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## **EUMETSAT ACTIVITIES ON OCEAN MONITORING**

This paper provides a general overview of EUMETSAT activities in satellite oceanography. In particular it describes general context, operational activities, involvements in ocean monitoring projects and international cooperation. Details on (pre-)operational products and products in development are provided in working paper CGMS38-WP33.

CGMS to take note

## **EUMETSAT activities on ocean monitoring**

### **1 General context**

Monitoring and understanding the ocean-related aspects of the Earth system, including weather, climate, water cycle, natural resources, ecosystems, and natural and human-induced hazards is crucial. Satellite observations are recognised as a fundamental input for these tasks as they provide a unique uniform coverage over the global ocean. The space component of the global ocean observing system developed and matured remarkably over the last decades. It forms, together with in-situ system elements like the network of ARGO floats, a solid foundation for an integrated observing system as part of wider system of systems to serve both research and operational interests.

The operational interests are the core justification of EUMETSAT's involvement and growth in satellite oceanography. While maintaining the priority on operational, meteorological and climate services, services for the ocean environment are also developed to the extent that they interact with, drive, or are driven by meteorology and climate. The near future may see high-resolution coupled ocean-land-atmosphere models for routine Numerical Weather Prediction (NWP) over a range of 1-15 days. In particular, this community will experiment with coupled ocean-atmosphere models for exploring error growth in simulations of modes of organized convection and of interactions between the tropical and the extra-tropical atmosphere. A variety of global and regional seasonal prediction programs are furthermore underway. Finally, operational oceanography with ocean-only models, as for example in the context of the Global Monitoring for Environment and Security (GMES) Marine Core services (MCS), requires the same systematic and long-term routine measurements, rapid interpretation and dissemination. Being a user-driven organization, EUMETSAT's objective is to ensure that essential data and operational products of high quality are made available in a sustained manner to the widest possible user community.

### **2 Operational Data Products**

#### **2.1 Ocean and Sea Ice Satellite Application Facility (OSI SAF)**

EUMETSAT established Satellite Application Facilities (SAFs) for complementing the capability of its central facilities to process and validate data products, as well as taking benefit from specialized expertise in Member States.

The Ocean and Sea Ice Satellite Application Facility (OSI SAF, [www.osi-saf.org](http://www.osi-saf.org)) is dedicated to the common requirements from the meteorology and oceanography communities for a comprehensive information on the ocean-atmosphere interface. The core objective of the OSI SAF is to produce, control and distribute operationally in near real-time OSI SAF products, using available satellite data, as well as carrying

out the necessary users support activities. CGMS 38 WP-33 provides an overview of the products in operation and in development.

The OSI SAF will in the future take further into account requirements on climate monitoring and operational oceanography, e.g., the GMES MCS.

## **2.2 Altimetry missions and services**

Spaceborne altimetry data is vital to understand the dynamics of the global ocean. The main current activity of EUMETSAT in satellite altimetry is the partnership with CNES, NOAA and NASA in the OSTM/Jason 2 mission, launched on June 20<sup>th</sup>, 2008. EUMETSAT and NOAA are providing the near real time data services as required by marine meteorology, seasonal forecasting and operational oceanography forecasting. NOAA and CNES are providing data services for climate applications. The recent joint exploitation review meeting in June 2010 highlighted that OSTM/Jason-2 reliably delivers the agreed services. EUMETSAT also disseminates near real time products from the Jason-1 mission. CGMS 38 WP-33 provides an overview of the products in operation and in development

In the near future EUMETSAT will expand altimetry activities through its involvement in the Jason-3, Sentinel-3 (SRAL) and Altika (SARAL) missions.

- a. Jason-3 is the continuation of the reference altimetry mission established by TOPEX, Jason 1 and OSTM/Jason 2, lead this time by the operational agencies EUMETSAT and NOAA. The programme's Memorandum Of Understanding has been signed by all partners, and has entered into force on July 13<sup>th</sup>, 2010.
- b. EUMETSAT will operate the ESA Sentinel-3 satellite and provide the oceanographic data products. More details on Sentinel-3 mission are given below
- c. EUMETSAT will provide near real time data services, similar to those of OSTM/Jason-2 for the SARAL mission planned to be launched in 2011.

