EGU21-655, updated on 19 Oct 2021
https://doi.org/10.5194/egusphere-egu21-655
EGU General Assembly 2021

Correcting sea surface temperature spurious effects in salinity retrieved from spaceborne L-band Radiometer measurements

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We derived a new parametrisation for the dielectric constant of the ocean (Boutin et al. 2020). Earlier studies have pointed out systematic differences between Sea Surface Salinity retrieved from L-band radiometric measurements and measured in situ, that depend on Sea Surface Temperature (SST). We investigate how to cope with these differences given existing physically based radiative transfer models. In order to study differences coming from seawater dielectric constant parametrization, we consider the model of Somaraju and Trumpf (2006) (ST) which is built on sound physical bases and close to a single relaxation term Debye equation. While ST model uses fewer empirically adjusted parameters than other dielectric constant models currently used in salinity retrievals, ST dielectric constants are found close to those obtained using the Meissner and Wentz (2012) (MW) model. The ST parametrization is then slightly modified in order to achieve a better fit with seawater dielectric constant inferred from SMOS data. Upgraded dielectric constant model is intermediate between KS and MW models. Systematic differences between SMOS and in situ salinity are reduced to less than +/-0.2 above 0°C and within +/-0.05 between 7 and 28°C. Aquarius salinity becomes closer to in situ salinity, and within +/-0.1. The order of magnitude of remaining differences is very similar to the one achieved with the Aquarius version 5 empirical adjustment of wind model SST dependency. The upgraded parametrization is recommended for use in processing the SMOS data.

The rationale for this new parametrisation, results obtained with this new parametrisation in recent SMOS reprocessings and comparisons with other parametrisations will be discussed.

Reference:

Boutin, J.,et al. (2020), Correcting Sea Surface Temperature Spurious Effects in Salinity Retrieved From Spaceborne L-Band Radiometer Measurements, IEEE TGRSS, doi:10.1109/tgrs.2020.3030488.