

## **STATUS OF THE CURRENT ESA EARTH OBSERVATION MISSIONS**

CGMS is informed of the status of the current European Space Agency Earth Observation missions. Two of them, MSG and Metop are in co-operation with EUMETSAT. The success of the Envisat mission, launched in 2002, is well established, with a constant increase of user demand for data and services. Currently, over 2200 scientific projects are served with Envisat data. Today, the Envisat mission has exceeded the original foreseen 5 years lifetime and a 3 years extension from 2011 to 2013 has been approved.

ERS-2, the second ESA EO mission, launched in 1995, continues to satisfy the steady increasing data demand despite the failure of the gyroscopes and the low rate recorders for which workaround solutions have been successfully implemented. PROBA, an experimental ESA satellite, provides remarkable hyperspectral data since 2001. The archive contains more than 13000 products.

Finally, the Gravity field and steady-state Ocean Circulation Explorer, GOCE, was successfully launched on 17 March 2009. The commissioning phase and instrument calibration was completed by early September.

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### **1. INTRODUCTION**

**Envisat** marked six years of operations on 1 March, and the mission's success story continues. The number of Envisat data users continues to grow, addressing all aspects of Earth Observation, from Earth science (2200 scientific projects) to pre-operational GMES services.

**ERS-2**, the 'veteran' of European Earth Observation from space, is not getting tired yet. After 13 years of operations, ERS-2 is still providing very relevant data to the Earth science community. The value of the 17 years of data gathered by the ERS-1, ERS-2 and Envisat missions is regularly exploited for studies related to climate change.

Finally the experimental ESA **PROBA** mission has reached 7 years of operations.

### **2. STATUS OF THE ERS MISSIONS**

The ERS-1 spacecraft, which ceased its operations in March 2000, is regularly tracked to predict and avoid possible interference with the orbits of other missions. All ERS services are provided by ERS-2, which remains operational.

The ERS-2 mission proceeds satisfactorily and is now in its 14<sup>th</sup> year in operations. In February 2008 the ATSR-2 ceased following a Scan Mirror failure which has performed more than 2.5 Billion revolutions despite its age, ERS-2 continues providing large amounts of data requested by users. The successful ERS-2/Envisat Tandem Phase allowing inter-satellite SAR Interferometry has been repeated during the winter season 2008/09 with an extended observation coverage. Special emphasis has been given on observation on Cryosphere and highly populated river deltas for the creation of high resolution DEMs.

Since 2007 ERS-2 is supporting SAR NRT operations in combination with very fast satellite tasking capability of 13 hours latency time.

The ERS-2 Low Bit Rate station network, essential for the mission since the lost on the on-board recorder in 2003, has been extended with a station in South Africa. A total of 9 stations are supporting the ERS-2 Near Real Time and off-line downlink needs.

In order to ensure a homogenous data access covering 18 years of continuous observations, the formats and processing algorithms of the ERS products were aligned to those of Envisat.

The most complete information about the ERS mission, system, instruments, its products, user services and latest news can be found at <http://earth.esa.int/ers/> .

### 3. STATUS OF THE ENVISAT MISSION

After 7 years of operations, the Envisat mission continues making important contributions to Earth environmental issues. The second absolute minimum of Arctic sea ice extent was observed by Envisat Synthetic Aperture Radar instrument in September 2008, following the absolute minimum observed last year. Envisat did also provide full visibility on the break-up of the Wilkins Ice Shelf in Antarctica. The Envisat mission is particularly adapted to the polar observations, thanks to its microwave and atmospheric chemistry instruments.

Events such as the US floods consecutive to the Gustav and Ike hurricanes in September 2008 or the L'Aquila earthquake in Central Italy in April 2009 were also observed by Envisat. Results related to these events were obtained very quickly thanks to a fast and easy Envisat data access allowed by the latest upgrades within the Ground Segment.

Taking advantages of the current low solar activity allowing an optimum ERS-2 attitude stability, a second ERS-2 / Envisat SAR Interferometry Tandem campaign was performed between November 2008 and April 2009. Its objectives was to exploit the 30 minutes difference between Envisat and ERS-2 data acquisition, focusing on the velocity of fast moving glaciers and low relief Digital Elevation Models in the high Northern latitudes (in particular Siberia).

