# Agency Report
# European Space Agency

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25th WGCV
Budapest – 9-12 May 2006

# ESA on-going projects

- Definition of Quality Products & Cal/Val data center
  - This is actually the combination of two projects described earlier as separate projects:
    - Definition of Quality Products
    - Third generation Cal/Val Data Centre
    - The Cal/Val Portal is a third element of that suite.
- Test Site characterization study
  - Test Sites are needed for calibration or validation and those Test Sites need to be perfectly characterized. The selection of test sites depends on the products type we need to calibrate and validate. The study will consist in selecting Test Sites for specific product type and to perfectly characterize subset of selected sites.
- Requirement Definition for Multi-Mission Generic Quality Control Standards
  - So far Quality Control, Calibration, and in a less extend, Validation activities have been setup as dedicated to single missions. The scope of this project is to define the requirements of standards in the context of multi-mission infrastructure.
- Earth Observation Operational & Centralized Auxiliary Data File Access

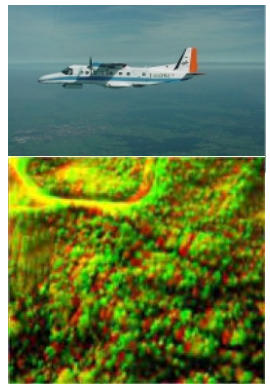
# Recent Campaigns 1/5

- **AQUIFEREX**
  - Location: Tunisia
  - Instrumentation: L-,C- and X-band polarimetric/multi-pol SAR (DLR E-SAR), AVIS-2 imaging spectrometer + ground measurements
  - The aim of the campaign is to collect data for the AQUIFER project in the framework of the Data User Element and in support of the TIGER initiative. The objectives of the campaign are all devoted to providing and analysing high quality data sets suitable for Aquifer Project activities such as the validation of the science products of the Aquifer Project. In addition the aim is to demonstrate the possible improvements that would be given by advanced Earth Observation sensors (presently only available on airplanes) for the observation of watershed properties relevant for aquifer management, and also provide a baseline for future Earth Observation products. The campaign was carried out in November 2005 over two test areas in southern Tunisia, the Ben Gardane and Gabés regions. Each is about 10,000 hectares in size and represents agricultural crops, irrigation practices and natural pastures.

- **BACCHUS-DOC**
  - Location: Frascati, Italy
  - Instrumentation: L-,C-band multi-pol SAR (DLR E-SAR)
  - The campaign will demonstrate the validity/potential of airborne sensing and generate reference radar ortho-rectified high-resolution data for immediate use within the BACCHUS project (precision farming). The objective of the campaign is to investigate the potential for SAR for the estimation of parameters useful for vine inventory and characterisation (i.e. vineyard limits, row spacing, row orientation, rate of missing plants, production estimate) and assess soil parameters such as moisture and roughness. The campaign was carried out in two stages; one on 5 October 2005 before the grape harvest and the other on 25 October 2005 after the harvest.

# Recent Campaigns 2/5

- **Indonesian radar experiment (Indrex-II)**
  - Location: Borneo, Indonesia
  - Instrumentation: P-,L-,C- and X-band polarimetric/multi-pol SAR (DLR E-SAR) and ground measurements.
  - The aim of the campaign is to assess the optimal SAR sensor configuration and algorithms for forest biomass retrieval in tropical areas and for the monitoring of tropical forests. Extensive ground measurements for tropical forest biomass are used in the assessment. Data was successfully collected in November/December 2004 and evaluation of configurations and algorithms is currently underway.



- **Sentinel 2 – Airborne fluorescence experiment (SENT2FLEX)**
  - Location: Barrax, Spain
  - Instrumentation: Airborne fluorescence instrument (AIRFLEX), CASI-3 Hyperspectral Imaging system, AHS Hyperspectral imaging system and ground measurements
  - The SENT2FLEX campaign addresses multiple Agency objectives. These first include collecting airborne measurements of the solar-induced fluorescence signal over different types of land to verify their suitability for space borne missions. This will provide feedback about the optimal configuration for the operational Sentinel-2 optical satellite mission and as well as feedback to the Agency on Earth Observation data requirements necessary to fulfil the European Union Water Policy Directive.

