination of sustained near-real-time data rates in the area of multiple of 10 Mbit/s within Europe;

Dissemination of sustained data rates in the area of <10Mbit/s over the Atlantic and to Asia-Pacific (for bi-lateral data exchange);

Flexible and easy connection of new users to the network;

Guaranteed timeliness;

Differentiated classes of services (priorities);

Multicast and unicast;

Committed SLA and MTTR across the entire network.

3.2 DANTE/GEANT, EUMETCast Terrestrial

The DANTE networks are based on the national research networks and span across Europe (GEANT) with links to similar regional networks in Asia, Africa and the Americas. A combination of national research networks in RA-VI is GEANT2. The key aspects and limitations are:

Almost any network topology can be logically implemented using either the backbone or dedicated wavelengths on fibres;

The dedicated wavelengths do not carry inherent redundancy therefore two diverse links are required which is not available in all sites;

Multicast and IPV-6 is supported;

Throughput requirements are usually implemented via over-provision of bandwidth;
No guaranteed Service Level Agreements;
No service management;
Non-profit only use;
Contracts are with the individual NRENs (National Research Networks);
Access to the network is restricted to public or R&D institutes only and needs to be negotiated in the individual cases with the local NREN.

EUMETSAT performed in 2010 in cooperation with DANTE extensive multicast data transfer feasibility tests. The test setup consisted of a number of EUMETSAT computers connected to the GEANT network in London (server) and Amsterdam and Prague (both as clients). A number of different transfer mechanisms were used including the Tellicast multicast system which is implemented in EUMETCast.

These test showed that the usage of a DANTE (in Europe: GEANT) based network provides an effective point to point or point to multipoint data transfer mechanism. Furthermore, the existing EUMETCast platform can be operated with minimal adaptations on the GEANT network, thus providing the same interface to end users as EUMETCast. It can be seen as a terrestrial “footprint extension” to EUMETCast.

As a next step, EUMETSAT is planning to implement in 2012 a EUMETCast platform prototype on GEANT to supply data to a limited number of end users to demonstrate the feasibility of an operational “EUMETCast Terrestrial” dissemination system.

This method can be used for bi-lateral data exchange or to provide high volume data to a limited number of users. A typical case would be the provision of MTG-S L1b full resolution sounder data to interested users.

3.3 EUMETSAT Internet Data Service

The Internet provides an affordable way to make smaller volumes of data and products available to both the general user community and specific user groups. It is planned to be a fully operational service with user access managed via the Earth Observation Portal.

These data sets typically consist of:

- Image Gallery - Near Real-time Imagery, Visualised Products & RGB Composites, Topical Images;
- Low Rate SEVIRI Data, IODC data;
- Data Collection Retransmissions - DCP messages;
- Test/Trial data flows where data have a low volume and low timeliness requirement.

The anticipated timeframe for implementation of this enhanced service is 2013.

4 EUMETCAST EUROPE EVOLUTION AND DVB-S2 MIGRATION

Satellite broadcast is still the most appropriate solution for operational dissemination to a large number of users, and for target areas lacking modern network infrastructure. EUMETSAT will take advantage of the DVB-S2 technology for the Ku band service in Europe to get the most out of the transponder resources, in terms of data rates, availability and service to the users. A migration of EUMETCast Africa or EUMETCast Americas to DVB-S2 is not yet foreseen but might be considered in the future.

A study has been conducted to analyse various DVB-S2 configuration scenarios in order to find the optimal configuration for the future EUMETSAT DVB-S2 dissemination system. The scenarios were based on the currently used transponder on EUROIRD-9A, but the results are valid for any transponder.

The basic result is to provide, corresponding to the dissemination needs, two services: a common service and a high volume services. The two services can co-exist on one transponder or may be spread over multiple transponders.

This scenario, which is described in more detail in the next paragraphs, has been tested on a transponder on EUROIRD-9A with representative antenna sizes for the core footprint. The results were better than the link budget calculations suggested. Therefore there is room for higher throughput when the service will actually be implemented.

