

EUMETSAT Headquarters Darmstadt, Germany

Central Operations Report for the period January to June 2017





# **Cooperating State**

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**SERBIA** 



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Any service changes introduced in the reporting period are presented on our website: <u>www.eumetsat.int</u>, under 'Data'  $\rightarrow$  'Service Status'  $\rightarrow$  'Product History'



## Introduction

Welcome to the Central Operations Report for the first half of 2017.

One very significant event in the reporting period was the change in the IODC service from its original implementation with a first generation Meteosat satellite to a much higher-performance service utilizing a more capable Meteosat Second Generation satellite, Meteosat-8.

As reported in the previous issue of this report, Meteosat-8 was relocated to 41.5°E in the summer of 2016 and dissemination of image data commenced in October, in parallel to that of Meteosat-7. The Meteosat-8 service officially started on 1 February 2017, and the Meteosat-7 service from 57°E was stopped at the end of March. The new Meteosat-8 service is EUMETSAT's best-effort contribution to a resilient Indian Ocean Data Coverage service, which also involves satellites from ISRO, ROSHYDROMET and the China Meteorological Administration (CMA).

The reorbiting and passivation of Meteosat-7 took place in early April, with the final switch-off on 11 April. The decommissioning of equipment and the archiving of software, data and documentation is in progress and will continue until the end of 2017.

Availability of services in the reporting period was generally very good, with most services above-target in most months, with the exceptions of Meteosat-8 IODC, Metop-A ASCAT and Jason-2.

The Meteosat-8 IODC service was impacted by various events, most notably by two SEVIRI standbys on the satellite (see <u>slide 8</u> for further information).

 $\rightarrow$ 



## Introduction (continued)

The ASCAT instrument on Metop-A suffered a Heater-Refuse Mode provoked by space radiation giving rise to a 'Single Event Upset', or SEU, on 27 May (also see <u>slide 8</u>). SEU is the term used to mean the effect on onboard electronics caused by charged particles (e.g. solar), which results in unpredictable behaviour (sometimes a switch-off) of an electronic system.

As reported on <u>slides 43 and 44</u>, Jason-2 experienced several Safe-Hold Modes in March and May, suspected as being caused by cumulated space radiation effects on the functioning of two of its gyros under high temperature conditions. The Jason-2 Steering Group evaluated the best course of action for the continuation of the mission and decided to move the satellite to a new orbit, a so-called LRO (Long Repeat Orbit), 27 km below the reference orbit, leaving the latter free for the future Jason-CS satellites. The manoeuvre was carried out and OGDR production was resumed on 24 July 2017. Since then, mission operations have been nominal, and the viability of an onboard software patch to mitigate the effects of the gyro problems is being assessed by CNES and industry.

Please note that descriptions of two longer-term factors impacting operational services have been added to this issue of the report for extra clarification – please see <u>slide 9</u>.

Best regards,

Livio Mastroddi

**Director of Operations and Services to Users** 



## **Performance Reporting: Categories**

The charts on the service slides in this report present a summary view of the performance of the services within the categories listed here:

- <u>Meteosat Services</u>
- Metop, Suomi-NPP & NOAA Global Data Services (GDS)
- Regional Data Services (EARS)
- Search and Rescue Support
- Jason-2 and Jason-3 OGDR Service
- Third-Party Data Services
- EUMETCast
- The EUMETSAT Data Centre
- EUMETSAT's Support to Climate Services
- Helpdesk Service

Several terms with special meaning (e.g. 'Nominal RCs') appear in the slides. A <u>glossary</u> is provided at the end of the report.



## **Performance Reporting: Conventions**

This report presents an overview of EUMETSAT's operational services in the half-year reporting period by means of the following two indicators:

#### **Service Availability:**

The availability of the operational services to users is measured monthly against the maximum amount of products/data which theoretically could be delivered each calendar month of the reporting period, i.e. from a "perfect" satellite system.

#### **Operational Performance:**

This quantifies how well EUMETSAT has performed operationally with respect to its service targets, taking into account all planned routine operational activities such as instrument calibration and spacecraft manoeuvres, i.e. the intrinsic limitations of the satellite system.

These two indicators are used for Meteosat and Metop services as delivered over the prime dissemination mechanism, namely EUMETCast Europe. Where statistics are available, they are presented in the charts on the following slides. Comments are provided alongside, which identify any significant events or factors (satellite or ground-segment in nature) that have had impact on the service availability and/or operational performance. Currently, only product generation statistics are available for the Meteosat meteorological products.

Note: Events having significant impact on operational services are described on a dedicated slide following this one.



## **Events Leading To Significant Operational Impacts**

The following events occurred during the reporting period:

#### **Operational Incident 73: Metop Control Centre Computer System Problems**

A failure of a computer system platform on 13 May 2017 caused the stoppage of Metop MCS, production and dissemination functions. Normally, a switch to redundant hardware would have prevented any service outage, but a problem was also experienced with the mechanism for automatic failover. This resulted in Level 0 production outages of 2.5, 3.5 and 5 hours for Metop-B, Metop-A and N19 respectively. System recovery was completed in the early hours of 14 May. Various improvements are being considered in the context of the incident review.

#### **SEVIRI Standbys on Meteosat-8**

On two separate occasions, 9 May and 26 June, the SEVIRI instrument was autonomously put into standby mode, due to the receipt onboard of unexpected commands which resulted from the control centre's monitoring & control system wrongly reacting to drops in the housekeeping telemetry received from the Fucino Ground Station. Various automatic procedures have been modified to avoid inappropriate reactions.

#### Metop-A ASCAT Heater-Refuse Mode

The ASCAT instrument on Metop-A autonomously entered heater-refuse mode on 27 May at 02:04 UTC, suspected to have been triggered by a Single Event Upset (SEU) while flying over the South Atlantic Anomaly. Following analysis by the operations team, the instrument was returned to measurement mode at 11:21 UTC on 29 May.



## **Longer-Term Factors Impacting the Operational Services**

Discrete events affecting the services appear on either the previous slide (when significant) or the slide for an individual service, when affecting only that service. Factors of an ongoing nature are listed below:

#### **Fuel Migration on MSG Satellites**

Each MSG satellite has four interconnected fuel tanks, which allow fuel to flow along the lines between them. Under conditions of thermal stability, this movement is gradual and has no effect on the satellite's attitude. During eclipses, even though the tank temperature is regulated, some variation in fuel temperature and density occurs. This gives rise to fuel migration between the tanks, causing a small resultant effect on the satellite's attitude, which manifests itself as variations in the geometric accuracy of the images. For Meteosat-8 and Meteost-9, ground commanding to augment the satellite's onboard thermal control system has partly mitigated the effect by timing the fuel migration to occur during scan mirror retraces. Even though the image-processing system incorporates algorithms to correct for these artefacts, not all images can be corrected to achieve the target specification for geometric accuracy. Currently, around 0.3% of the RCs for the 0° service are affected, and around 0.6% for IODC.

