3RD PARTY DATA SERVICES AT EUMETSAT

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Abstract

The operational availability of satellite data in near-real time is crucial for many meteorological and oceanographic applications. EUMETSAT, as a satellite data provider, has a reliable and well established data dissemination infrastructure to provide data from EUMETSAT satellites to users in Europe, Africa and South America via EUMETCast, and globally via the GTS. During the last decade these dissemination mechanisms have been used more and more to distribute also available data from non-EUMETSAT missions to the user community. If required by the users, additional data processing or data reformatting is performed by EUMETSAT. These services include or will include in the near future data from the following satellite missions and instruments: DMSP series (SSMIS), EOS (MODIS), Oceansat-2 (OSCAT), SMOS (MIRAS), FY3 (MWHS, MWTS), Megha-Tropiques (SAPHIR, MADRAS), SUOMI NPP/JPSS (ATMS, CrIS), SARAL, NOAA 15-18 (AMSU, MHS, HIRS).
In cooperation with its member states and based on their requirements, EUMETSAT continuously extends these services to new satellites and instruments not only from operational agencies but also to routinely available data from research missions.

INTRODUCTION

EUMETSAT is widely known as an operator or co-operator of meteorological and oceanographic satellites and as a provider of various data and products from these satellites. Since the start of the Initial Joint Polar System (IJPS) together with NOAA, EUMETSAT also processes and distributes data from the primary NOAA satellites in the mid-morning orbit as part of its operational service in the core ground-segment. Currently this service comprises the data from NOAA-19.
During the last decade more and more organisations launched meteorological and oceanographic satellites or started making the data from their satellites available to a broader user community. In parallel the needs of the user communities for more and advanced satellite data were triggered by advances e.g. in the data assimilation techniques or in the application of satellite data in nowcasting. The availability of the data from the newly available satellites to the users was, however, often limited by technical, formal, or data policy obstacles. Therefore EUMETSAT stakeholders decided to use EUMETSAT's established data dissemination techniques to distribute also data from non-EUMETSAT and non-IJPS satellites in a user friendly fashion to its various user communities. These activities are covered by the newly established 3rd Party Data Service.
The selection and priority setting of data sets which EUMETSAT tries to make available through the 3rd Party Data Service is performed by EUMETSAT's Delegate Bodies as representatives of the user community. The NRT data come from various organisations (CMA, CNES, ESA, ISRO, JAXA, JMA, NASA, NOAA, NSOAS, ROSHYDROMET) and the data are transferred to EUMETSAT in various ways (dedicated lines, RMDCN, Internet, ...) using various data transfer mechanisms.
The reception and raw data processing is done by the satellite provider or on behalf of the satellite provider and the data policies of the data providers remain applicable also to the data disseminated by EUMETSAT. This leads in very few cases to limitations in the access of the data.
Depending on user demands EUMETSAT can reformat the data in other data formats or tailor the data to specific parameters, channels, or geographical regions. The data dissemination is done in most cases via EUMETCast, sometimes also via GTS. Archiving of the 3rd Party Data is usually not done by EUMETSAT but by the data provider. The registration for the reception of 3rd party data follows the same principles as for other EUMETSAT data through the Product Navigator. Since EUMETSAT acts

mainly as a data relays in this context, the availability and timeliness of the data is mostly determined by the data providers.

This paper gives an overview of EUMETSAT's active 3rd Party Data Services for global and regional missions and the extensions planned for the near future.

OPERATIONAL GEO-STATIONARY DATA

The EUMETSAT 3rd Party Data Service was formally established only after the start of the EUMETCast data distribution system but in fact existed already before in the context of the Foreign Satellite Data (FSD) Service for data from geostationary data from the GOES and MTSAT satellites. These data are still distributed 3-hourly through the direct broadcast of the METEOSAT satellites. In addition the EUMETCast dissemination of 1-hourly data from GOES, MTSAT and FENGYUN-2 satellites has been implemented. Table 1 gives an overview of the disseminated spectral channels and the availability of the data on the three EUMETCast dissemination streams for Europe, Africa and South America.

