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Testing SMOS Salinity Retrievals against surface salinity observations in the North Atlantic Ocean

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Since January 2010 the ESA Soil moisture and ocean salinity mission (SMOS) provides salinity data of the sea surface (SSS). Those measurements offer the possibility to better observe and understand SSS variations over the global ocean. However, an important step for any new measurement technology is to test and improve those measurements through comparisons against in situ measurements. For space based SSS measurements this is particularly important in high latitudes where uncertainties are highest due to the reduced sensitivity of the emissivity (brightness temperature) to surface salinity variations. In this paper we test SMOS salinities against surface salinity observations obtained during a series of cruises of German research vessels in the Nordic Seas. We analyze the differences of SMOS and TSG data with respect to the distance to the coast, temporal variability, as well as to the surface temperature and to the water depth. Although absolute SMOS salinities show biases, the spatial structures of the salinity variations are very similar in both data sets. SMOS data are most of the time too fresh with respect to in situ data. Especially in areas of higher SSS the average bias is $\approx 2\ \frac{g}{kg}$. This too fresh bias could be caused by a remaining land contamination in the SMOS data.However, some local differences- particularly around the front of freshwater from the Greenland shelf- can clearly be attributed to temporal variability of the position of this front. Within the frontal zone, the SMOS salinities are higher than the TSG salinities, and the SSS gradient in the TSG data is more distinct. This is due to the monthly and spatially averaging of the SMOS product.