#### **Dissemination System Anomalies**

A long-term project to modernize and extend the dissemination system at EUMETSAT has necessitated a staged approach to the development and implementation of the new system. Although the current configuration is generally very stable, from time to time there have been various system performance problems which have impacted data throughput. The 0° FES and IODC services, delivering the largest volume of L1.5 RC products, appear to be the most affected from the indicators, but this is artificial, due to RCs being rated non-nominal when only one segment out of 114 is lost or delayed. Several modifications have been made during the course of the reporting period to tune the system and mitigate the problems. The final stage of the implementation of the new system is expected to be completed by the end of 2017.





# **Meteosat Services**

This service category comprises the data and products produced with the Meteosat Systems, which utilise the following geostationary satellites for the services listed:

Meteosat-10 (at 0°):	the primary Full-Earth Scan (FES) service.
Meteosat-9 (9.5°E):	the Rapid-Scan Service (RSS). Meteosat-9 is also used as the backup for the primary FES service.
Meteosat-8 (41.5°E):	Meteosat-8 IODC FES Service, on a best-effort basis. Data dissemination started on 1 February 2017, in parallel to MTP IODC.
Meteosat-7 (57°E):	MTP Indian Ocean Data Coverage (IODC) was discontinued on 31 March 2017, and the satellite was deorbited in April.

#### A further MSG satellite is available:

Meteosat-11 (3.4°W): currently 'stored in-orbit', with deployment to operations planned for 2018.

The individual services covered in the following slides are as follows:

- Meteosat L1.5 image data and derived meteorological products for FES, IODC and RSS
- Data Collection and Retransmission (the DCP service)



#### Meteosat Services $\rightarrow$ 0° FES Image Data & Derived Meteorological Products



Prime satellite supporting the service is Meteosat-10, with Meteosat-9 as backup.

Service Availability and Operational Performance are measured on the basis of <u>nominal</u> Level 1.5 Repeat Cycles (RCs) disseminated 'on-time' via EUMETCast Europe. See <u>slide 7</u> for an explanation of the two indicators.

#### Events which impacted availability:

The majority of RC losses / delays were attributable to the following:

- Intermittent dissemination system problems experienced in most months of the reporting period, especially in April.
- Fuel migration affected varying numbers of RCs in the months March to June

For further information on the above, please see slide 9.

In addition, an Inclination manoeuvre was performed in May.



Meteorological products derived from the Full-Earth Scan (FES) images produced nominally by Meteosat-10 at 0°.

Performance of this service is still currently measured in terms of the number of meteorological products which have been generated at source in EUMETSAT, as a percentage of those scheduled.

**Events which impacted availability:** 

None significant.

NOTE: The availability of MPE products is measured and charted separately (see <u>slide 14</u>).



#### Meteosat Services → 57°E and 41.5°E IODC Image Data & Meteorological Products



Meteosat-7 supported the IODC service at 57°E until the service was discontinued at the end of March 2017. The Meteosat-8 IODC service (on a best-effort basis) started in February 2017, with the satellite positioned at 41.5°E.

Service Availability and Operational Performance are measured on the basis of <u>nominal</u> Level 1.5 Repeat Cycles (RCs) disseminated 'on-time' via EUMETCast Europe. See <u>slide 7</u> for an explanation of the two indicators.

#### Events which impacted availability:

- 23 Jan 29 Mar: Spring eclipse season: MTP IODC service availability reduced by up to 5 slots per day.
- 20 February: Image-processing problems following system swap.
- 25 April: Meteosat-8 east-west station-keeping manoeuvre.
- 9 May & 26 June: Meteosat-8 SEVIRI standbys (see slide 8).

April, May, June: Fuel migration and dissem. system problems (see slide 9).



Meteorological products derived from Full-Earth Scan images produced by Meteosat-7 until end of March 2017, and those produced by Meteosat-8 from February 2017 onwards.

Performance of this service is measured in terms of the number of meteorological products which have been generated at source in EUMETSAT, as a percentage of those scheduled.

#### Events which impacted availability:

General: Degraded quality of some Meteosat-7 HWW (High-resolution WV Wind) products due to image quality related to the satellite's high inclination.

NOTE: The availability of MPE products is measured and charted separately (see <u>slide 14</u>).



#### Meteosat Services → 9.5°E RSS Image Data & Derived Meteorological Products



Meteosat-9 located at 9.5°E supports the Rapid-Scanning Service (RSS).

For more info on RSS: <u>www.eumetsat.int → Rapid-Scanning Service</u>.

Service Availability and Operational Performance are measured on the basis of <u>nominal</u> Level 1.5 Repeat Cycles (RCs) disseminated 'on-time' via EUMETCast Europe. See <u>slide 7</u> for an explanation of the two indicators.

#### Events which impacted availability:

Monthly: Scheduled 48-hour interruptions of the RSS service, to exercise SEVIRI with Full-Earth Scanning.

#### 10-Jan – 9-Feb:

Scheduled annual interruption of the RSS service (1 month duration)



Meteorological products derived from Rapid-Scanning images produced at 9.5°E.

Performance of this service is still currently measured in terms of the number of meteorological products which have been generated at source in EUMETSAT, as a percentage of those scheduled.

Events which impacted availability:

None significant.

Note: The availability of MPE products is measured and charted separately (see <u>slide 14</u>).



#### Meteosat Services $\rightarrow$ MPE Products for 0°, RSS and IODC



Multi-sensor Precipitation Estimate (MPE) products are derived from infrared data present in Meteosat 0°, RSS and IODC imagery, and passive microwave imager measurements from the US DoD's DMSP satellites. MPE products are used for nowcasting and short-term forecasting, especially useful for regions for which there is no rainfall radar data, such as in Africa and Asia.

Availability of these particular products delivered as one type of the corresponding meteorological product services is measured in terms of the number of products which have been generated at source in EUMETSAT, as a percentage of those scheduled.

#### Events which impacted availability:

23-Jan – 29-Mar: Eclipse season effects on IODC MPE products.

<u>NOTES:</u> Meteosat-7 supported the IODC service at 57°E until the service was discontinued at the end of March 2017. The Meteosat-8 IODC service on a best-effort basis started in February 2017, supported by the satellite at 41.5°E.

The availability of MPE products is presented separately, to take account of their being derived from data from the US DoD's DMSP satellites, the availability of which is beyond EUMETSAT's control and provided by aging instruments.



## Meteosat Services → DCP Channel Availability at 0°

Data Collection and Retransmission operations at 0° utilise the international and regional DCP channels of the satellite supporting the service (nominally Meteosat-10).

The chart shows the availability of the 0° DCP service. It is measured in terms of the number of hourly reference DCP messages on all operational regional channels which have been successfully received back by EUMETSAT, as a percentage of those sent.

For information concerning the geographical distribution of registered DCPs, please see the next slide.

**Events Which Impacted DCP Channel Availability:** 

None significant.

<u>Note:</u> Some DCP messages continue to be corrupted/lost due to interference on the satellite link. It is not expected that the cause will be resolvable. EUMETSAT continues to monitor the situation.