4.1 The Common Service

The common service is the continuation of the current EUMETCast service for all users. The DVB-S2 transmission parameters, the modulation and coding (Modcode), are optimised to serve the existing user side antenna infrastructure. This means that users will have the same availability compared to now using the existing (DVB-S) antennas. As a minimum users have to upgrade the DVB reception device. Using 8PSK 3/5 on a 34 MHz transponder, a net bitrate (on file level, without protocol overhead) of 44 Mbps is achievable.

Data available through the common service will be the current set on EUMETCast Europe, with the addition of NPP, Metop-B and other mostly small data streams. In future a sub-set of MTG data might also be included in the common service.

4.2 The High Volume Service

The high volume service provides the highest throughput for special users, with still acceptable antenna sizes for high service availability. The calculations show that with twice as large antennas 50% more throughput is possible compared to the common service, i.e. 66 Mbps net bitrate on a 34 MHz transponder using 8PSK 9/10.

For the smaller antennas of the common service users the link margin is still high enough to have a 100% service at clear sky conditions - however the rain availability will be degraded.

It is currently foreseen to disseminate the future high volume products on the high volume service, such as:

- GMES Sentinel-3 products
- MTG Image: Imaging data, meteorological products, and
- MTG Sounder: reduced sub-set principal components

4.3 DVB-S2 VCM mode

EUMETSAT will use the DVB-S2 VCM (variable coding modulation) mode which requires DVB reception equipment supporting this mode. A number of professional and consumer grade cards/boxes are available on the market. This mode has the advantage that both, common and high volume service can be operated simultaneously on the same transponder. Also, the reallocation of bandwidth between the services can be done dynamically without changes needed on user stations.

4.4 Migration schedule

Technically, the need for an upgrade to DVB-S2 arises when the bandwidth occupied by EUMETCast reaches a full transponder, due to the limited availability of shared DVB-S services. The schedule is also driven by the contractual arrangements. This leads to an earliest introduction of DVB-S2 in 2013, but it may take as long as 2017 if the anticipated bandwidth needs do not materialise.

5 MTG DISSEMINATION BASELINE

A preliminary MTG dissemination baseline can be seen in annex A. It shows a breakdown of the centrally produced MTG products, its characteristics and the availability mechanism for users. Please note that this list is not yet finalised and subject to change. A refined baseline, also regarding assignment of data to the EUMETCast common or high volume service and the availability of products in EUMETCast Africa, will be available in the future.

6 CONCLUSIONS

CGMS is invited to take note of the current status and evolution of the EUMETSAT multi-mission dissemination system, and the preliminary MTG dissemination baseline.



ANNEX A: CENTRALLY GENERATED PRODUCT LIST

This Annex A shows the list and characteristics of the disseminated and internal products to be generated at the EUMETSAT Central Application Facility. The list indicates the generation, periodicity and the dissemination service baseline (EUMETCast, high rate terrestrial dissemination, RMDCN or internet) for all missions. A periodicity of zero minutes means that the product is not going to be disseminated via the particular dissemination service. The EUMETSAT Data Centre (UMARF) provides the functionality to archive the datasets of intermediate data levels. Level 0 data is always stored as it is the basis for historical reprocessing. The details about Level 2 products to be archived are identified in the column “EUMETSAT Data Centre”. All FCI, IRS and LI Level 2 products shall be archived in the Data Centre, this is reflected in the entries of the “UMARF periodicity column”. It is still TBD in **Error! Reference source not found.** whether the UVN Level 2 products are going to be archived or not.

