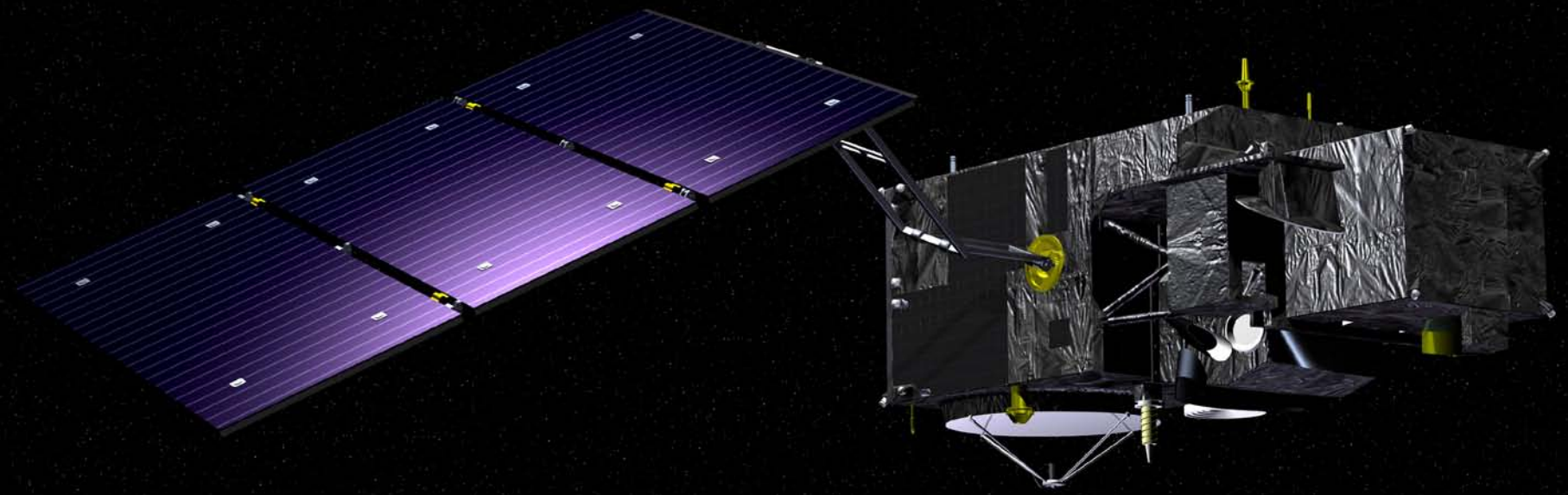
ESA Agency Report



Bojan R. Bojkov

Head, Sensor Performance, Products and Algorithms

Directorate of Earth Observation Programmes

European Space Agency (ESA/ESRIN)

Sentinel-3

ESA Earth Observation missions

ERS-1 (1991-2000) – Ice edge monitoring, cryosphere, sea and land surface temperature

ERS-2 (1996-2011) – ERS-1 plus global ozone monitoring

Envisat (2002-2012) – ERS plus atmospheric chemistry and ocean colour

GOCE (2009) - Gravity Field and Steady-State Ocean Circulation Earth Explorer mission

SMOS (2009) – Soil Moisture and Ocean Salinity Earth Explorer mission

CryoSat (2010) – Land/sea ice thickness and ocean Earth Explorer mission

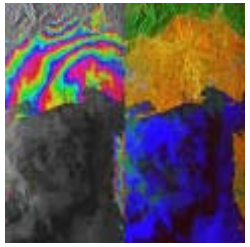
SWARM (2013) – Measuring the magnetic field

ADM-AEOLUS (2014) – Wind fields

EarthCARE (2016) – Aerosol and cloud properties

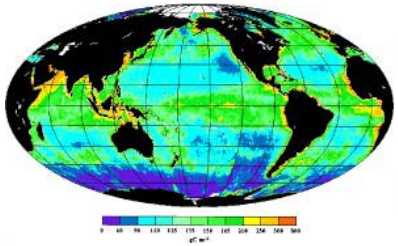
BIOMASS (2018) - forest

GMES / ESA Sentinel missions



Sentinel 1 (2014) – SAR imaging

- *All weather, day/night applications, interferometry*



Sentinel 2 (2014) – Superspectral imaging

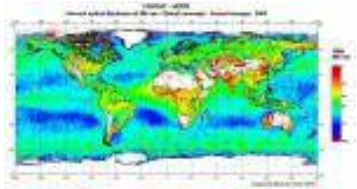
- *vegetation, forestry, security*

Sentinel 3 (2014) – Ocean/land monitoring

- *Wide-swath ocean color and surface temperature sensors, altimeter*

Sentinel 4 (2019) – Geostationary atmospheric

- *Atmospheric composition monitoring, trans-boundary pollution*



Sentinel 5p / 5 (2015 / 2020) – Low-orbit atmospheric

- *Atmospheric composition monitoring*

Agency highlights – Phase “F”