## Meteosat Services $\rightarrow$ Geographical Distribution of DCPs

DCPs	Country	DCPs		Country	DCPs		Country	DCPs	Country	As of the end o
6	Albania	1		Falklands	1		Malta	10	Tanzania	June 2017. the
51	Algeria	1	_	Finland	4		Mauritania	2	Togo	were:
13	Angola	133		France	4		Mauritius	54	Uganda	1204 registered
2	Armenia	1		Gambia	23		Mozambique	49	UK	Data Collection
2	Austria	27	↑	Germany	30		Namibia	24	Ukraine	Platforms (DCI
6	Belarus	11		Ghana	19		Niger	1	Union des Comores	belonging to 1
2	Benin	1		Gibraltar	57	↑	Nigeria	65	USA	operators, dep
5	Bhutan	1		Greece	10		Oman	1	Yemen	by the 79 coun
14	Botswana	11		Guinea	4		Pakistan	16	Zambia	shown in the ta
1	Brazil	2		Guinea-Bissau	3		Philippines	13	Zimbabwe	Of the total nu
1	Bulgaria	9		Indonesia	11		Republic of Moldova			of registered D
							Republic of			there were 632
7	Burkina Faso	2	_	Iran	11		Seychelles			in active opera
60	Cameroon	192		Iraq	7		Romania	Large	er numbers of DCPs are	
								highl	ighted with darker	
1	Canada	8		Ireland	8		Rwanda	ςοίοι	ırs.	
4	Cap Verde	74	↑	Italy	11		Senegal			
2	Central African Republic	3		Ivory Coast	13		Sierra Leone	Table	e entries in green = new.	
3	Chad	3		Kenya	1		Slovakia	Coun	try name in red = DCPs	
3	Congo	6		Lesotho	41		South Africa	no lo	nger registered.	
3	Croatia	11		Libya	8		Spain			
1	Cyprus	6		Madagascar	123	$\downarrow$	Sri Lanka	│ <b>↑</b> ↓	= indicates an	
30	Dem. Rep. of the Congo	9		Malawi	3		Sudan	incre	ase /decrease in DCPs	
8	Djibouti	3		Maldives	5		Southern Sudan	regis	tered, compared with	
1	Egypt	19		Mali	2		Swaziland	previ	ous report.	



# Metop, Suomi-NPP & NOAA Global Data Services (GDS)

These services refer to the dissemination of global data and products produced as part of the Initial Joint Polar System (IJPS) and the Joint Transition Activities (JTA) agreements between EUMETSAT and NOAA. The JTA is an interim agreement, providing continuity between the Initial Joint Polar System (IJPS) and future Joint Polar System (JPS).

The services provide Level 0, 1 and 2 products derived from the data from instruments onboard the satellites Metop-A & -B, Suomi-NPP and NOAA-19, as summarised in the following table:

	A-DCS	AMSU	ASCAT	ATOVS	AVHRR	GOME-2	GRAS	HIRS	IASI	MHS	SEM	ATMS & CrIS
Level 0	Mx2 <sup>(1)</sup>	-	-	-	-	-	-	-	-	-	Mx2	-
Level 1	-	Mx2, N	Mx2	-	Mx2, N	Mx2 <sup>(2)</sup>	Mx2	Mx2, N	Mx2	Mx2, N	-	SDR
Level 2	-	-	-	M(B), N	-	-	-	-	Mx2	-	-	-

Legend:

**'Mx2'** = Metop-B (prime) and Metop-A (secondary) - dual data & products, with the following exceptions:

<sup>(1)</sup> Due to reduced capability of A-DCS on Metop-B, Metop-A provides the prime Argos-3 A-DCS service (Metop-B provides Argos-2 mode).

<sup>(2)</sup> GOME-2 Tandem operations: Metop-A instrument has swath width of 960 km, Metop-B's has full width of 1920 km.

'M(B)' = ATOVS L2 products based on Metop-B (products for Metop-A discontinued – see ATOVS slide )

**'N'** = Data and products from the AMSU, AVHRR, HIRS and MHS instruments onboard NOAA-19.

'SDR' = Sensor Data Records from the ATMS and CrIS instruments onboard Suomi-NPP.

# The charts on the following slides show the month-by-month availability of the products, identifying any significant events which impacted the service.



## Metop, Suomi-NPP & NOAA GDS: Definition of Availability

Unless otherwise indicated in the availability slides, the monthly figures are those for 'timely availability', where 'timely' is used to mean the following:

Levels 0 & 1:	Available within 2 hours 15 minutes of sensing (Metop and NOAA)
Level 2:	Available within 3 hours of sensing (Metop and NOAA)
SDRs:	Current target: available within 2 hours of sensing, will be refined (Suomi-NPP)

The above timeliness targets are those originally specified for the Metop and NOAA-19 data and delivery is currently measured against them. The Level 0 and 1 targets for the primary Metop are by far exceeded since the introduction of (1) the Antarctic Data Acquisition (ADA) service which improved the timeliness of the data, and (2) the multiplexed data transfer between the Svalbard Ground Station and Darmstadt which gave a further timeliness improvement for the data of both Metops.

Availability figures are based on the following:

Level 0: Production statistics from EUMETSAT's EPS Product Generation Facility

Levels 1 & 2: Reception statistics from EUMETSAT's reference EUMETCast User Station

The next slide shows the profile of Metop-B passes acquired via the ADA service, which relays half-orbits'worth of data for most of the 14 to 15 passes possible per day, delivering the first half of each orbit approximately 50 minutes earlier than that via Svalbard.

On <u>slide 20</u> onwards, service availability and operational performance are presented for the data (mostly delivering Level 1) from instruments onboard Metop-A, Metop-B, N19 and Suomi-NPP. Please see <u>slide 7</u> For explanation of the two metrics.



#### Metop, Suomi-NPP & NOAA GDS: Antarctic Data Acquisition (ADA)

Data from the primary Metop satellite, Metop-B, is acquired at NOAA-NSF's ground station on McMurdo Sound in Antarctica and routed to EUMETSAT HQ. This acquisition complements that of Svalbard, and allows the data of the first half of each orbit to be disseminated processed and earlier. thus improving data Metop-based timeliness of products.

The chart shows the average daily passes per month that have been successfully acquired at McMurdo and relayed to Darmstadt since the service became operational in 2014.

The average daily number of ADA passes of Metop-B is 14.2. Since January 2014, the overall daily average of those acquired is 13.6.

#### Events in the reporting period: None significant.





#### Metop, Suomi-NPP & NOAA GDS → A-DCS Level 0 Data

Metop A & B carry instruments for supporting the Argos Advanced Data Collection System (A-DCS). Environmental data is transmitted by measurement platforms on land or sea, or in the atmosphere, and this is relayed via the Metop satellites and EUMETSAT to CLS in Toulouse, in accordance with a cooperation agreement with CNES.

Metop-A provides the prime Argos-3 A-DCS service, with Metop-B providing just Argos-2 mode, due to the reduced capability of A-DCS onboard that satellite.

**Events which impacted availability:** 

13-14 May: Metop Control Centre computer system problems (see slide 8)





## Metop, Suomi-NPP & NOAA GDS → AMSU Level 1B BUFR Products

The Advanced Microwave Sounding Unit (AMSU) is a 15-channel microwave radiometer supplied by NOAA which provides information on atmospheric temperature profiles.

Level 1B products are derived from the data generated by the instruments onboard the Metop-A, Metop-B and NOAA-19 satellites.