The list and the characteristics will be refined through the course of the programme. The lists here are only for information and indicative as the up to date reference list is defined in the [EURD] and its annexes **Error! Reference source not found.**

ID	Archived or Disseminated Dataset	Science Data Level	Format (1)	Coverage (2)	Resolution (3)	Generation periodicity (4) in min	EUMETCast periodicity in min	High-Rate terr. periodicity in min	RMDCN periodicity in min (5)	Internet (SDDI) periodicity in min	U-MARF periodicity in min
FES_000	FCI-FULL DISC SCAN SERVICE (FCI-FDSS)										
FES_001	FCI-FDSS <level 0> <dataset> (16 Channels + 1 fire channel) at downlink resolutions i.e. equivalent 21 channels	0+	netCDF-4 (packets inside)	Full disc	SSD	10	0	0	0	0	10
FES_002	FCI-FDSS <level 1 dataset> (16 Channels + 1 fire channel)	1c	netCDF-4	Full disc	SSD	10	10	10	0	0	10



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RSS_008	Low resolution FCI HRFI <dataset> (VIS 0.6, NIR 2.2, IR 3.8, IR 10.5)	1c	netCDF-4	Full disc TBC	> SSD	30	30	30	30	30	30
IRS_000	INFRA RED SOUNDER LOCAL AREA SCANNING SERVICES (IRS-LASS)										
IRS_006	IRS-LAC4 Interferogramme	0+	netCDF-4 (packets inside)	1/4 disc North	SSD	30	0	0	0	0	30
IRS_007	IRS-LAC3 Interferogramme	0+	netCDF-4 (packets inside)	1/4 disc middle/Nort h	SSD	72	0	0	0	0	72
IRS_008	IRS-LAC2 Interferogramme	0+	netCDF-4 (packets inside)	1/4 disc middle/Sou th	SSD	90	0	0	0	0	90
IRS_009	IRS-LAC1 Interferogramme	0+	netCDF-4 (packets inside)	1/4 disc South	SSD	120	0	0	0	0	120
IRS_010	IRS-LASS4 sounding radiances	1b	TBD	1/4 disc North	SSD	30	0	0	0	0	30
IRS_011	IRS-LASS3 sounding radiances	1b	TBD	1/4 disc middle/Nort h	SSD	72	0	0	0	0	72
IRS_012	IRS-LASS2 sounding radiances	1b	TBD	1/4 disc middle/Sou th	SSD	90	0	0	0	0	90
IRS_013	IRS-LASS1 sounding radiances	1b	TBD	1/4 disc South	SSD	120	0	0	0	0	120
IRS_015	Deleted										
IRS-016	IRS-LASS4 reduced sub-set of 300 Principal Components	1b	BUFR	1/4 disc North	SSD	30	30	0	60	60	30
IRS-017	IRS-LASS3 reduced sub-set of 300 Principal Components	1b	BUFR	1/4 disc middle/Nort h	SSD	72	72	0	144	144	72
IRS-018	IRS-LASS2 reduced sub-set of 300 Principal Components	1b	BUFR	1/4 disc middle/Sou th	SSD	90	90	0	180	180	90



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IRS-019	IRS-LASS1 reduced sub-set of 300 Principal Components	1b	BUFR	1/4 disc South	SSD	120	120	0	240	240	120
LS_000	LIGHTNING SERVICE										
LS_001	Lightning event trigger and Background Image	0+	netCDF-4 (packets inside)	disc of 16° [TBC]	SSD	1	0	0	0	0	1
LS_002	Lightning event (LE)	1b	netCDF-4	IFOV	SSD	0.10	10	10	20	20	10
LS_004	Background Lightning image	1b	netCDF-4	disc of 16° [TBC]	SSD	1	0	0	0	0	1
UVN_000	UVN SOUNDER SCANNING SERVICES										
UVN_001	UVN Level 0 measurement data	0+	netCDF-4 (packets inside)	Europe	SSD	5	0	0	0	0	5
UVN_002	UVN sounding radiances	1b	netCDF-4	Europe	SSD	60	60	60	0	0	60
UVN_003	UVN Irradiances	1b	netCDF-4	Europe	SSD	1440	1440	1440	0	0	1440
MET_000	Level 2 CORE METEOROLOGICAL PRODUCT SERVICE (FCI based, MSG continuity)										
	FCI All sky radiance		BUFR	Full disc	16 * 16 IR Pixels	10	10	10	10		10
MET_002	FCI- All Sky Radiance (ASR)	2	BUFR	disc	16 * 16 IR Pixel (for 8 Channels * 6 products * 3 parameters)	10	10	10	10	0	10
	FCI Clear sky reflectance map		GRIB	Full disc	SW Pixel	1440	1440	1440	1440		1440
MET_008	Clear Sky Reflectance Map (CRM)	2	GRIB	disc	SW Pixel (6 sw non absorbing channels)	1440	1440	1440	0	0	1440
	FCI SCENE		GRIB	Full disc	IR Pixel	10	10	10	10		10
MET_007	Clear / Cloud Flag (CLM)	2	GRIB	disc	IR Pixel (1 parameter)	10	10	10	0	0	10