Several Envisat user workshops highlighted the significant progress on many fronts, primarily in the field of data access and development of new processing algorithms. The long-time series of ATSR data were recognised as a major asset for Earth Science and climate change studies. The users recommended ESA to preserve the current effort in calibration and validation activities, in synergy with other agencies, and in prevision of a possible data gap between Envisat and GMES Sentinel-3. They also encouraged ESA to maintain the current approach for stimulating alternative access to processed data (e.g. toolboxes, processing-on-demand), in complement to the standard ESA products. Finally the ESA exploitation activities (e.g. Data User Element programme) aiming to the synergetic use of Envisat data with similar non-ESA mission data received very positive feedbacks.

The satellite continues to provide overall stable performances, except for the GOMOS atmospheric chemistry instrument. This instrument continues experiencing a major degradation on the performance of the star tracking mirror. The investigation proceeds with the objective to reach a final conclusion on the GOMOS instrument operability during fall 2009.

Both the large user community and the good prospects for operating Envisat were major elements for ESA Members States to approve a proposed 3-years Envisat mission extension from 2011 to 2013. In parallel, the activities related to the

adaptation of the Envisat mission elements to new orbital parameters have started, with the objective to be completed few months before October 2010 when the satellite will be lowered by about 17 km. Such requested orbital change will allow mitigating the impact of the low level of on-board hydrazine.

The most complete information about the Envisat mission can be found on the mission web page at <http://envisat.esa.int/>.

#### **4. STATUS OF CHRIS/PROBA**

The Earthnet/Third Party Mission (TPM) programme enables harmonized access to non-ESA missions for the benefit of European users. Currently, ESA provides access to data from 20 Third Party Missions and more than 25 instruments. One of them is CHRIS/Proba:

Following 8 years of exploitation, a growing hyperspectral user community is being served with CHRIS/Proba data. Due to the expanding archive contents of CHRIS Proba with more than 13.000 data products available worldwide, scientists make increasing re-use of archived imagery. More information on CHRIS/Proba can be found at:

<http://earth.esa.int/missions/thirdpartymission/proba.html>

#### **5. STATUS OF GOCE**

The aim of the *Gravity field and steady-state Ocean Circulation Explorer (GOCE)* mission is to provide global and regional models for the Earth's gravity field and for the geoid, its reference equipotential surface, with high spatial resolution and accuracy. Such models will be used in a wide range of research and application areas, including global ocean circulation, physics of the interior of the Earth and leveling systems based on GPS.

The mission responds to the requirements put forward by many international scientific programs such as the WOCE, CLIVAR and GOOS. It is designed for the determination of an accurate description of the ocean dynamic topography and, thereby, the mean ocean circulation, as an essential complement to the precise monitoring of ocean temporal variability already provided by altimetry.

The gravity vector cannot be measured directly in orbit, but can be inferred from other observations. The GOCE carries a gravity gradiometer that measures gravity gradients and GNSS (Global Navigation Satellite Systems) receivers for precise satellite positioning.

*The satellite was launched into a 96.67 degrees sun-synchronous orbit on 17 March 2009, and reached its 254.9 km mapping altitude in early September, after successfully completing the commissioning phase and the instrument calibration. Mapping of the Earth gravity field will be carried out in two seven months long*

*eclipse-free periods from September to end of March (2009-2010 & 2010-2011). Operations are also likely to continue in the eclipse season.*

The mission ground segment has been successfully commissioned as well, both in terms of flight operations and payload data processing.

## **6. INTERNATIONAL CHARTER ON SPACE AND MAJOR DISASTERS**

Following the UNISPACE III conference held in Vienna, Austria in July 1999, the European and French space agencies (ESA and CNES) initiated the [International Charter "Space and Major Disasters"](#), with the Canadian Space Agency (CSA) signing the Charter on October 20, 2000. Since its signing, the International Charter on Space and Major Disasters has been providing important EO satellite data input to natural hazards post-crisis management around the world, with both increasing Charter activations and participating space agencies as data providers. Further information can be found at <http://www.disastercharter.org>

## **7. REFERENCES**

Further information about the various ESA missions can be found on the following WWW addresses which offers the possibility to download many supporting relevant documentation:

<http://www.esa.int>

<http://earth.esa.int>

<http://earth.esa.int/missions/thirdpartymission/proba.html>

Complementary to this report is the information contained in the "CGMS Consolidated report" and in CGMS-37-ESA-WP-02 regarding future missions.