- 26-27 April: NOAA SOCC ground segment issues impacted 5 passes in total.
- 13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)







#### Metop, Suomi-NPP & NOAA GDS → ASCAT Level 1B (SZF) Products

The Advanced Scatterometer (ASCAT) is a C-band radar on the Metop satellites which measures normalised backscatter from the Earth's surface. The prime objective of ASCAT is to measure wind speed and direction over the oceans, as an input to NWP models. ASCAT data is also used to extract information on soil moisture, sea-ice extent and permafrost boundary. EUMETSAT disseminates sampled Level 1B data from both Metop-A and Metop-B and derived Level 2 products over EUMETCast.

Performance of the Level 1B service is now measured in terms of the timely availability of the 'SZF' products (full resolution - original instrument sampling) on the EUMETCast reference user station.

- 13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)
- 27 May: Metop-A: ASCAT heater-refuse mode (see <u>slide 8</u>)





#### Metop, Suomi-NPP & NOAA GDS → ATOVS Level 2 Products

ATOVS Level 2 product processing transforms the calibrated radiance measurements from the AMSU-A, MHS and HIRS instruments (onboard Metop-B and NOAA-19 satellites) into information on the vertical distribution of atmosphere state parameters, on cloud and surface parameters and total atmosphere contents. All the parameters derived are assembled into one ATOVS L2 sounding product for each satellite.

Performance of the Level 2 service is measured in terms of the timely availability of the BUFR-encoded products received on the EUMETCast reference user station (US).

- 26-27 April: NOAA SOCC ground segment issues impacted 5 passes in total.
- 13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)
- Note: Metop-A ATOVS L2 products discontinued as of 7 December 2015, due to the failure of AMSU channels 7 and 8.





## Metop, Suomi-NPP & NOAA GDS → AVHRR Level 1B Products

The Advanced Very High Resolution Radiometer (AVHRR) is a multi-spectral imaging instrument provided by NOAA which produces global cloud imagery and information on land and sea surfaces. Level 1B products are derived from the data generated by the instruments onboard the Metop and NOAA-19 satellites.

- 26-27 April: NOAA SOCC ground segment issues impacted 5 passes in total.
- 13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)





## Metop, Suomi-NPP & NOAA GDS → GOME-2 Level 1B Products

The Global Ozone Monitoring Experiment-2 (GOME-2) is a scanning spectrometer used to measure profiles and total columns of atmospheric ozone and other trace gases.

**Events which impacted availability:** 

13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)

GOME-2 on Metop-B suffers degradation of throughput similar, but not identical, to that seen on Metop-A. The performance of the GOME-2 instruments on Metop-A and Metop-B and the evolution of their degradation will continue to be monitored.

See the 'Product Quality Monitoring Reports' via dedicated links on the <u>'Service Status'</u> page of www.eumetsat.int for further performance information. The GOME-2 Newsletter can be found under either of the two report sections.





#### Metop, Suomi-NPP & NOAA GDS → GRAS Level 1B Products

The GNSS Receiver for Atmospheric Sounding (GRAS) instruments provide information on atmospheric profiles using radio occultation of GPS signals from typically between 28 and 31 GPS navigation satellites in operational use.

The chart shows for each month:

- (1) the total numbers of GRAS Level 1B occultations (plus geolocation and quality flags) from Metop-A and Metop-B disseminated via EUMETCast
- (2) the daily average number of occultations from each Metop provided to users (numbers in italics)

Note that all occultations produced are disseminated, along with appropriate quality flags (including those produced during manoeuvres and recovery from anomalies).

**Events which impacted availability:** 

None significant.





#### Metop, Suomi-NPP & NOAA GDS → HIRS Level 1B BUFR Products

The High Resolution Infrared Radiation Sounder (HIRS) measures incident radiation using 19 infrared channels and 1 visible channel, providing information on the atmosphere's vertical temperature profile and water vapour from the Earth's surface to an altitude of about 40 km. Level 1B products are derived from the data generated by the instruments onboard both Metop-A/B and NOAA-19 satellites.

**Events which impacted availability:** 

Notes on latest instrument status:

- 26-27 April: NOAA SOCC ground segment issues impacted 5 passes in total.
- 13-14 May: Metop Control Centre computer system problems (see slide 8)

Metop-A HIRS: channels 1-12 and 14 out of spec, with large, short-term fluctuations and further degradation likely.
Metop-B HIRS: channels 10 and 14 slightly out of spec;

- (2) Metop-B HIRS: channels 10 and 14 slightly out of spec; instrument radiometric performance quite stable over the reporting period.
- (3) NOAA-19 HIRS: channels 1-12: close to, or out of specification, but the data is still considered usable for the time-being.





#### Metop, Suomi-NPP & NOAA GDS → IASI Level 1C & Level 2 BUFR Products

Infrared **Atmospheric** The Sounding Interferometer (IASI) the measures spectrum of infrared radiation in 6000 channels. providing information on profiles atmospheric of temperature. water vapour and trace gases, as well as surface temperature, surface emissivity and cloud characteristics.

**Events which impacted availability:** 

- January: Both Metops: external calibrations (moon intrusion) performed.
- 13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)



Note that external calibrations are performed typically on a monthly basis and these reduce the availability of Level 1 / Level 2 data (relative to that of Level 0) by approximately 0.5 to 0.6% of the scheduled availability.



#### Metop, Suomi-NPP & NOAA GDS → MHS Level 1B BUFR Products

The Microwave Humidity Sounder (MHS) is a 5-channel microwave radiometer providing information on atmospheric humidity profiles primarily, but also cloud liquid water content and precipitation.

Level 1B products are derived from the data generated by the instruments onboard both Metop-A/B and NOAA-19 satellites.

#### **Events which impacted availability:**

- 26-27 April: NOAA SOCC ground segment issues impacted 5 passes in total.
- 13-14 May: Metop Control Centre computer system problems (see slide 8)



#### Notes on latest instrument status:

- NOAA-19 MHS: channel 3 remains out of spec.
- Metop-A MHS: spikes seen on channel 2 NEDT after local oscillator swap, but otherwise all channels within spec.
- Metop-B MHS: all channels within spec.



#### Metop, Suomi-NPP & NOAA GDS → SEM Level 0 Data

The Space Environment Monitor (SEM) consists of a pair of instruments on each Metop satellite which provide data to determine the intensity of the Earth's radiation belts and the flux of charged particles at the satellite's orbiting altitude.

Level 0 data (consisting of the SEM instrument source packets in EPS native format) is provided to NOAA via a dedicated terrestrial line.

**Events which impacted availability:** 

13-14 May: Metop Control Centre computer system problems (see <u>slide 8</u>)





#### Metop, Suomi-NPP & NOAA GDS → Suomi-NPP Sensor Data Records

The Global Data Service delivers Sensor Data Records from the ATMS and CrIS instruments (Advanced Technology Microwave Sounder and Cross-track Infrared Sounder respectively) onboard NASA-NOAA's Suomi-NPP (National Polar-orbiting Partnership) satellite.

**Events which impacted availability:** 

None significant.





# **Regional Data Services**

The Regional Data Services (RDS) are based on direct acquisition of data from Metop and NOAA satellites by a network of HRPT stations, known as EARS (EUMETSAT Advanced Retransmission System). At each station, an EARS node processes the data locally and then relays it on to EUMETSAT for very timely distribution to the user community via EUMETCast and the GTS.