With the loss of Envisat in April 2012, ESA has implemented a new strategy for algorithm development and reprocessing in Phase “F” with the following goals:

- *Maintain scientific capabilities across Europe*
- *Rigorous data consolidation and data recalibration*
- *Further development of algorithms (incl. new supporting products)*
- *Undertake at least one further reprocessing by 2015*

Note: these are intermediate activities prior to Long-term Data Preservation (LTDP)

Agency highlights - workshops

As part of Phase ‘F”, ESA also initiated a series of “Validation and Evolution” Workshops to identify and consolidate mission dataset requirements:

1. *ACVE – Atmospheric Composition Validation and Evolution WS, March 2013*
2. *L1 WS – L1 and calibration WS, June 2013 (based on of ACVE requirements)*
3. *LPVE – Land Product Validation and Evolution WS, November 2013*
4. *Arctic Validation WS, Spring 2014*

Note: the outcome of these science driven workshops will also impact the Sentinel and Earth Explorer developments

WGCV related activities - highlights

Continue to consider/incorporate WGCV (and sub-group) recommendations such as:

- *Continued funding of the Cal/Val portal (WGCV)*
- *Continued funding of AQ groundbased intercomparisons (ACSG)*
- *Funding of LandNet site selection study (IVOS)*
- *Funding of atmospheric and ocean hyperspectral validation instrumentation (ACSG, IVOS)*
- *Funding of advanced tropospheric humidity correction (MWR, ACSG)*
- *Support for "Miami IV" (IVOS)*
- *etc.*

QA4EO at ESA - activities

ESA is supporting numerous QA4EO (or QA4EO related) studies:

- *Generic ESA mission documentation gap analysis with one case study (started Fall '10 - €200+k)*
- *Long-Term Data Preservation (LTDP) procedures (started Nov '11 - €200k+)*
- *Characterisation of SAR and radiometric calibration tools (kick-off Summer '12 - €200+k)*
- *Fund the development of a "best practice/protocol" for intercomparions of groundbased and satellite soil moisture data (TUW task lead in CVP, to be completed by 2014)*
- *End-2-end characterisation of Sentinel 2 Radiometric Uncertainty Analysis (18 month Fellowship, completed August '12)*
- *Study on geometric uncertainties and mixed pixel information for Sentinel-2/3 (2 year post-Doc, began May '12)*

QA4EO at ESA – activities (ii)

- *Establishment of "best practice" for atmospheric validation activities (for example profile, air quality), both for space and groundbased instrumentation (part of validation projects)*
- *GlobVapour (http://www.globvapour.info) algorithmic uncertainty characterisation and establishment of validation procedures (part of two year project, €1M)*
  - Input and intercomparison guidelines to be used as the baseline for the new Global Energy and Water Cycle Experiment (GEWEX) Water Vapour Assessment - GVap
  - Impact of future reprocessing and Sentinel altimetry and atmospheric correction over land and ocean (follow-on projects €500+k)
- *E2E per pixel uncertainty estimation requirement (similar to GlobVapour requirements) in the Climate Change Initiative cloud project (began Fall '10)*

ESA QA4EO – way forward

ESA QA4EO activities have had mixed results - We conclude that:

- *Clear targeted studies are needed to achieve concrete outcomes*
- *Use of best practices required (i.e. apply the "theory")*

We have also found that QA4EO principles can have a quick impact on Cal/Val by tuning existing procedures such as for example in data curation (i.e. data consolidation and version control procedures).

We have a QA4EO budget line for the EOEP-4 (2013-2016) and also within the Copernicus budget for 2014/5. The plan is to focus on clear targeted studies for Cal/Val and reprocessing:

- *Ocean Colour buoy procedures and traceability with IOCCG*
- *Snow product intercomparisons with WMO/GCW*
- *Landnet best practise development (for instrumentation) with WGCV/IVOS*
- *Aeronet reprocessing scenarios*
- *Radiative Transfer studies*
- *etc.*

Thank you for your attention!

bojan.bojkov@esa.int