# Recent Campaigns 3/5

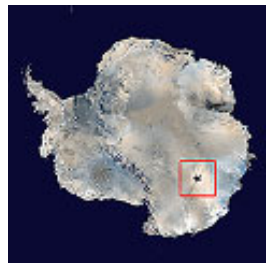
- **NezerPyla Experiment**
  - Location: Les Landes, France
  - Instrumentation: P- and L-band polarimetric SAR (RAMSES) and ground measurements.
  - The aim of the campaign is to assess the optimal SAR sensor configuration and algorithms for biomass retrieval over temperate forests and to assess the potential of low frequency radars for imaging sub-surface structures in arid environments. Data has been successfully collected and evaluation of configurations and algorithms is currently underway.

- **ESABC 2004**
  - Location: Kiruna, Sweden, Aire sur l'Adour and Gap, France
  - Instrumentation: different payloads on board stratospheric balloons
  - The Envisat Stratospheric Aircraft and Balloon Campaign ESABC 2004 runs until 2007 and is part of the Envisat validation and long-term monitoring programme for the instruments GOMOS, MIPAS and SCIAMACHY.

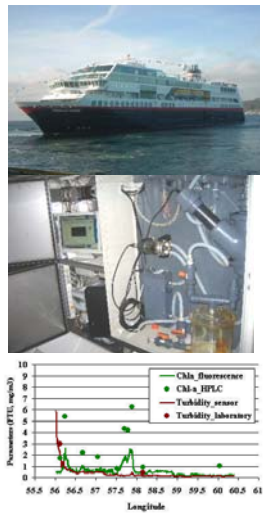
- **Teresina**
  - Location: Brazil
  - Instrumentation: Balloon flights
  - The Teresina campaign is part of the Envisat validation and long-term monitoring programme for the GOMOS, MIPAS and SCIAMACHY instruments using stratospheric balloons. The location in the tropics is chosen in order to fill a gap in latitudinal coverage of validation measurements. The campaign is currently underway.

# Recent Campaigns 4/5

- **Dome C Experiment (DOMEX)**
  - Location: Dome Charlie, Antarctica
  - Instrumentation: L-Band radiometer
  - The aim of the DOMEX experiment is to take measurements of the surface of the ice sheet by simultaneous observation from several radiometers in support of field calibration for the SMOS mission. Data has been successfully collected and currently under analysis.



- **VAMP**
  - Location: Norwegian and Baltic Seas
  - Instrumentation: Chlorophyll-a fluorescence, particle concentration, temperature and salinity
  - VAMP (Validation of MERIS data Products) is an ESA and Norwegian Space Centre project dedicated to validating MERIS data products. The project has been run by the Norwegian Institute for Water Research since the launch of Envisat and now includes Ships of Opportunity in its activities. This makes use of the 'FerryBox' project which, supported by the European Union, is a multi-disciplinary research and development project using commercial ships such as ferries to monitor the environmental condition of European seas. Installing scientific equipment on commercial ferries offers a cost-effective method of realising a host of measurements on water quality. The VAMP project will run until the end of 2005.

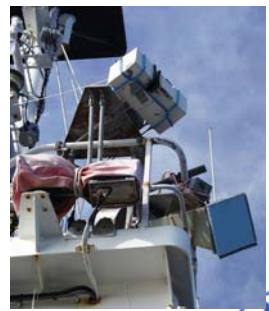


# Current Campaigns 1/4

- **CryoSat Validation Experiments (Cryovex)**
  - Location: High Arctic (Spitsbergen, Greenland, northern Canada)
  - Instrumentation: ESA Ku-band ASIRAS radar altimeter, Laser scanner, Helicopter Electromagnetic (EM) ice thickness sensor and ground measurements
  - These large-scale campaigns are planned for 2006/2007 to address critical validation needs of ESA's CryoSat mission. Simultaneously collocated airborne and radar altimeter data, helicopter-borne sea-ice thickness data, and extensive ground measurements are collected and analysed to determine geophysical uncertainties in trends of ice thickness recorded by the CryoSat mission.

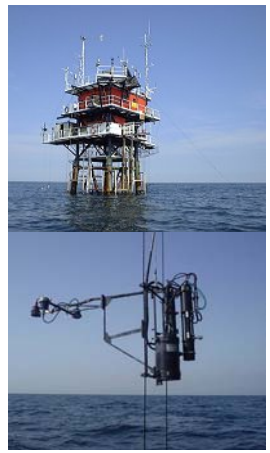
- **Wales Experiment (WALEX-3)**
  - Location: Flights between Munich, Germany and Darwin, Australia
  - Instrumentation: Long-range airborne Differential Absorption Lidar (DIAL)
  - The objective of the campaign is to collect lidar measurements of real water vapour and aerosol scenes from mid-latitudes, sub-tropical and tropical (northern and southern hemispheres) regions, in support of the WALES satellite mission concept. Data is to be used to simulate satellite water vapour measurements and assess their accuracy and impact on our understanding of atmospheric processes.

