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# Sea surface salinity as measured by SMOS and by autonomous platforms: impact of rain

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The ESA/SMOS (European Space Agency/Soil Moisture and Ocean Salinity) satellite mission provides new measurements of Sea Surface Salinity (SSS) using L-band radiometry. After correcting SMOS brightness temperatures from systematic biases, SMOS sea surface salinity (SSS) reproduce quite well large scale expected SSS variations.
The SMOS level 1 data acquired in 2010 and 2011 have been reprocessed end of 2011 and level 2 SSS are expected to be reprocessed beginning 2012. With respect to previous processings, this reprocessing reduces SSS biases close to coast, sun contamination and it improves the geometrical rotation as it uses a consolidated total electronic content estimate. In this presentation, we will assess the precision of reprocessed SMOS SSS with respect to in situ SSS acquired by ARGO and surface autonomous drifters in tropical regions, and then we will focus on the impact of rain.
At L-band frequency, the skin depth is 1 centimetre while most in situ SSS measurements are taken at a few meters depth. A preliminary study based on ARGO vertical profiles (Hénocq et al., 2009) indicated that vertical salinity differences between 1m and 10m depth higher than 0.1 pss-78 are observed in the 3 oceans, mainly between 0° and 15°N, coinciding with the average position of the Inter Tropical Convergence Zones characterized by high precipitation rates.
Reverdin et al. [2011] have analyzed the drifter measurements in the tropical oceans in 2007-2010 and have identified individual freshening events larger than 0.1 pss-78 (averaging 0.56 pss-78 at 50 cm) often related with local rainfall. When two measurement levels are available, the initial salinity signal is larger by more than 20% at the shallow depth (15 cm) compared with the deeper measurement level (near 50 cm).
Comparisons between a preliminary version of reprocessed SMOS SSS and ARGO SSS at 5m depth have been performed in the subtropical Atlantic Ocean, in the region where the 2012-2013 “Salinity Processes in the Upper Ocean Regional Study” (SPURS) experiments dedicated to the calibration and validation of SMOS and Aquarius satellite measurements will take place. They indicate a standard deviation of the difference of 0.2pss-78 once SMOS SSS are averaged over typical GODAE scales (10days-one month, 100kmx100km). On another hand, the same kind of comparison in the Intertropical Convergence zone of the Pacific Ocean indicates a standard deviation of the difference of 0.4pss-78 and a mean difference 0.1pss-78 lower in the ITCZ than in the SPURS region. Correlation with SSM/I rain rates shows that the larger standard deviation and the negative difference in the ITCZ is mainly attributable to rain events. The effect of rain freshening on the 1cm SSS will be discussed together with possible effect of rain onto the atmospheric and roughness contribution to L-band brightness temperature (Tb), based on the angular signature of SMOS Tbs measured in rainy conditions.