MONITORING SMOS BRIGHTNESS TEMPERATURES AT GLOBAL SCALE; A PRELIMINARY OVERALL QUALITY ASSESSMENT

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The Soil Moisture and Ocean Salinity (SMOS) mission [1,2] of the European Space Agency (ESA) was successfully launched on November 2nd 2009. Using a novel concept based on the Synthetic Aperture Radar technique, it is expected that SMOS observations will provide global accurate maps of brightness temperatures (TB) and soil moisture at L-band every 3 days. Thus, SMOS data will soon provide a valuable input for numerical weather prediction (NWP), hydrological and land surface systems, among others.

Operational numerical weather forecast systems are widely used to evaluate and analyse new types of satellite observations. NWP centres use new satellite data in the analyses to derive level 2 retrieved geophysical parameters (e.g. soil moisture and ocean salinity for SMOS) from the observed radiances. The European Centre for Medium Range Weather Forecasts (ECMWF) is monitoring the first flow of SMOS level 1C TB over sea and land. Monitoring, i.e. the systematic comparison between observations and the corresponding model variables, is a mandatory step prior to data assimilation. The first objective is to provide an overall quality assessment of SMOS data based on departures values between SMOS observations and the modelled equivalent in the observation space. This is a significant contribution to the calibration / validation activities during the SMOS commissioning phase. Any systematic error or spikes in the data become visible and can be reported to ESA and the other calibration and validation teams without significant delays. Furthermore, the monitored data at global scale will help to calibrate the SMOS instrument at key decision points during the commissioning phase.

In this paper the first SMOS data is monitored. As an example fig.1 shows SMOS TB at global scale for the 28th of November at horizontal polarisation and at an incidence angle of 40°. At this incidence angle almost all grid points expressed in the nominal L1C product are included. It is observed that, for this data, border effects in the satellite along-track direction are quite significant as well as some land signatures are shown near the coastlines. Additionally, Radio Frequency Interference is shown in many parts of Europe and Asia. However, this data is part of the first available flow of L1C product, and no calibration or correction of any disturbing effects has been applied yet. Furthermore, at this stage the reconstruction algorithm was not fully running yet. Routinely global monitoring of SMOS data will make it possible to localize possible spatial and temporal bias or drifts in the data. Special emphasis will be given to the effect of different parametrisations and auxiliary data sets on the simulated TB, based on the Community Microwave Emission Model (CMEM) [3,4,5]. CMEM has been developed at ECMWF as the forward model operator for low frequencies passive microwave brightness temperatures of the surface. CMEM has a modular structure and for each component of the land emission different parametrisations are available and can be tested independently.

After the quality of SMOS data will be evaluated through routinely monitoring, SMOS TB will be assimilated with the aim to improve the initialization of soil moisture for NWP systems.

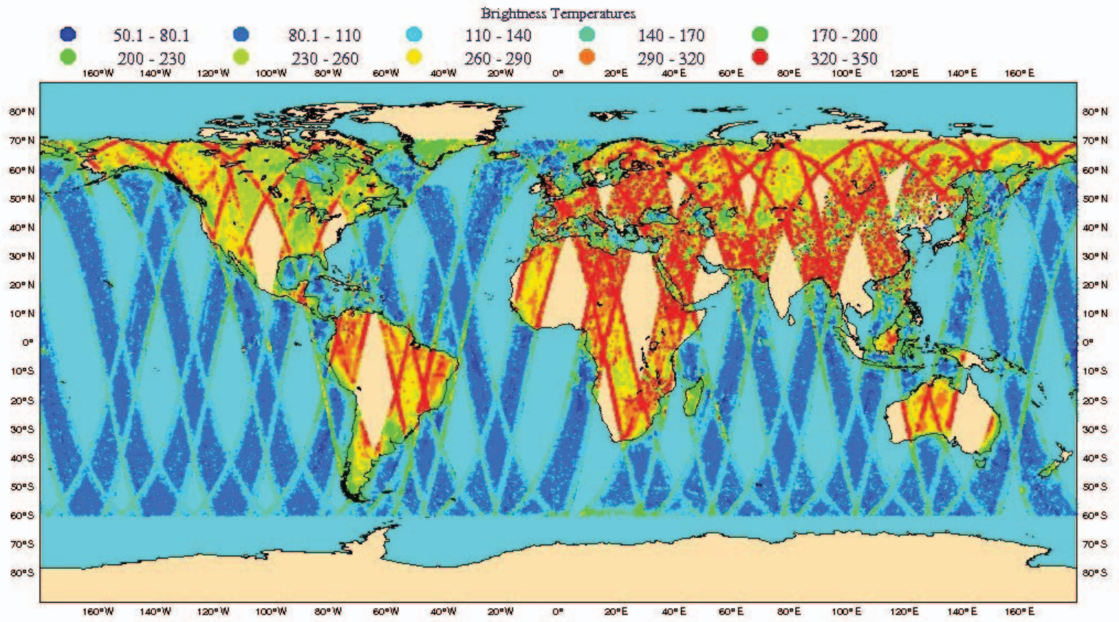

Fig.1 – SMOS brightness temperatures at horizontal polarisation and 40° incidence angle. Data corresponds to 28th-Nov-2009.

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