- **Validation of ENVISAT AATSR Geophysical Products in Opportunity Cruises using the SISTeR Precision Radiometer**
  - Location: Ship cruises
  - Instrumentation: SISTeR Precision Radiometer
  - The objective of the campaign is to assess the quality and accuracy of AATSR derived sea surface temperature (SST) by comparing the results of in-situ measurements with co-located Envisat data.

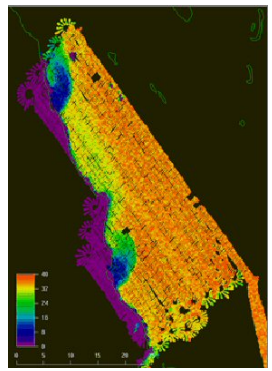


# Current Campaigns 2/4

- **Validation of MERIS marine products at the Acqua Alta Oceanographic Tower (AAOT)**
  - Location: northern Adriatic Sea
  - Instrumentation: SeaPRISM system
  - Support to MERIS validation/calibration activities with continuous radiometric measurements obtained with the autonomous SeaPRISM system ( a modified CIMEL CE-318 for both atmospheric and marine measurements) at the Acqua Alta Oceanographic Tower (AAOT) in the northern Adriatic Sea (45.314N, 12.508E). The effort will be devoted to the validation of MERIS derived marine reflectance and aerosol optical thickness. The results of in-situ measurements shall be compared with co-located Envisat MERIS data.



- **Campaign for Validating the Operation of SMOS (CoSMOS-2)**
  - Location: Australia
  - Instrumentation: L-Band Radiometer
  - The CoSMOS-2 campaign is designed to acquire SMOS-like data so that the algorithms are fine-tuned and accurately validated before launch of the SMOS satellite in 2007. The objective is to take measurements of moisture in the soil and salinity in the surface-waters of the ocean using L-band radiometers. The project is a first element of Australian-European collaboration for SMOS validation and data exploitation. The European contribution to this collaboration is the deployment of an L-band radiometer developed specifically for the campaign by the Technical University of Denmark.



# Current Campaigns 3/4

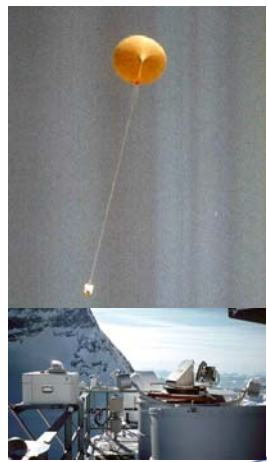
- **Validation of MERIS marine products - Boussole**
  - Location: Western Mediterranean sea
  - Instrumentation: Satlantic 200 series radiometers, Chelsea MiniTracka Fluorometers, Wetlabs WetStar Transmissometer, Seabird SBE 37SI CTD sensor, Hobilabs Hydroscat-2 Backscattering meter.
  - Support to MERIS validation/calibration activities with continuous radiometric measurements at sea with a system called Boussole. This BOUSSOLE buoy was designed and built by French company ACRI on behalf of ESA, specifically for the MERIS validation campaign. Only four and a half metres of the buoy can be seen – the other 20 metres stays underwater. A Kevlar cable anchors it to the sea floor. As a floating platform for scientific instruments such as radiometers, it played an important role in the MERIS validation campaign. .

- **Campaign for Validating the Operation of SMOS - Instrumentation**
  - Instrumentation: L-Band Radiometer - AMIRAS
  - This instrument will be able to take measurements in horizontal and vertical polarisations, and like SMOS, in dual- and full-polarisation modes. Even the viewing geometry will be similar to that of SMOS; positioned in the cargo bay of an aircraft the backward tilt angle is 24 degrees with the same array orientation with respect to the ground and the same spacing between the antenna elements. Among other similarities, the LICEF-2 receivers on the demonstrator instrument provide frequency responses very close to those of the LICEF flight models of MIRAS, with a bandwidth of 19 MHz centred at 1413.5 MHz. .

