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The ESA SMOS+SOS Project: Oceanography using SMOS for innovative air-sea exchange studies

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We report on the work plan of the SMOS+Surface Ocean Salinity and Synergy (SMOS+SOS) project. SMOS+SOS is funded through the Support to Science Element (STSE) component of the European Space Agency's (ESA) Earth Observation Envelope Programme. The SMOS+SOS consortium consists of four organisations namely the National Oceanography Centre (UK), the LOCEAN/IFREMER/CATDS research team (France), the Met Office (UK) and Satellite Oceanographic Consultants Ltd (UK). The end of the SMOS+SOS project will be marked by a final open workshop most likely hosted by the UK Met Office in September/October 2014.

The project is concerned with demonstrating the performance and scientific value of SMOS Sea Surface Salinity (SSS) products through a number of well-defined case studies. The case studies include: Amazon/Orinoco plumes (freshwater outflow); Agulhas and Gulf Stream (strong water mass boundary); Tropical Pacific/Atlantic (strong precipitation regime); sub-tropical North Atlantic (ie SPURS; strong evaporative regime); and Equatorial Pacific (equatorial upwelling).

With SMOS measuring the SSS in the top cm of the ocean, validating SMOS against in situ salinity data taken typically at a few meters depth introduces assumptions about the vertical structure of salinity in the upper ocean. To address these issues, the project will examine and quantify discrepancies between SMOS and in situ surface salinity data at various depths in different regions characterised by strong precipitation or evaporation regimes.

Equally, data editing and spatio-temporal averaging play a central role in determining the quality, errors and correlations in SMOS SSS data. The project will explore various processing and spatio-temporal averaging choices to define the SMOS SSS products that best address the needs of the oceanographic and data assimilation user community. One key aspect of this project is to determine how one can achieve useful accuracy/uncertainty in SSS without jeopardising SMOS's ability to capture rapidly-varying or small scale features such as rain cells or the mesoscale variability associated with river plumes and major western boundary currents.

Finally, the study explores the ability of SMOS SSS to provide insights into new oceanographic processes when used in synergy with other data. Hence, synergy with Aquarius will be used to seek evidence of the possible impact of diurnal warming on the SMOS SSS data, and to explore differences in the salinity signatures of Tropical Instability Waves observed in the Pacific with SMOS and Aquarius.