Foreign Satellite Data Description/ Dissemination Channel	GOES-East (GOES-13) Spectral bands: VIS_00_7_075W IR_03_9_075W IR_10_7_075W WV_06_6_075W	GOES-West (GOES-11) Spectral bands: VIS_00_7_135W IR_03_9_135W IR_10_7_135W WV_06_8_135W	MTSAT (MTSAT-2) Spectral bands: VIS_00_7_145W IR_03_8_145W IR_10_8_145W IR_12_0_145W WV_06_8_145W	FENGYUN-2 (FENGYUN-2E FENGYUN-2D) Spectral bands: FDI_IR1 FDI_IR2 FDI_IR3 FDI_IR4 FDI_VIS FDI_VIS_1KM
MSG **Direct Dissemination** LRIT Encrypted	3 hourly All bands excluding IR_03_9_075W	3 hourly All bands excluding IR_03_9_135W	3 hourly All bands excluding IR_03_8_145W	Not disseminated
EUMETCast **Ku Band** LRIT	1 hourly All bands	1 hourly All bands	1 hourly All bands	1 hourly All bands
EUMETCast **C-Africa** Band. LRIT	3 hourly All bands	3 hourly All bands	3 hourly All bands	1 hourly All bands
EUMETCast **C-Americas** LRIT	3 hourly All bands	3 hourly All bands	Not disseminated	1 hourly All bands

Table 1: **Geostationary satellite data available from the Foreign Satellite Service of EUMETSAT.**

NEW GEO-STATIONARY DATA: ELEKTRO-L N1

Since 24th September 2013, EUMETSAT provides also selected data from the Russian Elektro -L N1 satellite in a trial dissemination mode to European EUMETCast users.

Elektro-L N1 is a geo-stationary satellite, positioned at 76° East and operated by ROSHYDROMET. It has been designed with 10 channels from the visible to the IR spectral range. Unfortunately,not all

channels are showing their nominal performance. The ground resolution is 1km for the VIS/NIR channels and 4 km for the IR channels. The repeat cycle of the Elektro-L satellites is 30 minutes.

EUMETSAT decided to distribute only a selected subset of the data to its users during the trial phase of the dissemination. Depending on the feedback of the users, the data selection can be re-addressed for a potential operational dissemination. Currently data from 4 channels (0.85, 8.0, 9.7, and 10.8µm) for the full disc are available in HRIT data format for each 30 minute repeat cycle. The total data volume is around 450MB per day.

OPERATIONAL LOW EARTH ORBIT SATELLITE DATA

Various data sets from the satellites on low earth orbits have been made available through EUMETCast or GTS over the last years. Based on the demands from the users community many of them are re-formatted before they are disseminated. The following product list gives only an overview. For detail on the specific products, please check the Product Navigator on the EUMETSAT Web-page (http://navigator.eumetsat.int).

- Microwave Sounder (**MWHS** and **MWTS**) and microwave imager (**MWRI**) L1b data from CMA's FY-3A and FY-3B polar orbiting satellites are provided in HDF5 format (only to National Met. Services).
- Products derived from data of the **MODIS** instrument on NASA's Terra & Aqua satellites. Radiance data sets in HDF4 consist of level 1 spatially thinned radiance data (MOD02), comprising a subset of channels and covering Europe, North Atlantic and the northern polar region. In addition various Ocean and Fire products are made available, including the daily global Chlorophyll-Alpha map from NASA.
- **SSMIS** SDRs derived from sounder data of the DoD's DMSP satellites F16 and F17, reformatted to BUFR.
- **SMOS** NRT BUFR light products derived from the MIRAS on-board ESA's SMOS satellite.
- For **SARAL** the early dissemination to all users of pre-operational products started 23-July-2013. The main geophysical parameters in the OGDR product, derived from the AltiKa Ka-band altimeter, are significant wave height and ocean surface wind speed. In addition a sea surface height anomaly product is disseminated.
- Level 2A and 2B **OSCAT** products derived from the scatterometer onboard of ISRO's Oceansat-2 satellite.