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MET_025	Dust Storm Detection	2	GRIB	disc	IR Pixel (1 parameter)	10	10	10	0	0	10
MET_013	Fire Detection (FIRA)	2	GRIB	disc	IR Pixel (1 parameter)	10	10	10	0	10	10
MET_028	Volcanic Ash	2	GRIB	disc	IR Pixel (1 parameter)	10	10	10	0	0	10
	FCI OCA		GRIB	Full disc	IR Pixel	10	10	10	0		10
MET_030	Cloud drop effective radius - Cloud top	2	GRIB	disc	IR Pixel	10	10	10	0		10
MET_031	Cloud optical depth	2	GRIB	disc	IR Pixel	10	10	10	0		10
MET_032	Cloud sub-pixel fraction	2	GRIB	disc	IR Pixel	10	10	10	0		10
MET_033	Cloud top phase	2	GRIB	disc	IR Pixel	10	10	10	0		10
MET_034	Cloud top pressure temperature and height	2	GRIB	disc	IR Pixel	10	10	10	0		10
	FCI AMVs		BUFR	Full disc	Synoptic scale <80km [TBC]	60	60	60	60		60
MET_001	Atmospheric Motion Vectors (AMV)	2	BUFR	disc	Synoptic scale <80km [TBC]	60	60	60	60	0	60
	FCI GII		BUFR	Full disc	3 x 3 pixels (TBC)	10	10	10	0		10
MET_012	Global Instability Indices (GII)	2	BUFR	disc	3 by 3 Pixels (TBC) 2 indices	10	10	10	0	0	10
MET_020	Ozone - Total column (TOZ)	2	BUFR	disc	3 by 3 Pixels	10	10	10	0	0	10
MET_021	Specific humidity - Lower Troposphere	2	BUFR	disc	3 by 3 Pixels	10	10	10	0	0	10
MET_022	Specific humidity - Middle Troposphere	2	BUFR	disc	3 by 3 Pixels	10	10	10	0	0	10
MET_023	Specific humidity - Upper Troposphere	2	BUFR	disc	3 by 3 Pixels	10	10	10	0	0	10



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MET_024	Specific humidity - Total column	2	BUFR	disc	3 by 3 Pixels	10	10	10	0	0	10
	FCI Aerosol		GRIB		SW Pixel	60	60	60			60
MET_015	Aerosol asymmetry parameter	2	GRIB	disc	SW Pixel	60	60	60	60		60
MET_016	Aerosol optical depth - Total column	2	GRIB	disc	SW Pixel	60	60	60	60		60
MET_017	Aerosol refractive index	2	GRIB	disc	SW Pixel	60	60	60	60		60
MET_018	Aerosol single scattering albedo	2	GRIB	disc	SW Pixel	60	60	60	60		60
MET_019	Aerosol size distribution	2	GRIB	disc	SW Pixel	60	60	60	60		60
	FCI processing of external algorithms		TBD		TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TBD										
	FCI Internal Products archived										
MET_050	FCI ISCCP	2	IDS			On request					
MET_051	FCI Surface Emissivity - Surface Emissivity	2	GRIB	disc	SW Pixel	60					60
MET_052	FCI Cloud Analysis - Cloud cover	2	GRIB	disc	IR pixel	10					10
MET_053	FCI Cloud Analysis - Total column	2	GRIB	disc	IR pixel	10					10
MET_054	FCI Cloud Analysis - Cloud top phase	2	GRIB	disc	IR pixel	10					10
MET_055	FCI Cloud Analysis - Cloud top pressure	2	GRIB	disc	IR pixel	10					10
MET_056	FCI Cloud Analysis - Cloud top temperature	2	GRIB	disc	IR pixel	10					10
MET_057	FCI Cloud Analysis - Cloud top height	2	GRIB	disc	IR pixel	10					10
MET_058	FCI Cloud Analysis - Cloud type	2	GRIB	disc	IR pixel	10					10
MET_059	FCI HPI - Accumulated precipitation (over 24 hours)	2	HPI	+/- 40° latitude; +/- 50° longitude of SSP	IR pixel	1440					1440
MET_060	FCI FCDRs - TBD	2	TBD	TBD	TBD	TBD					yes
MET_061	FCI FCDRs - Outgoing LW irradiance at TOA	2	TBD	TBD	TBD	TBD					yes