The RDS comprises the following services :

EARS-ASCAT, EARS-ATMS, EARS-ATOVS, EARS-AVHRR, EARS-CrIS, EARS-IASI, EARS-NWC, EARS-VASS and EARS-VIIRS

RosHydromet's Novosibirsk station started providing data to the EARS ATOVS and IASI services as of 8-August, and its Khabarovsk station to the ATOVS service as of 21-September.

Service performance is measured in terms of the availability of the data on the EUMETCast user reception stations being within 30 minutes of the instrument's observations, unless specified otherwise in the following slides.

See EUMETSAT's document TD14, available from the <u>'Regional Data Services'</u> page of EUMETSAT's website (see 'Related Links') for more general information on the various EARS services, including which HRPT stations contribute to each of the services.



## Regional Data Services → EARS-ASCAT

This service provides products derived from the data produced by the ASCAT instrument onboard Metop-A and Metop-B.

Level 1 data is produced by the EARS system, and then forwarded to KNMI (Netherlands) for the generation of Level 2 data. Availability shown on the chart is that of the Level 2 data received by users (relative to scheduled passes).

#### **Events which impacted availability:**

27 May: Metop-A: ASCAT heater-refuse mode (see <u>slide 8</u>)





## Regional Data Services → EARS-ATMS

This service provides SDRs derived from the data produced by the ATMS (Advanced Technology Microwave Sounder) instrument onboard NASA-NOAA's Suomi-NPP satellite.

Availability shown on the chart is that of the BUFRformatted SDRs received by users (relative to scheduled passes).

**Events which impacted availability:** 

None significant.





## Regional Data Services → EARS-ATOVS

This service provides ATOVS products covering datasparse areas, derived from data received by all HRPT stations from the following satellites (listed in order of priority): Metop-B, Metop-A, NOAA's N19 and N18 (N15 until 27-April-2017). Note that Metop's AHRPT partial coverage data is used.

The availability target shown in red on the chart is that for the products received by users (relative to scheduled ground station passes) and covers Level 1C and 1D products.

Note the less-stringent timeliness target for data from the following HRPT stations:

Edmonton, Gander, Miami & Monterey: 45 mins.

**Events which impacted availability:** 

None significant.

#### Notes:

- Data from NOAA's N15 satellite was descoped from the ATOVS service as of 27 April 2017.
- N18 and N19 data from the Ford Island station was added to the service on 13 March 2017.



----- Target Availability for EUMETCast = 90%



## Regional Data Services → EARS-AVHRR

This service provides data from the AVHRR instruments onboard NOAA-19 and the Metop satellites. AHRPT partial coverage data and data from the Fast Dump Extract System (FDES) are used from the Metops.

Availability shown on the chart is for Level 0 data received by users (relative to scheduled regional passes). Note that no higher-level products are generated.

#### **Events which impacted availability:**

January: Some passes missed from Moscow, Maspalomas and Svalbard.





## Regional Data Services → EARS-CrIS

This service provides SDRs derived from the data produced by the CrIS (Cross-track Infrared Sounder) instrument onboard NASA-NOAA's Suomi-NPP satellite.

Availability shown on the chart is that of the BUFRformatted SDRs received by users (relative to scheduled passes).

**Events which impacted availability:** 

April, May, June: Moscow Dolgoprudny passes not acquired due to an antenna configuration problem.





## Regional Data Services → EARS-IASI

This service provides products derived from the data produced by the IASI instrument onboard the Metop-A and B satellites.

Availability shown on the chart is that of the Level 1C data received by users (relative to scheduled passes). The products comprise calibrated and geolocated IASI observations containing both 300 Principle Component Scores and 500 original IASI channels, cloud/scene analysis information, BUFR formatted, suitable for nowcasting applications.

#### **Events which impacted availability:**

None significant.

General Issue: Incomplete passes in the HRPT zone cannot be processed, hence lower availability of products compared to the passes.



Target Availability for EUMETCast = 90%



## Regional Data Services → EARS-NWC

This service delivers Level 2 cloud products derived from data produced by the AVHRR instruments onboard Metop-B and NOAA-19.

Three types of product are delivered:

- Cloud-Top Temperature and Height (CTTH)
- Cloud Mask (CM)
- Cloud Type (CT)

Availability shown on the chart is currently only that of the CTTH products received by users (relative to scheduled passes).

Events which impacted availability:

None significant.



Target Availability for EUMETCast = 90%



#### Regional Data Services → EARS-VASS

The EARS Vertical Atmospheric Sounding Service (VASS) delivers data processed to L1B from the MWHS-II (Microwave Humidity Sounder II) and IRAS (Infra-Red Atmospheric Sounder) instruments onboard the FY-3C satellite from the China Meteorological Administration (CMA).

Availability shown on the chart is that of the BUFR-formatted L1B data relayed via EUMETCast.

The HRPT stations contributing to the VASS service are Athens, Kangerlussuaq, Lannion, Maspalomas, and Svalbard.

**Events which impacted availability:** None significant.



Target Availability for EUMETCast = 90%



## Regional Data Services → EARS-VIIRS

This service delivers products based on M-Band data from the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument onboard NASA-NOAA's Suomi-NPP satellite.

Availability shown on the chart is that of the L1 SDR products received by users (relative to scheduled passes).

The HRPT stations contributing to the VIIRS service are Athens, Kangerlussuaq, Lannion, Maspalomas, and Svalbard.

**Events which impacted availability:** None significant.





# **Search & Rescue Support**

EUMETSAT supports the Cospas-Sarsat System for Search and Rescue (SAR) by flying transponders onboard its MSG and Metop satellites.

The Cospas-Sarsat System is designed to provide distress alert and location data to assist SAR operations, using a constellation of geostationary and low-altitude Earth-orbiting satellites to relay signals from distress beacons to ground terminals. More information concerning the system can be found on <u>www.cospas-sarsat.org</u>.

- MSG: Meteosat-9 and 10 have provided full-time nominal SAR coverage over the reporting period. Meteosat-8's transponder was activated on 19 June to support tests for a potential IODC SAR service, whereas Meteosat-11's transponder has remained off during in-orbit storage.
- Metop: Metop-A and Metop-B have provided full-time SAR support during the reporting period, with the exception of an outage of ~22 hours on 25-26 January on Metop-A, resulting from a suspected SEU, for which a software restart was performed, followed by a power cycle.



# **Jason-2 and Jason-3 OGDR Service**

This service delivers the 'Operation Geophysical Data Record' (OGDR) products, derived from the altimetry data acquired from the Jason-2 and Jason-3 satellites.

Jason-2 (supporting the Ocean Surface Topography Mission (OSTM)) and Jason-3 (supporting the Copernicus Programme) are both cooperative ventures between EUMETSAT, NOAA, CNES and NASA (Jason-3 also involves the European Union, as a Copernicus mission). Jason-2 has been supporting the operational OGDR service since December 2008. Jason-3 was successfully launched in January 2016, and has been supporting the primary service since the 1st of July 2016. The European role in operations is funded by Copernicus.

EUMETSAT and NOAA process the data from the satellites in near real-time, and disseminate and archive the products. The chart on the next slide shows the availability of the products within the timeliness constraints of 3 hours and 5 hours respectively from the time of sensing.