Furthermore, EUMETSAT leads together with European Space Agency (ESA) the continuation of the altimetry reference mission, known as the Jason Continuity of Services (Jason-CS). Current activities focus on programmatic cooperation, phase A and B studies, in order to establish a mission concept and roadmap. Seamless continuity of the reference mission beyond Jason-3 requires a Jason-CS launch around 2017.

## **3 Ocean Activities in relation to GMES Marine Core Services**

The GMES programme, led by the European Commission in partnership with ESA, will provide an operational system to monitor the European and Global environment. The GMES Marine Core Services (MCS) will deliver a set of basic generic data products on physical and biogeochemical state variables.

### **3.1 Sentinel-3**

The ESA Sentinel-3 mission is dedicated to serve the GMES MCS objectives. In July 2009, EUMETSAT started a third party programme to achieve readiness for its role as the operating agency of Sentinel-3, as well as serving the marine user community with near-real-time and off-line products. ESA will procure the products over land. Current activities focus on setting up the relevant ground segment components within EUMETSAT. Sentinel-3 services will include the provision of sea surface temperature, sea surface height and ocean colour. There will also be land and atmosphere services.

### **3.2 Identifying user requirements and benefit areas**

All the products discussed above provide an existing operational basis for the services build in Thematic Assembly centres (TACs) of the GMES MCS, such as the SST TAC, the Winds and Sea Ice TAC and the Dynamic Topography TAC. The Ocean Colour TAC will rely directly on Sentinel-3 services.

In a wider context, EUMETSAT is assessing the European user requirements for marine core services and the already existing marine meteorological services. This assessment includes the underlying benefit areas, institutions and related funding schemes.

## **4 Projects and further cooperation**

### **4.1 Cooperation with NOAA and IOC/IODE on marine forecasting**

EUMETSAT organized together with NOAA and IOC/IODE, a training course on the use of satellite wind and wave products for marine forecasting, which took place on 14-18 December 2009 in Oostende, Belgium. The goal of this course was to promote the use of these data in operational marine analyses and forecasts and it focussed on national weather services with Global Maritime Distress and Safety Systems (GMDSS) responsibility in the Southern Hemisphere. It is planned to have a follow-on course in 2011.

### **4.2 The DRAPSO project**

The Data Routing and Alternative Processing System for Oceansat-2 (DRAPSO).project aims to design, implement, integrate, verify and validate the processing system for Oceansat-2 scatterometer data at EUMETSAT. Oceansat-2 is a recently launched ISRO satellite which comprises of three payload instrument, the OSCAT scatterometer, the ROSA radio occultation antenna, and the ocean colour sensor. In the framework of the DRAPSO project, EUMETSAT will provide support to ISRO for the NRT reception, routing, processing and dissemination of OSCAT data. The Level 1 and level 2 data are to be delivered in NRT to the user community via EUMETCAST and via NOAA.

### **4.3 The Indian Ocean Tsunami Warning and Mitigation System (IOTWS)**

The 2004 Indian Ocean tsunami led to the establishment of the Indian Ocean Tsunami Warning and Mitigation System (IOTWS), which is a near real time operational tsunami monitoring system providing information to disaster managers along the Indian coast of Africa. The METEOSAT-7 is used to receive and relay data from Data Collection Platforms through the GTS and EUMETCast.

### **4.4 EAMNET**

In July 2010, the Europe-Africa Marine Earth Observation (EO) Network (EAMNet) project was launched, supporting the definition and implementation of the Global Monitoring for Environment and Security in Africa (GMES-Africa) initiative. Thanks to EAMNet initiatives the near real time GMES MCS products discussed above will be available operationally in near real time to African users. These data and products will complement other operational oceanography data (such as the OSTM/Jason 2 and Ocean and Sea Ice Satellite Application Facility data) already available through EUMETCAST.

## **5 CONCLUSIONS**

EUMETSAT, as an operational agency, is involved in an increasing number of missions with ocean-dedicated and ocean-related sensors. This involvement ranges from initiation of new programs to the relay of existing relevant products from third party missions. The emphasis is currently on near real-time provision of data with proven and monitored quality to serve operational applications in NWP, marine meteorology, seasonal forecasting and operational oceanography. Other strong objectives are also the provision of archived and reprocessed products to serve climate monitoring and climate assessments and the promotion and support of data uses in Europe and beyond.