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MET_062	FCI TCDRs - TBD	2	TBD	TBD	TBD	TBD					yes
METIRS_000	Level 2 NEW METEOROLOGICAL PRODUCT SERVICE (IRS derived new products)										
	IRS Profiles		BUFR	1/4 disc	IRS Pixel ~100 levels	30	30	30	TBD	TBD	30
METIRS_001	Atmospheric temperature profile (THPP4)	2	BUFR	1/4 disc Zone 4	IRS Pixel ~100 levels	30	30	30		0	30
METIRS_002	Humidity profile (THPP4)	2	BUFR	1/4 disc Zone 4	IRS Pixel ~100 levels	30	30	30		0	30
METIRS_003	Atmospheric Temperature profile (THPP3)	2	BUFR	1/4 disc Zone 3	IRS Pixel ~100 levels	72	72	72		0	72
METIRS_004	Humidity profile (THPP3)	2	BUFR	1/4 disc Zone 3	IRS Pixel ~100 levels	72	72	72		0	72
METIRS_011	Atmospheric Temperature profile (THPP2)	2	BUFR	1/4 disc Zone 2	IRS Pixel ~100 levels	90	90	90		0	90
METIRS_006	Humidity profile (THPP2)	2	BUFR	1/4 disc Zone 2	IRS Pixel ~100 levels	90	90	90		0	90
METIRS_007	Atmospheric Temperature profile (THPP1)	2	BUFR	1/4 disc Zone 1	IRS Pixel ~100 levels	120	120	120		0	120
METIRS_008	Humidity profile (THPP1)	2	BUFR	1/4 disc Zone 1	IRS Pixel ~100 levels	120	120	120		0	120
METIRS_009	Clear Sky Wind profile (CSWP4)	2	BUFR	1/4 disc North	TBD	60	30	30			60
METIRS_013	Clear Sky Wind profile (CSWP3)	2	BUFR	1/4 disc middle/North	TBD	360	72	72			360
METIRS_014	Clear Sky Wind profile (CSWP2)	2	BUFR	1/4 disc middle/South	TBD	360	90	90			360
METIRS_015	Clear Sky Wind profile (CSWP1)	2	BUFR	1/4 disc South	TBD	360	120	120			360
METIRS_016	Atmospheric composition-Z4	2	TBD	1/4 disc North	IRS Pixel (5 parameters TBC)	30	30	30			30



