SMOS Salinity Retrieved from New Seawater Dielectric Constant Models at L-band

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Abstract— The accuracy of the Sea Surface Salinity (SSS) retrieved from L-Band radiometer measurements is strongly dependent on the accuracy of the modelling of the dielectric constant. Two new parametrizations have recently been developed based on one hand on the Soil Moisture and Ocean Salinity (SMOS) satellite multi-angular brightness temperature measurements [1] (BV) and on the other hand on new laboratory measurements [3] (GW2020). These two approaches are fully independent. The brightness temperatures, Tb, simulated with the BV and GW2020 parametrizations are compared with each other and with the ones derived from dielectric constant models previously in use in the SMOS, Soil Moisture Active Passive (SMAP) and Aquarius SSS retrievals.

Tb simulated with the BV and GW2020 parametrizations agree particularly well for most SSS and SST commonly observed over the open ocean and are found to be in closer agreement than with earlier parametrizations. Nevertheless, uncertainty remains at low SST where a $\sim 0.1\,\mathrm{K}$ relative difference between the two models is observed.

A complete reprocessing of SMOS SSS (2010–2020) has been performed using the BV parametrization instead of the Klein and Swift (1977) model previously used in SMOS processing. When compared with Argo derived near surface salinity maps, clear improvements are observed in warm and cold regions. Remaining uncertainties in cold waters will be discussed relatively to the uncertainties in SMOS Tb linked to sea ice contamination and given the constraints given by the GW2020 laboratory measurements.

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