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SMOS INSTRUMENT PERFORMANCE AND CALIBRATION AFTER 4 YEARS AND 6 MONTHS IN ORBIT

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By April 2014, ESA's Soil Moisture and Ocean Salinity (SMOS) mission will have been in orbit for 4 years and a half, and the second reprocessing of the whole mission data set will have taken place with a fully polarimetric Level-1 processor, for the first time. The assessment of the mission performances based on this new processor will then be possible. In particular the metrics of the spatial ripple and the temporal variations (including orbital, seasonal and long term drifts) will be evaluated and compared against the corresponding values achieved with the current version of the Level-1 processor. This will allow quantifying the improvement of the brightness temperature observations of SMOS since its launch. It is expected that the reprocessed data will no longer exhibit any negative trend in the brightness temperatures at low incidence angles, and that the seasonal and yearly drifts will have been substantially reduced. Other improvements, although not so significant, are also expected, such as a small reduction in the spatial ripple and in the orbital variations. All these benefits come thanks to the readiness of the first fully-polarimetric version of the Level-1 processor, which has been possible, to a great extent, after the correction of some inconsistencies in the use of the cross-polar antenna patterns, the positive cumulative effect of many small improvements in the calibration, a major modification of the image reconstruction processor using the complete polarimetric formulation and the utilization of the available redundancy on-board that allows the selection of the best Noise Injection Radiometer.

Major areas that require further work include the correction and handling of the Sun effects, the further reduction of the spatial ripple and temporal variations, some correction of the residual land-sea contamination and an improved Radio-Frequency Interference data flagging. The Sun correction will be attempted through increasingly more complex cancellation algorithms, including or not the limited set of Sun acquisition responses which are available. The reduction of the spatial ripple and the residual land-sea contamination will require further understanding of fundamental image reconstruction issues as well as more elaborated ways to compute and apply the Ocean Target Transformation. Finally, the mitigation of the temporal variations will be attempted using a more sophisticated model of the front-end losses of the receivers, applied to the current instrument configuration as well as to the so called ALL-LICEF mode.

An overview of the results of the second mission reprocessing at Level-1 and the progress achieved in both calibration and image reconstruction by April 2014, as anticipated above, will be presented in this contribution.