Geophysical Research Abstracts
Vol. 13, EGU2011-10248, 2011
EGU General Assembly 2011

Monitoring SMOS data at ECMWF

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The Soil Moisture and Ocean Salinity (SMOS) mission of the European Space Agency (ESA) was successfully launched on November 2nd 2009. Since then SMOS has been providing global maps of brightness temperatures at L-band at different incidence angles and polarisation modes of the electromagnetic signal.

Currently no ground-based network provides regularly soil moisture measurements at global scale. In this context, SMOS data is of a potential great interest due to the good spatial and temporal resolution of the measurements. SMOS will help to better constrain the soil moisture state of the root-zone layer through the assimilation of SMOS radiances. Realistic soil moisture fields are a very valuable input for numerical weather prediction (NWP) systems, but also for hydrological and land surface systems, among others. Over oceans the SMOS signal is also sensitive to the salinity content. Salinity variations in the seawaters is one of the most important driving factors of ocean currents.

The European Centre for Medium-Range Weather Forecasts (ECMWF) has developed an operational chain with makes it possible to monitor, in near real time, SMOS brightness temperatures at different configurations and independently over land and sea. In the context of NWP, monitoring computes the difference between an observation and the corresponding model equivalent (also called first-guess departure). Monitoring is a mandatory step prior to data assimilation, as systematic bias or drifts in the observations or in the model can be easily localized and quickly reported. It can also provide an overall quality assessment of SMOS data based on departure values.

In this paper near real time global statistics with several months of SMOS data and the corresponding simulations are presented. These results are part of the monitoring chain implemented at ECMWF. The different statistical variables monitored show significant correlation with land characteristics, such as snow and forests, but also they reflect soil water content variations. Over sea, time-averaged geographical mean fields also show very good correlation with sea ice extent. Unfortunately and although the emission in L-band is prohibited, strong radio frequency interference (RFI) has been contaminating the natural surface emission in extended areas of Asia and Europe. This effect limits the potential of SMOS data to correct soil moisture and in some cases it may also mask the correct interpretation of first-guess departures produced by soil moisture variations.