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SMOS after 2 YEARS and a half in orbit

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The SMOS (Soil Moisture and Ocean Salinity) satellite was successfully launched in November 2009. This ESA led mission for Earth Observation is dedicated to provide soil moisture over continental surface (with an accuracy goal of 0.04 m3/m3) and ocean salinity. These two geophysical features are important as they control the energy balance between the surface and the atmosphere. Their knowledge at a global scale is of interest for climatic and weather researches in particular in improving models forecasts.
The purpose of this communication is to present the mission results after more than two years in orbit as well as some outstanding results already obtained. A special attention will be devoted to level 2 products.
Modeling multi-angular brightness temperatures is not straightforward. The radiative model transfer model L-MEB (L-band Microwave Emission) is used over land while different models with different approaches as to the modeling of sea surface roughness are used over ocean surfaces. Over land the approach is based on semi-empirical relationships, adapted to different type of surface. The model computes a dielectric constant leading to surface emissivity. Surface features (roughness, vegetation) are also considered in the models. However, considering SMOS spatial resolution a wide area is seen by the instrument with strong heterogeneity. The L2 soil moisture retrieval scheme takes this into account.
Brightness temperatures are computed for every classes composing a working area. A weighted function is applied for the incidence angle and the antenna beam. Once the brightness temperature is computed for the entire working area, the minimizing process starts. If no soil moisture is derived (not attempted or process failed) a dielectric constant is still derived from an simplified modeled (the cardioid model).

SMOS data enabled very quickly to infer Sea surface salinity fields. As salinity retrieval is quite challenging, retrieving it enable to assess very finely the characteristics of the complete system in terms of stability, drift etc. Some anomalies such as the ascending descending temperature differences, temporal drifts or land sea contamination were used to infer issues and improve data quality. The modeling has to account for several perturbing factors 'galactic reflection, sea state, atmospheric path and Faraday rotation etc…as the useful signal is quite small when compared to the perturbing factors impact as well as the instrument sensitivity.
Over sea ice several studies showed that it was possible to infer thin ice (first year ice, 50 cm or less) from SMOS measurements. Other studies focused on the Antarctic plateau with also very interesting new results.
This presentation will show in detail the SMOS in flight results. The retrieval schemes have been developed to reach science requirements, that is to derive the surface soil moisture over continental surface with an accuracy better than 0,04m3/m3. Over the ocean the goals are not yet satisfied but results are already getting close to the requirements.