

ESA Calibration/Validation Report for CEOS WGCV 24, Status and Plans.

1 Introduction

The reporting period for the status report is from the last meeting of the CEOS Working Group on Calibration and Validation on 3-5 March 2005 (WGCV 23) to the next meeting on 8-11 November 2005 (WGCV 24). Calibration and validation activities of the European Space Agency during this period included routine calibration, performance monitoring and algorithm development for ERS-2 & Envisat, planning of calibration & validation for future missions and airborne simulation campaigns.

2 Missions in Orbit

2.1 ERS-2

The high quality of the ERS data products under reduced attitude stability was maintained. It is planned to stretch ERS operation as much as possible to avoid gaps in data provision between ERS, Envisat and METOP. An example of routine ozone observation freely available on the Internet is shown in Figure 1. See also http://www.knmi.nl/gome_fd/index.html

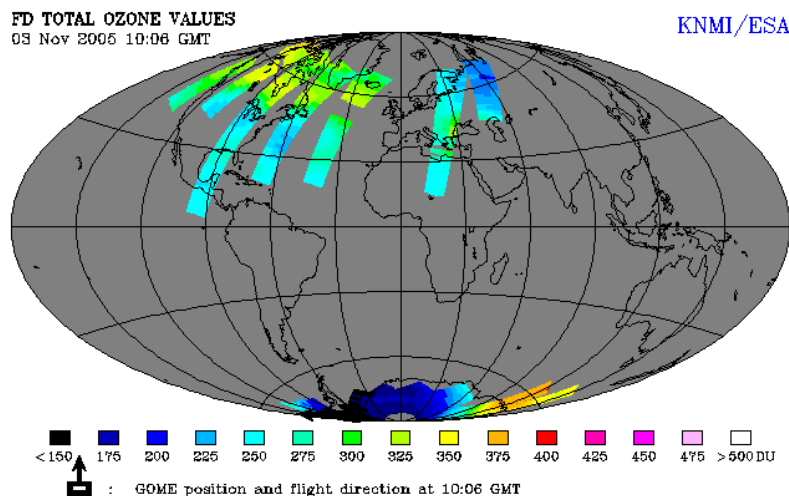


Figure 1 Ozone monitoring by KNMI based on GOME (ERS-2) data

2.2 ENVISAT

Three and a half year after its launch, the success of the Envisat Mission is well established. There is a constant increase of user demand for Envisat data and services. The quality of Envisat 's data products is being ensured with the support of data quality working groups for each instrument as well as with validation teams for level-2 data products (geophysical variables). The scientific and commercial exploitation of ERS and Envisat 's data is being reviewed during a series of dedicated workshops. See also <http://envisat.esa.int/>

The Envisat satellite is expected to continue its operations until 2010. The main limiting factor of the Envisat mission is the on-board hydrazine. Data access has been substantially improved: MERIS Reduced Resolution and AATSR near real time data are easily accessible on Internet (very soon applicable for MERIS archived data as well). Simplified Category 1 procedure are put in place for data systematically generated (i.e. MERIS RR and AATSR data).

Numerous validation activities have been carried out to confirm that the data received from its ten optical and radar instruments are as accurate as possible. As part of this ongoing commitment, commercial ships equipped with scientific equipment, so-called 'Ships of Opportunity', are now being used to monitor water conditions to compare in-situ data with data from Envisat., as for example the Norwegian Space Centre project validating MERIS (Medium

Resolution Imaging Spectrometer) data products making use of the 'FerryBox' project using commercial ships such as ferries to monitor the environmental condition of European seas.



Figure 2 The Norwegian Ferry Box Project for MERIS product validation.

2.3 PROBA

PROBA (PROject for On-Board Autonomy) is a highly manoeuvrable small satellite. It was successfully launched into a sun-synchronous polar orbit on 22 October 2001. For Earth Observation the main scientific interest of this mission relates to the use of the imaging spectrometer CHRIS (Compact High-Resolution Imaging Spectrometer) on-board PROBA. The data acquisition plans include vicarious calibration sites (see <http://www.rsac1.co.uk/chris/>). The project has completed its first full-scale science programme and further extension of the operations during 2005 has been approved. Achievements and project plans were presented at a dedicated workshop in March 2005 (Fig.3).