The Oceansat-2 OSCAT Data Service has two particular features which make it more complex than other 3rd Party Data Services.
In the case of OSCAT data EUMETSAT also provides a backup support to the primary data processing at ISRO-NRSC in Shadnagar, India. In the case of problems with the primary processing site or the transfers from the reception station at Svalbard to the processing centre, the raw data are transferred directly to EUMETSAT and the processing to L1 and L2 is performed at EUMETSAT, Darmstadt, using the identical software that is installed at the primary processing site in Shadnagar. A second unique aspect is the provision of the OSCAT data by EUMETSAT to our North American partners at NOAA. OSCAT data distributed via EUMETCast consist of L2a backscatter ratios and L2b wind products in 50km resolution in HDF5 data format. In addition EUMETSAT distributes the OSI-SAF 50km wind product in BUFR. Figure 1 shows the OSCAT wind field from the OSI-SAF product shortly before the landfall of hurricane Sandy at the East Coast of the United States.
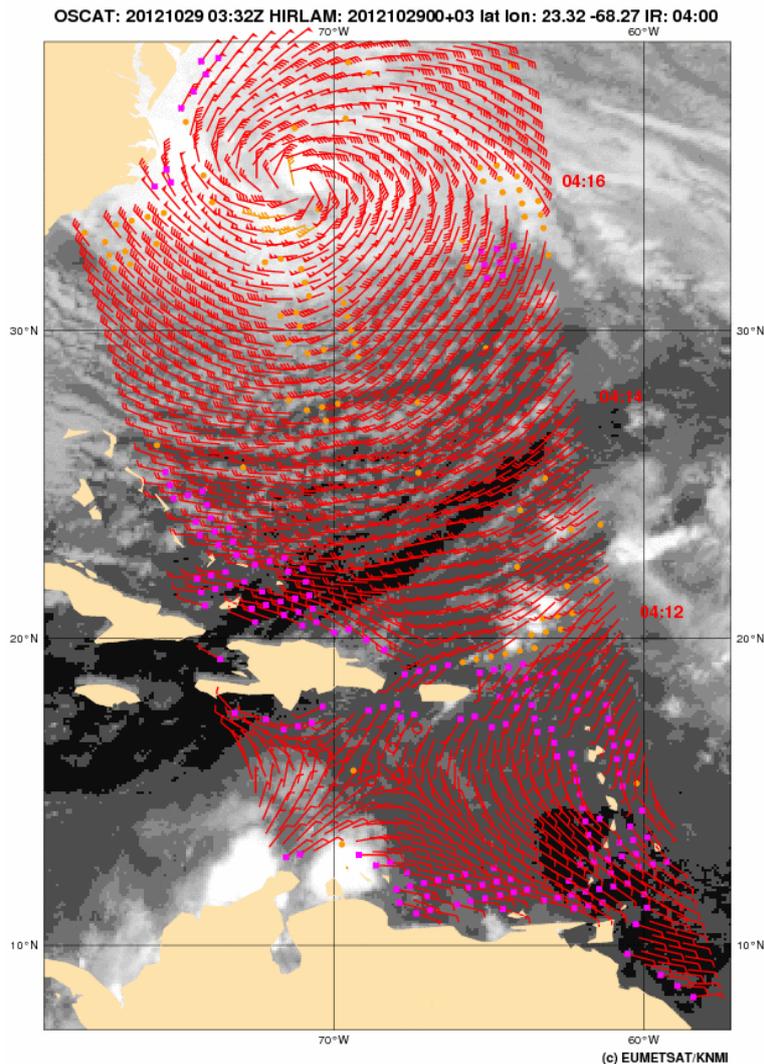
Figure 1: OSCAT 50km wind product by EUMETSAT OSI-SAF ,West Atlantic, 29/10/20102, 3:32 UTC (Hurricane Sandy shortly before landfall).

NEW LOW EARTH ORBIT SATELLITE DATA: GLOBAL SDR FROM SUOMI NPP

The trial dissemination of Sensor Data Records (SDR) from the sounding instruments onboard NOAA's Suomi NPP satellite started in July 2012. The SDRs from the Advanced Technology Microwave Sounder (ATMS) and the Crosstrack Infrared Sounder (CrIS) are received from the NOAA NPOESS Data Exploitation (NDE) project in BUFR data format.
At EUMETSAT the ATMS and CrIS files are re-named according to the WMO GTS filenaming standard, the BUFR bulletins are repacked and the data are disseminated via EUMETCast and GTS. For CrIS,SDRs two additional steps are performed: If VIIRS cloud mask EDRs (received by EUMETSAT in netCDF) are available in a timely manner, the co-located cloud information is merged into the CrIS product. The data volume for the GTS distribution of CrIS SDRs is reduced by providing only 399 selected channels.

PLANNED 3RD PARTY SERVICE EXTENSIONS

Making new satellite data and products available for our user communities is very often not only a technical challenge but requires also detailed legal agreements on data exchange and data policies. EUMETSAT continues its efforts to overcome legal and technical obstacles to give access also to

other data sources. Table 2 shows the new data which are planned to be available on EUMETCast in 2013/2014.

Satellite	Instrument	Data	Impl. Date
NOAA-15,18	Sounders	L1 BUFR	Q4 2013
Megha-Tropique	SAPHIR	L1A2 BUFR	Q4 2013
GCOM-W1	AMSR-2	L1B(R), SST	Q4 2013
FY-3A, B	Sounders	L1 BUFR	Q1 2014
HY-2A	ALT MWI SCAT	IGDR, netCDF-4 SST, GHRSST Ocean winds, BUFR + HDF5	TBD (2014)
Suomi-NPP	VIIRS	EDR (ocean and atmospheric composition products)	TBD (2014)

Table 2: **Geostationary satellite data available from the Foreign Satellite Service of EUMETSAT.**

