TOWARDS THE VALIDATION OF OCEAN SURFACE SALINITY MEASUREMENTS FROM THE ESA SMOS MISSION

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In 2009, the European Space Agency (ESA) is due to launch the first-ever satellite attempting to measure ocean salinity from space: the Soil Moisture and Ocean Salinity (SMOS) mission. SMOS aims to deliver global maps of the hitherto poorly known sea surface salinity (SSS), especially its large scale and seasonal to inter-annual variability. Together with sea surface temperature (SST), SSS determines surface water densities and has important implications for air-sea exchanges of freshwater, heat and carbon. In the North Atlantic, sinking of dense waters associated with the Meridional Overturning Circulation leads to the heat transport which gives Northern Europe its relatively mild climate compared to other regions at the same latitude.

Given the technical challenges and novelty of L-band interferometric radiometry, calibration and validation of SMOS SSS remains challenging. Conventional validation methods, such as instantaneous comparisons with collocated in situ measurements, are of limited use, since significant spatio-temporal averaging over many SMOS overpasses is necessary to achieve sufficient accuracy (0.1 psu) to allow meaningful comparisons with in situ data. SMOS will produce 10- or 30-days composite maps of SSS on 1 or 2 degree resolution grids, which will be difficult to compare against accurate but sparse in time and space in situ near-surface salinity measurements affected by ocean mesoscale variability.

In this paper, we review the current understanding from the literature of the oceanic and atmospheric variability in the North Atlantic to determine which regions may be more propitious for the validation of SMOS SSS products. Given the strongly non-linear dependence of L-band brightness temperature on SSS, SST and ocean surface roughness, the variability of these variables and their impact on the retrieved SMOS SSS, is considered. Output from high-resolution operational model hindcast runs available from the Met Office within the UK National Centre for Ocean Forecasting is compared with high-quality oceanographic datasets to determine differences between hydrographic data, nearby Argo float measurements and satellite-assimilating model data and identify and characterise possible sources of errors in different regions of the North Atlantic e.g. drifts in Argo SSS, high mesoscale variability, near-surface vertical salinity gradients...