Overview on calibration and validation activities for ESA's Soil Moisture and Ocean Salinity Mission

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The Soil Moisture and Ocean Salinity (SMOS) mission, launched on 2 November 2009, is the European Space Agency's (ESA) second Earth Explorer Opportunity mission. The scientific objectives of the SMOS mission directly respond to the current lack of global observations of soil moisture and ocean salinity, two key variables used in predictive hydrological, oceanographic and atmospheric models. SMOS observations will also provide information on the characterisation of ice and snow covered surfaces and the sea ice effect on ocean-atmosphere heat fluxes and dynamics, which affects large-scale processes of the Earth's climate system.

A major undertaking in any environmental science related satellite mission are the calibration and validation activities. Calibration is an important prerequisite to the performance verification, which demonstrates that the instrument meets its requirements. It is also important for the validation of geophysical parameters, such as soil moisture and sea surface salinity.

The validation of the data will be handled through a combination of ESA led activities and national efforts. The SMOS Validation and Retrieval Team (SVRT) comprises the scientific contributions that will be made by the projects selected in response to the SMOS calibration and validation Announcement of Opportunity in 2005 as well as the two level 2 Expert Support Laboratories being involved in the development of the soil moisture and sea surface salinity data products. For the validation of the soil moisture data products ESA's activities will focus on two main sites, the Valencia Anchor Station, located in the East of Spain, and the Upper Danube Catchment, located in the South of Germany. In preparation to the SMOS commissioning phase, airborne rehearsal campaigns were conducted in spring 2008 over both aforementioned key sites and will be repeated, in collaboration with the French Space Agency CNES, in spring 2010. These will be coupled with a SMOS matchup generation exercise to verify that the methodology proposed actually meets the foreseen performances. Other activities include the deployment of the ground-based ESA funded ELBARA radiometers. Also, in collaboration with the Technical University Vienna, ESA funds the establishment of a soil moisture network data hosting facility in support to the SMOS calibration and validation activities.

The validation of sea surface salinity data products will be a challenging task requiring a highly accurate and stable instrument calibration. At local scales, the foreseen validation activities are focused on a better understanding of the emission of L-band radiation from the sea surface through dedicated airborne campaigns, whereas validation at global scales will

rely on buoy networks and basin scale ocean models. Close collaboration with the NASA Aquarius Team will further contribute to the validation of sea surface salinity data products.

A variety of campaigns, such as DOMEX, CoSMOS, WISE, LOSAC, EUROSTARRS, FROG, SMOSREX have been (and will be) performed to investigate uncertainties in the soil moisture and ocean salinity retrieval. The major aspects to investigate with regard to soil moisture are the influence of the various types of vegetation and their seasonal variability, as well as the influence of surface roughness. Over oceans, the impact of sea-surface state on the polarimetric radiometric signal is the main issue. The DOMEX campaigns will provide information for vicarious calibration over Antarctica.

The presentation will provide an overview on the calibration and validation activities carried out in the SMOS commissioning phase.