SMOS main results in terms of soil moisture monitoring and related applications

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SMOS, the Second Earth Explorer Opportunity Mission, consists of a L Band radiometer using aperture synthesis to achieve a good spatial resolution. SMOS was successfully launched on November 2, 2009. It was developed and made under the leadership of the European Space Agency (ESA) as an Earth Explorer Opportunity mission. It is a joint program with the Centre National d'Etudes Spatiales (CNES) in France and the Centro para el Desarrollo Tecnologico 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 enabling to infer both soil moisture and vegetation water content. SMOS achieves an unprecedented spatial resolution of 50 km at L-band maximum (43 km on average) with multi angular-dual polarized (or fully polarized) brightness temperatures over the globe and with a revisit time smaller than 3 days. SMOS has been now acquiring data for almost 4 years. The data quality exceeds what was expected, showing very good sensitivity and stability. The data is however very much impaired by man made emission in the protected band, leading to degraded measurements in several areas including parts of Europe and of China. However, many different international teams are now addressing cal val activities in various parts of the world, with notably large field campaigns or continuous measurements either on the long time scale or over specific targets to address the specific issues. Comparison with the Aquarius mission is also underway and will be presented. In parallel different teams are now starting addressing data use in various fields including hydrology. We have now acquired data over a number of significant "extreme events" such as droughts and floods or hurricanes giving useful information of potential applications. We are now working on the coupling with other models and or dis-aggregation to address soil moisture distribution over watersheds. We are also concentrating efforts on water budget and regional impacts. It includes rainfall estimates, stress / fire risk indices, thin sea ice monitoring. From all those studies, it is now possible to derive a possible way forward towards drought indices, root zone soil moisture etc... It should be also noted that SMOS is now used operationally by several agencies. This paper thus gives an overview of the science goals of the SMOS mission, a description of its main elements, and panorama of the first results including performances at brightness temperature as well as at geophysical parameters level and how they are being put in good use for hydrological applications. The results presented will depict how SMOS behaves over a large range of sites over land and will be compared to other datasets including Aquarius data.