<u>Special note:</u> Following the Safe-Hold Modes in March and May (see next slide), the Jason-2 Joint Steering Group decided to move the satellite to a new orbit (LRO – Long Repeat Orbit), 27 km below the reference orbit, leaving the latter free for the future Jason-CS / Sentinel-6 satellites. The manoeuvre was carried out and OGDR production resumed on 24 July 2017. The viability of an onboard software patch to mitigate the effects of the gyro problems is being assessed by CNES and industry.





#### Jason-2 and Jason-3 OGDR Service

The charts show the availability of the Jason-2 and Jason-3 Operational Geophysical Data Record (OGDR) products disseminated via EUMETCast.

The target figure of 95% applies to the availability of data received on EUMETCast reception stations with a timeliness of 5 hours. The further target of 75% is for the more demanding objective of 3-hour timeliness.

#### **Events which impacted availability:**

- March: Jason-2 experienced two Safe-Hold Modes, one on 15-March and a second on 22-March, caused by gyro faults.
- 17 May: Jason-2 experienced a further Safe-Hold Mode, again caused by a gyro fault. The instrument remained off during the remainder of May and the month of June.

(In general, redumps are taken at next visibility (or by other ground station) in cases of problematic passes and connection problems – this ensures minimisation of data loss, although some impact on timeliness occurs)







# **Third-Party Data Services**

In addition to its own satellite data and meteorological products, EUMETSAT also distributes data and products from partner organisations as part of an international cooperation.

Image data from the following geostationary satellites is made available via EUMETCast, Direct Dissemination and the Internet:

- NOAA's GOES-13 ('GOES-East') at 75°W, and GOES-15 ('GOES-West') at 135°W
- JMA's Himawari-8 at 140.7°E
- CMA's FY-2E, at 86.5°E, and FY-2G, at 105°E (also selected meteorological products)
- Meteorological products based on LEO satellite data are also disseminated:
  - Microwave Sounder products from CMA's FY-3B and FY-3C (only provided to National Met. Services)
  - Level 1, 2 and 3 products derived from data of the MODIS instrument on NASA's Terra & Aqua satellites
  - EUMETSAT SSMIS products derived from sounder data of the DoD's DMSP satellites (F16 F19)
  - Operational Geophysical Data Records (OGDRs) from the AltiKa instrument of ISRO/CNES's SARAL mission.

The charts on the following slides show the availability of the data via EUMETCast.



#### Third-Party Data Services → Geostationary Satellite Data & Products

The charts on this slide show the timely availability (as a percentage of expected) of image data originating from the geostationary satellites operated by NOAA and JMA (Japan Meteorological Agency), as disseminated via EUMETCast.











#### Third-Party Data Services $\rightarrow$ Geostationary Satellite Data & Products (cont.)

The charts here show the timely availability (as percentage of expected) of selected meteorological products generated from the data acquired by the Fengyun geostationary satellites operated by the China Meteorological Agency (CMA), as disseminated via EUMETCast.

#### **Events which impacted availability:**

- January: Intermittent gaps in reception of FY-2E and FY-2G products from CMA.
- Mar-Apr: For both FY-2E & FY-2G: Fewer products due to eclipseseason





#### FY-2E (86.5°E)



#### Third-Party Data Services $\rightarrow$ LEO Satellite Data & Products (1 of 3)

This section presents charts which show the availability of data and products for LEO satellites operated by partner organisations, as disseminated via EUMETCast.

On this slide: Level 1 data from microwave sounder instruments onboard CMA's Fengyun FY-3B and FY-3C satellites (made available only to National Met. Services and ECMWF). Availability shown as percentage of expected.

#### **Events Which Impacted Availability:**

April & May: No FY-3C IRASX products received from CMA in period 14-April to 15-May.



FY-3B Level 1 Data





#### Third-Party Data Services $\rightarrow$ LEO Satellite Data & Products (2 of 3)

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This slide presents further charts showing the availability of certain LEO satellite products from partner organisations, as disseminated via EUMETCast. Availability shown in terms of total products disseminated /month and equivalent daily average/month.

MODIS: Level 1, 2 and 3 regional products derived from the MODIS instruments hosted on NASA's Terra and Agua LEO satellites.

SSMIS Products: Extracted from SDR data from the 'Special Sensor Microwave Imager Sounder' radiometer onboard the nearpolar-orbiting, sun-synchronised DMSP satellites (one of the F16 – F18 series). Each product contains one orbit of data. comprising 4 BUFR component products: IMA, ENV, LAS and UAS.

#### Events which impacted availability:

- Jan & Feb: **MODIS:** Changes in types of products provided in period Nov 2016 to Feb 2017.
- SSMIS: Stats corrected for Jan & June: duplication of products at source, but are only conservative estimates.



#### EUM/OPS/REP/17/933663, V1A, 20 October 2017



#### Third-Party Data Services $\rightarrow$ LEO Satellite Data & Products (3 of 3)

This slide presents a chart showing the availability via EUMETCast of near-realtime Operational Geophysical Data Records (OGDRs), which are produced at EUMETSAT from the data from the 'AltiKa' Ka-band altimeter instrument of ISRO/CNES's SARAL mission.

Each OGDR corresponds to one orbit of data, and their availability is shown as a percentage of the scheduled passes.

75% of the OGDR products shall be made available to the users within 3 hours from data onboard acquisition and 95% of the products within 5 hours.

**Events which impacted availability:** 

17-18 May: Telemetry corrupted due to a suspected SEU – a total of 13 passes impacted.





# **EUMETCast**

EUMETCast is EUMETSAT's primary dissemination mechanism for the near real-time delivery of satellite data and products generated by the EUMETSAT Application Ground Segment. Third-party data and products from partner organisations are also delivered by the system, which is based on Digital Video Broadcast (DVB) technology. Since 1 January 2015, EUMETCast Europe has been implemented with the second generation DVB-S2 standard, whereas the Africa service remains on DVB-S.

For more information about EUMETCast and the services which it supports, please visit the <u>'EUMETCast'</u> page on the EUMETSAT website (via 'Data'  $\rightarrow$  'Data Delivery').

The chart on the following slide shows the availability of the system for the last 12 months, which includes the half-year reporting period.



## EUMETCast → System Availability for the Year-To-Date

The chart here shows the monthly svstem availability for the 3 **EUMETCast** services coverina Europe. Africa and the Americas respectively. Both EUMETCast Africa and EUMETCast Americas systems in effect. extensions of are. EUMETCast Europe and thus the endsystem availability to-end is calculated taking due account of the availability of EUMETCast Europe and of the respective extensions.

**Events which impacted availability:** None significant.

Note that the EUMETCast Americas service was terminated on 31 December 2016.





#### EUMETCast → Registered User Stations

The chart shows the trend of registrations of EUMETCast user stations since the establishment of the system in 2002.

Note that the number of registered user stations is larger than the number of users (shown on the next slide) due to some organisations possessing several user stations.

As of this issue of the report (2017/H1), the chart here no longer includes user stations which supported the RETIM\*\* service, provided on behalf of Météo-France. RETIM was not used to relay EUMETSAT operational data or products, and so it was considered more appropriate to exclude them from the statistics.

The EUMETCast Americas service was terminated at the end of 2016, resulting in the order of 50 deregistrations.