# Current Campaigns 4/4

- **EQUAL - Lidar**
  - Location: Network for the Detection of Stratospheric Change
  - Instrumentation: Lidar.
  - ESA started several new projects to support the long-term validation of ENVISAT's three atmospheric chemistry instruments; GOMOS, MIPAS and SCIAMACHY. The EQUAL project assesses the quality of their ozone and temperature profiles by comparison to lidar data from eleven stations worldwide. Besides the required coordination and contribution of the lidar data, this project involves dedicated validation activities to assess ENVISAT's data quality. The main focus will be on the quality of the operational ESA products, but the focus might sometimes be changed toward products of scientific institutes. The vast amount of lidar data allows the analysis for possible dependencies on several geophysical (e.g., latitude) and observational (e.g., star characteristics) parameters.


- **Technical ASsistance To Envisat (TASTE)**
  - Instrumentation: IR and UV-VIS spectrometers, UV spectrophotometers, MW and UV radiometers and balloon-borne electrochemical ozone-sondes
  - To ensure that the data record acquired by the atmospheric instruments on board Envisat are of the highest quality, ESA and a dozen research institutes in Europe, New Zealand and Russia continue the long-term programme of Technical ASsistance To Envisat (TASTE) validation..



# Cal/Val Portal 1/4

- CEOS CalVal Recommendation
  - Initiate an activity
    - document reference methodology to predict Top of Atmosphere (TOA) radiance for intercomparison of currently flying and planned wide swath sensors
    - create a standard for traceability
  - Create and maintain a fully accessible web page
    - instrument characteristics
    - database of instrument data
    - specific vicarious calibration sites
    - common format

*CEOS Working Group on Calibration and Validation, 18th Plenary Meeting, Beijing, November 2004, Doc No: 12.1*

# Cal/Val Portal 2/4

- Cal/Val Portal
  - Studies
    - Influence of various parameters on vicarious calibration
    - Identification of required tools
    - Gathering sensor characteristics
  - Web Portal
    - Description of methodologies
    - Description of instrument characteristics (SensorML)
    - Access to in-situ data
      - Local database
      - External database (link to Nilu type of Database)
    - Access to tools
    - Calibration and Validation Results
    - User management, Forum, Help

# Cal/Val Portal 3/4

- Cal/Val portal status
  - document reference methodology to predict Top of Atmosphere (TOA) radiance for intercomparison of currently flying and planned wide swath sensors is completed (Richard Santer)
  - Instrument characteristics – completed for MERIS/AATSR
  - database of instrument data – MERIS/AATSR/ALOS (Optical)
  - Will be open for ALOS ADEN team only in June – test case
  - 1st version will be opened in September.

# Cal/Val Portal 4/4

- Proposed Plan for Cal/Val Portal evolution
  - **WGISS Test Site Facility (WTF) continuation**
  - Evolution of the portal to manage the cal/val data needs:
    - user specific sites
    - cruise concept
    - temporal window
    - data quality criteria
    - user capacity to edit
  - Orbit propagator --> campaign planning
  - METRIC extension to other IVOS
    - **AATSR metric (meris site, cloud filtering) extraction**
  - Integration of KOMPSAT-2 – TBC (pending)
  - **Geometry feature integration: methodology, tool, insitu (GCP, photo…etc)**
  - **Evolution toward not optical sensor**
    - **SMOS**

# Current ESA Activities

- Sensor Performance, Products and Algorithm Functional Baseline
  - Operational data and product quality control
  - Product verification, calibration and Validation
  - Instrument Calibration
  - Sensor Performance monitoring and Assessment
  - Algorithm and processing chains development, verification, maintenance and evolution

- Vicarious Calibration and Geophysical Validation Functional Baseline
  - Establishment of multi-mission teams coordinating the validation activities.
  - Selection of validation requirements and validation methods to be used.
  - Development and maintenance of validation devices
  - Development and maintenance of tools for analysing validation device data
  - Development of software tools for analysing satellite data
  - Organising validation device inter-comparison campaigns
  - Organising validation data acquisition campaigns for independent measurements
  - Setting up and maintaining a facility for collection, quality control and archiving of multi-mission validation data
  - Analysing validation data during all phases, formulating quality statements and recommendations for future work

- MAVT meeting (22-24$^{th}$ March 2006) - Proceedings to be published soon
- ACVT meeting (23-27$^{th}$ October 2006)