3RD PARTY REGIONAL SERVICES: EARS-ATMS, EARS-CRIS, AND EARS-VIIRS

The EUMETSAT Advanced Retransmission Service (EARS) was the first Regional ATOVS Retransmission service (RARS) and provides data from the direct reception of polar orbiting meteorological satellites with very high timeliness to the European users via EUMETCast and GTS (http://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Metop/RegionalDataService/index.html). Currently, the EARS network comprises of more than 10 reception stations, covering the whole North Atlantic region and Europe. Five of these stations, Kangerlussuaq (East-Greenland), Svalbard, Athens (Greece), Lannion (Brittany, France) and Maspalomas (Canary Islands, Spain) are also distributing AVHRR data and derived cloud products for nowcasting applications (extension to Moscow planned in 2014). Figure 2 shows the reception range of these stations. During the last two years these stations have been equipped with X-Band antennas to enable also the reception of Suomi-NPP.
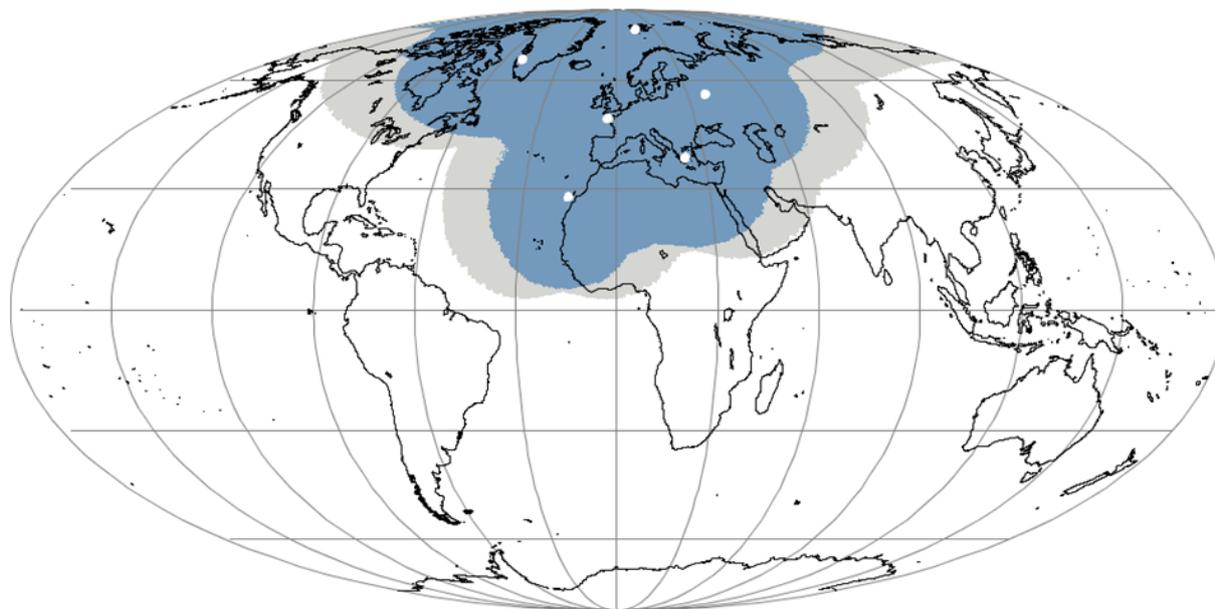

Figure 2: Initial coverage of the EARS-CrIS and EARS-ATMS service, including the planned extension to the Moscow reception station.

Since August 2013, ATMS and CrIS SDRs from these stations are operationally distributed via EUMETCast. The processing from raw data to SDR level is performed with NASA-DRL's Real-Time Software Telemetry Processing System (RT-STPS) and the Community Satellite Processing Package (CSPP) from CIMMS. During the initial phase of the service the CrIS SDRs do not contain the cloud information. The average timeliness of the data is around 30 minutes.

An EARS trial service for the Visible Infrared Imaging Radiometer Suite (VIIRS) is planned to be initiated by the end of 2013. This service focuses mainly on nowcasting users and will comprise the medium resolution VIRRS M-Band channels. The high data volumes of the original NOAA VIRRS HDF-5 format turned out to be not suitable for the data dissemination in the EARS framework with its high timeliness requirements. Therefore a compressed HDF-5 data format was developed (EUMETSAT, 2013) which contains the full original information. Data will be disseminated in the compressed format and a software package will be provided to the users to convert back to the original NOAA format. For the trial service only a timeliness of 30-45 minutes is expected which will be reduced later for the operational service to 15-30 minutes.

REFERENCES

Meier Soerensen, A., 2013, Compact VIIRS SDR Product Format User Guide, EUMETSAT Technical Note: EUM/TSS/DOC/13/708025