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METIRS_01 7	Atmospheric composition-Z3	2	TBD	1/4 disc middle/North	IRS Pixel (5 parameters TBC)	72	72	72			72
METIRS_01 8	Atmospheric composition-Z2	2	TBD	1/4 disc middle/South	IRS Pixel (5 parameters TBC)	90	90	90			90
METIRS_01 9	Atmospheric composition-Z1	2	TBD	1/4 disc South	IRS Pixel (5 parameters TBC)	120	120	120			120
METIRS_00 5	Cloud Product (IRS-CP4)	2	BUFR	1/4 disc North	IRS Pixel (5 parameters TBC)	30	30	30			30
METIRS_02 0	Cloud Product (IRS-CP3)	2	BUFR	1/4 disc middle/North	IRS Pixel (5 parameters TBC)	72	72	72			72
METIRS_02 1	Cloud Product (IRS-CP2)	2	BUFR	1/4 disc middle/South	IRS Pixel (5 parameters TBC)	90	90	90			90
METIRS_02 2	Cloud Product (IRS-CP1)	2	BUFR	1/4 disc South	IRS Pixel (5 parameters TBC)	120	120	120			120
METIRS_00 6	Total tropospheric column amounts of O3 and CO (IRS) TBD	2	BUFR	TBD	TBD	60mn (TBC) or 6 hours?					
	IRS processing of external algorithms		TBD		TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TBD										
	IRS Internal Products archived										
METIRS_05 0	IRS scene analysis - Clear / cloud flag	2	BUFR	1/4 disc (LAC zone 4)	IRS pixel	30					
METIRS_05 1	IRS scene analysis - Cloud fraction (TBC)	2	BUFR	1/4 disc (LAC zone 4)	IRS pixel	30					
METIRS_05	IRS scene analysis - Cloud top pressure	2	BUFR	1/4 disc (LAC zone 4)	IRS pixel	30					



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2				4)							
METIRS_05_3	IRS scene analysis - Cloud top temperature	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_05_4	IRS scene analysis - Land / ocean flag	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_05_5	IRS scene analysis - Sun glint	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_05_6	IRS PCA compression - PC scores for IRS radiances	2	TBD	LAC zones 1 to 4	IRS pixel	LAC zones 1 to 4 repeat cycles					
METIRS_05_7	IRS first guess - Atmospheric temperature profile	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_05_8	IRS first guess - Specific humidity profile	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_05_9	IRS first guess - Ozone profile (TBC)	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_06_0	IRS first guess - Surface Emissivity spectrum	2	BUFR	¼ disc (LAC zone 4)	IRS pixel	30					
METIRS_06_1	IRS FCDRs - TBD	2	TBD	TBD	TBD	TBD					
METIRS_06_2	IRS TCDRs - TBD	2	TBD	TBD	TBD	TBD					
METLI_000	Level 2 NEW METEOROLOGICAL PRODUCT SERVICE (LI derived new products)										
METLI_001	DELETED	2	netCDF-4	disc of 16° [TBC]	SSD	30s [TBC]					
METLI_002	Lightning flash (LI-LF)	2	netCDF-4	disc of 16° [TBC]	various	0.5	0.5	0.5	0	0	0.5
METLI_006	Flash densities and flash rates (LI-FD)	2	netCDF-4	disc of 16° [TBC]	SSD	TBD					
METLI_003	Lightning jump signature (LI-LJS)	2	netCDF-4	disc of 16° [TBC]	SSD	TBD					



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METLI_004	Lightning warning-first CG (LI-LW)	2	netCDF-4	disc of 16° [TBC]	SSD	TBD					
METLI_009	NOX production estimate (LI-NOX)	2	netCDF-4	disc of 16° [TBC]	SSD	TBD					
METLI_007	Cell tracking (LI-CT)	2	BUFR	disc of 16° [TBC]	SSD	0.5	0.5	0.5	0	0	0.5
METLI_008	Quantitative precipitation estimate (LI-QPE)	2	BUFR	disc of 16° [TBC]	SSD	0.5	0.5	0.5	0	0	0.5
METLI_010	LI initial processing - Lightning events	2	BUFR	disc of 16° [TBC]	LI pixel	0.5	0.5	0	0	0	
METLI_011	LI initial processing - Lightning groups	2	BUFR	disc of 16° [TBC]	LI pixel	0.5	0.5	0	0	0	
METLI_012	LI initial processing - Lightning flash	2	BUFR	disc of 16° [TBC]	LI pixel	0.5	0.5	0	0	0	
	LI processing of external algorithms		TBD		TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TBD										
	LI Internal Products archived										
METLI_050	LI Background scene processing - Background radiance maps	2	BUFR	disc of 16° [TBC]	LI pixel	5.0					
METUVN_000	Level 2 NEW METEOROLOGICAL PRODUCT SERVICE (UVN derived new products)										
METUVN_001	NO2 total vertical column / tropospheric column (UVN-NO2)	2	netCDF-4	Europe	SSD						
METUVN_002	O3 total vertical column (UVN-TVC)	2	netCDF-4	Europe	SSD						
METUVN_003	O3 profile / tropospheric column (UVN-O3P)	2	netCDF-4	Europe	SSD						
METUVN_004	O2 A-band Cloud Product (UVN-CP1)	2	netCDF-4	Europe	SSD						
METUVN_005	O2-O2 Cloud Product (UVN-CP2)	2	netCDF-4	Europe	SSD						
METUVN_006	Aerosol Profiles (UVN-APP)	2	netCDF-4	Europe	SSD	60	60	60		0	60