\*\* Former satellite broadcasting system of Météo-France, which has been superseded by a subscription-based download service.





#### EUMETCast $\rightarrow$ Users Worldwide as of 30 June 2017





# The EUMETSAT Data Centre

EUMETSAT's Data Centre archives all payload data acquired from EUMETSAT's operational satellites and most of the products derived from that data.

The Data Centre allows registered users to request data and products from the archive by use of its online 'self-service' ordering mechanism and supplies the requested items via physical media and the Internet. It also allows 'bulk orders' for long time-periods of data and 'standing orders' for repeated delivery of data / products over specified time periods to be requested for special needs.

Charts on the following themes appear on the next 3 slides:

- Data Delivered: Total Volume versus Items
- Archive Orders versus Data To Be Retrieved
- Archive Order Delivery-Time Trends

Note that the charts do not include orders and deliveries of Climate Data Records (CDRs). Although the volumes of CDR deliveries are large (typically many TBs), they are not logged in the automated statistics provided by EUMETSAT's Data Centre.



#### The EUMETSAT Data Centre $\rightarrow$ Data Delivered: Total Volume versus Items

The chart shows the number of items delivered monthly to the users by the Data Centre, and the corresponding monthly total volumes of data delivered, in the 3 years up to the end of 2015.

Items comprise images, products and ancillary files, and the statistics include all items supplied for all types of orders (regular, bulk and standing).

#### Notes for the reporting period:

May 2017:

Highest ever delivery volume in a month was achieved (145 TB, ~1.8 million items), since records began.

A significant part of the volume was attributable to an order for Meteosat data spanning 12 years. This was delivered on LT04 tapes to a Swedish company which specializes in producing high-quality weather predictions using neural networks.





## The EUMETSAT Data Centre → Archive Orders versus Data To Be Retrieved

The chart shows the day-by-day profile of archive orders awaiting processing, against the related volume of data needing to be retrieved from the archive and processed to satisfy the queued orders.

The chart is based on observed <u>daily</u> <u>maximum</u> orders and estimated retrieval volumes which are recorded automatically for each day of the year.

Peak levels March - August 2015:

As reported in the previous issues, the large increase in orders-pending was attributable to exceptionally high interest in archived data and a few exceptionally large orders from specialist users.

#### General Trend in 2017 to date:

Variations in orders pending and volume to be retrieved correlate with the orders received, but the overall profile stays well under control. As can be seen from the next slide, a record number of orders were handled in this reporting period.





## The EUMETSAT Data Centre → Archive Order Delivery-Time Trends

The 3 charts show delivery-time ranges for Data Centre orders according to 3 categories of order size (Small, Medium & Large), for each of the half-year periods shown on the horizontal axis. The lefthand scales help to show the proportions of the total orders delivered in the indicated time ranges (note: standing orders <u>not</u> included).

The colour-coding for the delivery-time bands on each of vertical bars on each chart is as follows:



The blue lines indicate the total orders per half year for each category (righthand scales apply).

Total orders across all 3 categories were:

2014/H2:	6537	2015/H1: 10238
2015/H2:	6583	2016/H1: 8869
2016/H2:	9757	2017/H1: 12688









# **EUMETSAT's Support to Climate Services**

EUMETSAT contributes to climate monitoring and climate change analysis by recalibrating and reprocessing sensor data and products from Meteosat and Metop satellites held in its archive. Improved processing algorithms are applied to the data collected since the 1980's, producing data records with improved overall consistency, with artefacts introduced during past satellite lifetimes corrected.

The following slide gives an overview of the new Climate Data Records made available in EUMETSAT's archive in the reporting period.

For further information on EUMETSAT's role in Climate Monitoring and the European Climate Projects in which it is involved, please see the '<u>Monitoring Climate</u>' page whose link can be found on the 'What We Do' section under 'About Us' on the EUMETSAT website.





## EUMETSAT's Support to Climate Services → Climate Data Record (CDR) Generation

Climate Data Record (CDR) production status at the end of the reporting period:

#### Produced in 2017/H1 – undergoing validation:

- GRAS bending-angle profiles for Metop-A and B, up to 2015 and some parts of 2016.
- SSM/T2, AMSU-B and MHS microwave sounding radiance records
- Meteosat 2-9 IR/WV channel re-calibration coefficients
- Meteosat-7 recalibrated visible channel reflectance
- Meteosat 7,8 and 9 cloud mask

#### To be produced in 2017/H2:

- COSMIC (2006-2015) and CHAMP (2001-2010) bending-angle profiles
- Meteosat 5 and 6 recalibrated reflectance
- Meteosat 2-6 cloud mask
- Meteosat 2-9 surface albedo
- Meteosat 2-9 ASR, CSR, CLA and AMV products.



# **Helpdesk Service**

EUMETSAT's User Helpdesk provides support to the users of EUMETSAT's services, handling enquiries, registrations, user feedback comments, problems experienced and enhancement requests.

This section includes charts on the following subjects:

- User interaction history of the last 10 years
- The countries and groups that gave rise to the largest numbers of user interactions in the reporting period
- Breakdown of those user interactions by category



## Helpdesk Service → User Interaction History

The chart shows the number of user handled interactions bv **EUMETSAT's** User Helpdesk in each half-year of the last 10 years. The next two slides focus on the user interactions for the reporting current period, in which a total of 1833 interactions were handled.



User Transactions per Half-Year Ending the Months Shown



## Helpdesk Service → User Interactions 2017/H1 by Country of Origin

The chart shows the interactions in the first half of 2017 from:

(1) the 5 countries that gave rise to the largest numbers of interactions, and

(2) the split of the remainder of the interactions between other Member States, the Cooperating States and other countries.





## Helpdesk Service → User Interactions 2017/H1 by Category

The chart shows the numbers of user interactions in the first half of 2017 for:

- Service Enquiries (8 categories)
- Service Registrations
- User Feedback

Total interactions for the halfyear came to 1833.

#### Notes:

(1) 'User Support Enquiries' on the chart refer to enquiries related to service messages, web information and training.

(2) 'User Feedback' includes comments on our services and suggestions for improvement





#### Information on EUMETSAT's Services

The following information is available on the EUMETSAT website, <u>www.eumetsat.int</u> :

Under **DATA** on the menu-bar, links to sections on the following subjects:

- Products, services and delivery mechanisms
- Training courses and materials
- Service Status, including a link to UNS, our User Notification Service

In addition, details of all products can also be found in EUMETSAT's Product Navigator, accessible under 'Quick Links' from the website's menu-bar.



