SCIENTIFIC AND OPERATIONAL EXPLOITATION OF GLOBAL SMOS OBSERVATIONS: ESA'S SUPPORTING ACTIVITIES

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Abstract

The European Space Agency's (ESA) Soil Moisture and Ocean Salinity (SMOS) mission was successfully launched on 2 November 2009. SMOS will play a key role in the monitoring of climate change on a global scale. It is the first ever satellite designed both to map sea surface salinity and to monitor soil moisture on a global scale. It features a unique interferometric radiometer that will enable passive surveying of the water cycle between oceans, the atmosphere and land. Apart from the calibration / validation activities during the 6-months commissioning phase ESA initiated a number of scientific projects exploiting the global data sets. This presentation will give an overview of these activities, show the key study results and provide an outlook on potential future activities.

While many countries, organisations and individual researchers have been collecting in-situ soil moisture data, little effort has yet been made to bring these data together in a standardized, global data base. The *International Soil Moisture Network* was initiated together with the Global Energy and Water Cycle Experiment (GEWEX) in cooperation with the Group of Earth Observation (GEO) and the Committee on Earth Observations (CEOS). Data hosting, maintenance and web-based distribution will initially be performed by the Vienna University of Technology (TU Wien). The long term perspective foresees the development from a centralized archive to a distributed archive and a transfer of the tasks of TU Wien to operational organisations active in this field. The data hosting facility can be found under following URL address: http://www.ipf.tuwien.ac.at/insitu/. This archive will also host selected data sets from ESA's SMOS calibration and validation activities.

As part of the continuous SMOS data quality control procedures, the European Centre for Medium-range Weather Forecasts (ECMWF) is monitoring global top of atmosphere brightness temperatures. In the context of Numerical Weather Prediction

monitoring is defined as the systematic comparison between the observations and the corresponding model fields, i.e. polarized L-band brightness temperatures computed from the predicted geophysical variables, namely soil moisture, soil temperature and atmospheric fields [1], [2], [3]. Monitoring is a mandatory step prior to data assimilation to detect and quantify systematic differences between the observations and the model. Monitoring can also reveal instruments drifts and failures. In addition, ECMWF will use the SMOS observations in its Kalman filter based land surface data assimilation system [4] to improve the soil moisture analysis and subsequently the operational weather forecast. A data assimilation study for ocean salinity and altimeter data is currently under preparation and will be kicked-off during the first half of 2010.

Soil moisture and ocean salinity are the two key geophysical variables retrieved from the SMOS brightness temperature observations and both parameters are generated operationally by the level-2 processor. However, L-band brightness temperatures are also sensitive to sea ice thickness variations. Within the framework of the "L-band radiometry for sea ice applications" study it was demonstrated through radiative transfer modelling that it may be possible to detect thin sea ice with thickness values up to ~ 1 m. Retrieval algorithms have been developed and tested using the 2007 POL-ICE campaign over the Northern part of the Baltic Sea. The agreement between independent observations and sea ice thickness derived from airborne L-band observations was good [5]. Currently, the retrieval algorithms are being revised and an Algorithm Theoretical Baseline Document has been drafted preparing a third level-2 SMOS product.

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