THE SMOS MISSION A NEW TOOL FOR MONITORING KEY ELEMENTS OF THE GLOBAL WATER CYCLE

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ABSTRACT

These guidelines include complete descriptions of the fonts, spacing, and related information for producing your abstracts. it is suggested to follow them and if you have any questions, direct them to Conference Management Services: Phone +1-979- It is now well understood that soil moisture and sea surface salinity are required to improve meteorological and climatic predictions. These two quantities are not yet available globally and with an adequate temporal sampling. So as to cover this data gap, it has been recognized that, provided it is possible to accommodate a suitable antenna on board a satellite, L Band radiometry was most probably the most promising way to fulfill this gap . It is within this framework that the European Space Agency (ESA)'s selected the second Earth Explorer Opportunity Mission, namely the Soil Moisture and Ocean Salinity (SMOS) mission. SMOS is currently ready to be launched and is scheduled for launch in 2009, slightly before Aquarius and SMAP. The SMOS mission is ESA's second Earth Explorer Opportunity mission it is a joint program lead by the European Space Agency (ESA) with the Centre National d'Etudes Spatiales (CNES) in France and the Centro para el Desarrollo Teccnologico Industrial (CDTI) in Spain. SMOS carries a single payload, an L band 2D interferometric radiometer in the 1400-1427 MHz h protected band. This wavelength penetrates well through the vegetation and the atmosphere is almost transparent. Consequently, the instrument probes the Earth surface emissivity. Surface emissivity can then be related to the moisture content in the first few centimeters of soil over land, and, after some surface roughness and temperature corrections, spatio temporal aggregation, to the sea surface salinity over oceans.

SMOS will achieve an unprecedented spatial resolution of 50 km at L-band maximum (43 km on average) seeking to meet soil moisture science objectives. This is possible by using a non-rotating thinned 8 m diameter antenna. The imaging capability of such antenna is implemented by aperture synthesis, the same technique of radio-astronomy. Such innovative concept has required a significant effort in the development of calibration techniques. It provides multiangular-dual polarized (or fully polarized) brightness temperatures over the globe and with a revisit time smaller than 3 days to retrieve soil moisture and ocean salinity, but with a somewhat reduced sensitivity when compared to conventional radiometers. It has thus some characteristics very complementary to those of Aquarius.

The SMOS mission is now ready for launch and awaiting launcher availability. On the technical side the Industry worked together with ESA and CNES to make a system fully compatible with the science objectives while remaining within budget and schedule. On the Science part the different international teams are addressing the different issues still to be tackled so as to provide the adequate inversion and assimilation algorithms for the different users. Currently the ground segment is in phases varying from B (for level 3 and 4 products) to almost CD for the first levels. Intensive research work is currently underway to finalize the retrieval algorithms while the Cal Val program has started being implemented at ESA. It is expected to make full use of synergisms between the SMOS and Aquarius (eventually SMAP) missions.

The current activities cover - apart from traditional ground experiments and modeling activities- simulations and generation of synthetic data sets for assessing retrieval algorithms (using existing sensors), large field campaigns either on the long time scale or over specific targets to address the specific issues related to retrieval with multi-angular L band measurements. In parallel intensive efforts are devoted to the basics of interferometry, be it the optimization of image reconstruction or devising the most efficient calibration scheme. Finally some efforts are also being devoted to external but important issues such as Galactic contribution, Sun's emission variation monitoring or radio frequency interferences.

This paper thus gives an overview of the science goals of the SMOS mission, a description of its main elements, including platform and payload, as well as the overall system. In addition the most updated status of the SMOS project will be presented together with the estimated performances at brightness temperature as well as at geophysical parameters levels.