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Global assessment of Level 3 SMOS and Aquarius salinity measurements using Argo and an operational ocean model

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The launch of the European Space Agency (ESA) Soil Moisture and Ocean Salinity (SMOS) satellite in November 2009 marked a new era in satellite oceanography. SMOS was joined in orbit, in June 2011, by the NASA/Argentine Aquarius/SAC-D mission, specifically designed to measure sea surface salinity (SSS). These two satellites have significantly improved our ability to measure SSS synoptically. Despite significant differences in how the two satellites estimate SSS, both utilise passive systems to measure the response of the brightness temperature (Tb) at L-band (1.4 GHz) to SSS and initial results are encouraging.

The UK National Oceanography Centre has produced 'Level 3' SSS data products for SMOS and Aquarius using monthly data on a 1º by 1º global grid, between 60ºS and 60ºN, from 1 September 2011 to 31 August 2012. Previous and on-going work shows for both satellites significant temporally varying differences between SSS from ascending passes (satellite moving south to north) and SSS from descending passes (satellite moving north to south). Therefore, for both SMOS and Aquarius, separate Level 3 products are produced from data for ascending and descending passes.

For this study, two separate monthly validation datasets are used based on the same grid as the satellite data. The first is averaged near-surface salinity (depth less than 10 m) as derived from the drifting Argo float programme. The second validation data source is output from the UK Met Office Forecasting Ocean Assimilation Model (FOAM), which is based on NEMO (Nucleus for European Modelling of the Ocean).

We calculate maps of the difference between all possible pairs of SSS data for each month, and consider their relationships using regression on the 1˚ values. The analysis is carried out for the global ocean, as well as for smaller, more homogeneous, study regions (e.g. SPURS in the subtropical North Atlantic).