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METUVN_007	Aerosol Optical Thickness / Aerosol Type (UVN-AOT)	2	netCDF-4	Europe	SSD						
METUVN_008	SO2 total vertical column (UVN-SO2)	2	netCDF-4	Europe	SSD						
METUVN_009	HCHO total vertical column (UVN-HCHO)	2	netCDF-4	Europe	SSD						
METUVN_010	BrO total vertical column (UVN-BRO)	2	netCDF-4	Europe	SSD						
METUVN_011	OCIO slant column (UVN-OCLO)	2	netCDF-4	Europe	SSD						
METUVN_012	Glyoxal total vertical column (UVN-CHOCHO)	2	netCDF-4	Europe	SSD						
METUVN_013	Surface UV irradiance (UVN-IRR)	2	netCDF-4	Europe	SSD						
METUVN_014	Surface albedo (UVN-ALB)	2	netCDF-4	Europe	SSD						
	UVN processing of external algorithms		TBD		TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TBD										
	UVN Internal Products archived										
FSD_000	RETRANSMISSION OF FOREIGN SATELLITE DATA (FSD)										
FSD_001	As defined in [DISSEMIN] plus growth potential for FSD improved performances. Overall 10 Mbps.	as received	as received		as received	0	0.0166	0.0166	0	0	0
DCP_000	DCP SERVICE										
DCP_004	DCP signal		digitalised RF spectrum	Earth disc (5° elevation)	0	on event	0	0	0	0	0
DCP_001	Messages			Earth disc (5° elevation)	0	ad hoc	0.01	0.01	0	0.001	0
DCP_002	Bulletins			Earth disc (5° elevation)	0	ad hoc	1	1	1	60	0
DCP_003	Derived statistical results			Earth disc (5° elevation)	0	ad hoc	0	0	0	60	60
SAR_000	SAR Service										



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SAR_001	SAR signal		RF analog	Earth disc (5° elevation)	0	continuous	0	0	0	0	0
SM_000	Services Messages										
SM_001	ADMIN		Ascii	0	0	1440	30	15	0	1440	1440
SM_002	NEWS		Ascii	0	0	ad hoc	1440	1440	1440	1440	1440
SM_003	REG-RPT		Ascii	0	0	week	1440	1440	1440	1440	1440

Notes: (1) BUFR and GRIB2 formats are defined in [WMOcode]. Further information concerning EUMETSAT's implementation thereof can be found on the EUMETSAT website, navigating thus: 'Access to Data' / 'Meteosat Meteorological Products' / 'BUFR & GRIB2'. Both formats include encoded quality control indicators. The NetCDF-4 (Network Common Data Form) format is defined in **Error! Reference source not found.**

Notes: (2a) Disc *coverage* for meteorological products means $<65^\circ$ around SSP.

Notes: (2b) Full disc for raw *images* includes deep space around the earth.

Notes: (3) When expressed in km the resolution applies at SSP.

Notes: (4) Generation means as available in the *EUMETSAT Data Centre*. The real-time dissemination frequency of the products may be different from their generation frequency.

Notes: (5) The operational practice is that data sets are disseminated hourly at (00:00, 01:00, 02:00, ...).