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SMOS ocean salinity performance and TB bias correction

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In the framework of the SMOS ocean salinity mission, a validation study has been carried out to determine the performance at Level 1 (brightness temperatures, TB) and Level 2 (sea surface salinity, SSS) products that can be expected. For this purpose a processing chain has been developed which includes the instrument simulator SEPS-GS to generate Level 0 products as well as the Level 1 and 2 prototype processors: based on geophysical input data, Level 0, 1 and 2 products are simulated and compared to the so-called perfect instrument, i.e. TB's directly obtained from forward models without passing through the Level 1 processor and thus avoiding image reconstruction.

Comparisons that have been carried out at Level 1 and Level 2 products reveal systematic TB biases which in turn cause a significant bias in retrieved SSS. Depending on the position in the SMOS field of view we obtain TB biases up to 4K which translate into SSS biases near the centre of the track of up to 3 psu. Such values are too high in order to attain the required 0.1 psu (at Level 3) precision. Consequently, a characterisation of this bias as well as correction methods have been investigated. Our results show that the bias is stationary for constant scenes but varies as soon as inhomogeneous (realistic) scenes are observed. Possible techniques to reduce this bias are presented along with their consequences on the SSS retrieval.