Figure 3 The PROBA Satellite and the CHRIS instrument nadir view of the Three Gorges Dam

3 Future Missions

3.1 METOP

METOP is a joint project of Eumetsat and ESA. For details on calibration and validation see <http://www.eumetsat.de>

3.2 Earth Explorer Missions

The following missions are part of ESA 's Earth Explorer Programme. (See <http://www.esa.int/livingplanet/>). Their calibration and validation requirements are currently under review. Airborne campaigns were executed for these missions as a proof-of-concept experiment or to test calibration/validation approaches. In-orbit campaigns are planned.

- GOCE -- <http://www.esa.int/export/esaLP/goce.html>
- CryoSat -- <http://www.esa.int/export/esaLP/smos.html>
- ADM-Aeolus -- <http://www.esa.int/export/esaLP/aeolus.html>
- SMOS -- <http://www.esa.int/export/esaLP/smos.html>
- SWARM -- <http://www.esa.int/export/esaLP/swarm.html>

Other future missions are currently being studied. See <http://www.esa.int/export/esaLP/futuremissions.html>

A major Cryosat validation experiment focused on land ice and time-varying penetration of Ku-band radar signal, density measurements in support of ice mass balance estimation and surface topographic effects. (Figure 4). First sea ice data collected over the Bay of Bothnia, Finland, in March 2005. Further campaign activities are planned for spring 2006, despite launch failure, covering sea and land ice targets.



Figure 4 The Cryovex Campaign series – Data collection on Spitsbergen

For the Soil Moisture and Ocean Salinity Mission SMOS various campaign activities are ongoing and planned to support the planned Soil Moisture and Ocean Salinity retrievals. In November 2005 the coSMOS-2 campaign is being carried out for validating the operation of SMOS and to provide data under varying geophysical conditions which are required for model parametrisation and validation of the L2 prototype processor (Figure 5). An airborne campaign dedicated to salinity retrieval procedure validation is under preparation to take place of the Norwegian coast in spring 2006.



Figure 5 The coSMOS-2 campaign preparations near the Goulburn river catchment in Australia

3.3 Earth Watch Missions

Earth Watch mission are operational missions under development by ESA as part of the Earth Observation Programme. This programme also responded to the GMES (Global Monitoring of Environment and Security) initiative taken jointly by ESA and the European Union. See <http://www.gmes.info/>. The GMES space segment comprises of a number of Sentinel missions currently being defined. Calibration and validation will be an essential part of GMES.

4 ESA Simulation Campaigns

The main objective of the ESA simulation campaigns is to provide support for the preparation of future space programmes and their users (see <http://www.esa.int/export/esaLP/campaigns.html>). Currently high priority is given to pre-launch and validation campaigns for the Earth Explorer Missions and Earth Watch Missions.

EgyptSAR – this is an initiative to join forces with a currently French national project exploring the surface penetration capability of long wave radar in P- and L-band. First results were already presented.

INDREX-2 (formally BioSAR) – the aim of the experiment is to estimate feasibility of biomass retrieval using P-Band backscatter and advanced interferometric techniques based on polarimetric L-Band data. The data analysis is close to completion.

SEN2FLEX – combines different activities in support of

- fluorescence experiments (formally AIRFLEX) for observation of solar induced fluorescence signal over multiple surface targets
- the GMES Sentinel-2 initiative for prototyping of spectral bands, spectral widths, and spatial/temporal resolutions to meet mission requirements
- the EC Water Framework Directive (WFD) EO projects for the improvement of protection and management of Europe's water resources.

The Calibration Home Base (CHB) (DLR (D))

On behalf of ESA a new imaging hyperspectral spectrometer is being developed for airborne applications. The Airborne Prism Experiment (APEX) covers the entire spectral range from 380 to 2500 nm with a bandwidth under 10 nm at a ground resolution of 2 to 5 m. It should be ready for flight by mid-2006. A Swiss-Belgian consortium is responsible for its development and operation; DLR is providing the aircraft and a calibration laboratory. The laboratory, named the CHB (Calibration Home Base), is currently being installed in the cellar of the DFD's building in Oberpfaffenhofen.



Figure 6 The optical bench for the Calibration Home Base is being delivered to DLR