SMOS FIRST SUCCESSES AND RELATED ISSUES: THE FIRST GLOBAL SOIL MOISTURE AND SEA SALINITY MAPS ARE COMING.

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Abstract

SMOS, an L-Band radiometer using aperture synthesis to achieve a good spatial resolution, 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 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 enabling to infer both soil moisture and vegetation water content over land and sea surface salinity over the oceans. SMOS achieves an unprecedented spatial resolution of 50 km at L-band maximum (43 km on average) with multi angular-fully polarised brightness temperatures over the globe and with a revisit time smaller than 3 days.

SMOS as been now acquiring data for over two 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 either on the long time scale or over specific targets to address the specific issues. These campaigns take place in various parts of the world, in different environments from the Antarctic plateau to the deserts, from rain forests to deep oceans. Actually SMOS is a new sensor making new measurements paving the way to new applications. However, it also requires a very fine analysis of the data so as to validate both the approach and the retrieval quality, as well as for monitoring the evolution of the sensor. To achieve such goals it is very important to link efficiently ground measurement to satellite measurements through field campaigns and related airborne acquisitions as well as with other existing sensors. This lecture thus gives an overview of the science goals of the SMOS mission, a description of the main mission elements, and a foretaste of the first results including performances at brightness temperature as well as at geophysical parameters. It will include how the ground campaigns were elaborated to address the main cal Val activities accounting for SMOS specificities, in what context they were organized as well as the most significant results.

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Yann H. Kerr (M '88, SM '01, F'13) received the engineering degree from Ecole Nationale Supérieure de l'Aéronautique et de l'Espace, the M.Sc. degree in electronics and electrical engineering from Glasgow University, Glasgow, Scotland, UK, and the Ph.D. degree in Astrophysique Géophysique et Techniques Spatiales, Université Paul Sabatier, Toulouse, France. From 1980 to 1985 he was employed by CNES. In 1985 he joined LERTS; for which he was director in 1993-1994. He spent 19 months at JPL, Pasadena in 1987-88. He

has been working at CESBIO since 1995 (deputy director and director since 2007). His fields of interest are in the theory and techniques for microwave and thermal infra-red remote sensing of the Earth, with emphasis on hydrology, water resources management and vegetation monitoring.

He has been involved with many space missions. He was an EOS principal investigator (interdisciplinary investigations), and PI and precursor of the use of the SCAT over land. In 1989 he started to work on the interferometric concept applied to passive microwave earth observation and was subsequently the science lead on the MIRAS project for ESA with MMS and OMP. He was also a Co-Investigator on IRIS, OSIRIS and HYDROS for NASA. He was science advisor for MIMR and Co I on AMSR. He is a member of the SMAP Science Team. In 1997 he first proposed the natural outcome of the previous MIRAS work with what was to become the SMOS Mission to CNES, proposal which was selected by ESA in 1999 with him as the SMOS mission Lead-Investigator and Chair of the Science Advisory Group. He is also in charge of the SMOS science activities coordination in France. He has organized all the SMOS workshops, and was guest editor on three IEEE Special issues. He is currently involved in the exploitation of SMOS data, in the Cal Val activities and related level 2 soil moisture and level 3 and 4 development and SMOS Aquarius SMAP synergistic uses and on the soil moisture essential climate variable. He is also working on the SMOS-Next concept and is involved in both the Aquarius and SMAP missions. He received the World Meteorological Organization 1st prize (Norbert Gerbier), the USDA Secretary's team award for excellence (Salsa Program), the GRSS certificate of recognition for leadership in development of the first synthetic aperture microwave radiometer in space and success of the SMOS mission, and the ESA team award for the SMOS project.