## Glossary

#### Special terms used in this report are explained in the table below (continued on several subsequent slides).

Term	Context in which used	Description
A-DCS	Metop-SNPP-NOAA GDS	ADVANCED DATA COLLECTION SYSTEM. Metop instruments contributing to Argos programme. Acquisition and transmission of signals from transmitters on buoys, ships, land sites and mobiles.
AMSU-A	Metop-SNPP-NOAA GDS	ADVANCED MICROWAVE SOUNDING UNIT-A. Multi-channel microwave radiometer used in combination with the HIRS instrument for measuring global atmospheric temperature profiles.
ASCAT	Metop-SNPP-NOAA GDS	ADVANCED SCATTEROMETER. C-band radar which measures near-surface wind speed and direction over the global ocean, and soil moisture.
ATOVS	Metop-SNPP-NOAA GDS	ADVANCED TIROS OPERATIONAL VERTICAL SOUNDERS. Calibrated radiance measurements from the AMSU-A, MHS and HIRS instruments are transformed into various parameters and assembled in the ATOVS L2 product.
AVHRR	Metop-SNPP-NOAA GDS	ADVANCED VERY HIGH RESOLUTION RADIOMETER. Multi-spectral imaging instrument which produces global visible, near-infrared and infrared imagery of clouds, oceans and land surfaces.
СМА	Third-Party Data	China Meteorological Administration ( <u>http://2011.cma.gov.cn/en/aboutcma/</u> )
Colinearity	Meteosat	Sun, satellite and ground station come into alignment twice a year, giving rise to disruption of uplink and downlink signals, resulting in partial loss of some images.
DCP	Meteosat	A 'Data Collection Platform' measures and transmits environmental data which is relayed by Meteosat satellite first to EUMETSAT's central operations, and then forwarded on to the DCP operator via direct, EUMETCast or GTS dissemination.
FDES	Regional Data Services	Fast Dump Extract System: This mechanism provides fast access to the most recent part of each X- band dump and transfers the relevant data to the EARS system for Level 1 processing.
FES	Meteosat	Full-Earth Scanning, where the SEVIRI instrument scans the full Earth disc (c.f. RSS).



Term	Context in which used	Description
Formats	Meteosat (IODC)	This refers to the High-Resolution Image (HRI) formats disseminated via Meteosat-7's direct dissemination broadcasts.
GDS	Metop-SNPP-NOAA GDS	GLOBAL DATA SERVICE. This is EUMETSAT's service delivering L0, L1 and L2 data and products based on instrument data acquired from the Metop, S-NPP and NOAA Low-Earth-Orbiting satellites.
GOME-2	Metop-SNPP-NOAA GDS	GLOBAL OZONE MONITORING EXPERIMENT-2. Scanning spectrometer instrument used to measure profiles and columnar amounts of ozone and other atmospheric constituents.
GRAS	Metop-SNPP-NOAA GDS	GNSS RECEIVER FOR ATMOSPHERIC SOUNDING. Bending angle / radio occultation instrument for temperature and water-vapour profiling in the troposphere and stratosphere with high vertical resolution.
GTS	General	The 'Global Telecommunications System', established by the WMO, is used by national meteorological services to exchange meteorological data and products. See also 'RMDCN'.
HIRS	Metop-SNPP-NOAA GDS	HIGH-RESOLUTION INFRARED RADIATION SOUNDER. Heritage atmospheric soundings of temperature and humidity in cloud-free conditions.
IASI	Metop-SNPP-NOAA GDS	INFRARED ATMOSPHERIC SOUNDING INTERFEROMETER. A multi-purpose sounding instrument used for enhanced atmospheric soundings of temperature, humidity and trace gases in cloud-free and partly- cloudy conditions, as well as surface temperature, cloud characteristics and surface emissivity.
JMA	Third-Party Data	Japan Meteorological Agency ( <u>http://www.jma.go.jp/jma/indexe.html</u> )



Term	Context in which used	Description
Level 0	Metop-SNPP-NOAA GDS	An instrument's raw data which has been demultiplexed from the total set of data dumped from one orbit of the Metop satellite.
Level 1.0	Meteosat	The raw image data acquired from a Meteosat satellite and preprocessed at the ground station, which is then received by a EUMETSAT image-processing facility, to be geometrically rectified and radiometrically corrected.
Level 1.5	Meteosat	Level 1.0 image data that has been corrected for radiometric and geometric non-linearity and is accompanied by the appropriate ancillary information that allows the user to calculate the geographical position and radiance of any pixel.
Level 1A	Metop-SNPP-NOAA GDS	Instrument data in full resolution with radiometric and geometric (i.e. Earth location) calibration computed and appended but not applied.
Level 1B	Metop-SNPP-NOAA GDS	Calibrated, earth-located and quality-controlled product, in the original pixel location, packaged with ancillary, engineering and auxiliary data.
Level 1C	Metop-SNPP-NOAA GDS	In the case of the IASI spectra, Level 1B data after the application of the apodization function.
Level 1D	Metop-SNPP-NOAA Regional Data	For EARS-ATOVS, AVHRR derived cloud information on HIRS grid.
Level 2	Metop-SNPP-NOAA GDS	Earth-located values converted to geophysical parameters at the same spatial and temporal sampling as the Level 1B and 1C data.



Term	Context in which used	Description
MHS	Metop-SNPP-NOAA GDS	MICROWAVE HUMIDITY SOUNDER. 5-channel microwave instrument for atmospheric humidity sounding in all weather conditions.
NOAA	Metop-SNPP-NOAA GDS and Third-Party	National Oceanic and Atmospheric Administration ( <u>http://www.noaa.gov/</u> )
Nominal RCs	Meteosat (0° SEVIRI)	SEVIRI repeat cycles consisting of geometrically and radiometrically-corrected data in all 12 channels, with less than 18 missing detector lines in the scanned Earth area for any given spectral channel (54 for HRV), where less than 12 of those lines (36 for HRV) are adjacent to each other.
'On-Time'	All	The data or product has been generated or received 'on-time' at a specified location (e.g. at generation facility or EUMETCast user station respectively) within the relevant timeliness constraint.
OOP	Metop	'Out-Of-Plane' manoeuvre, i.e. one conducted with a Metop satellite in order to adjust the inclination of its orbit.
Perfect Formats	Meteosat (IODC)	High-Resolution Image (HRI) formats which have no missing lines and are based on the latest scanned image according to schedule.
Perfect Images	Meteosat (IODC)	Rectified images which are 100% complete.



(end of report)

Term	Context in which used	Description
PGF	On Metop performance charts	The Metop 'Product Generation Facility' is the part of the EPS CGS (Core Ground System) which generates Level 0 data and controls the generation of Level 1 and 2 products by the relevant PPFs (Product Processing Facilities).
Repeat Cycles (or RCs)	Meteosat (0° SEVIRI)	The period in which the MSG SEVIRI instrument performs one scan and then is repositioned ready for the next repeat cycle. A nominal repeat cycle (a scan of the entire Earth disc) has a duration of 15 minutes.
RMDCN	General	The 'Regional Meteorological Data Communication Network' is used by WMO Region VI to carry GTS traffic within Europe. See also 'GTS'.
RSS	Meteosat (9.5° SEVIRI)	Rapid-Scan Service (for MSG), where the repeat cycle has a duration of only 5 minutes, covering the latitude range of 15 to 70°N.
SEM	Metop-SNPP-NOAA GDS	The 'Space Environment Monitor' consists of a pair of instruments which provide data to determine the intensity of the Earth's radiation belts and the flux of charged particles at the satellite's orbiting altitude.
SEU	Satellite or instrument outages	'Single Event Upset', the term used to refer to an effect on onboard electronics caused by charged particles (e.g. solar), possibly resulting in a switch-off of an electronic system.
SEVIRI	Meteosat Second Generation (MSG)	Spinning Enhanced Visible and Infra-Red Imager

