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SMOS L1PP Performance Analysis from Commissioning Phase - Improved Algorithms and Major Results

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Following the Soil Moisture and Ocean Salinity (SMOS) launch in November 2009, a Commissioning Phase has taken place for six months, having Deimos closely cooperated with the European Space Agency's (ESA) Level 1 team. During these six months several studies have been conducted on calibration optimization, image reconstruction improvement, geolocation assessment and the impact on scientific results, in particular to insure optimal input to Level 2 Soil Moisture and Ocean Salinity retrieval. In parallel with the scientific studies, some new algorithms/mitigation techniques had to be developed, tested and implemented during the Commissioning Phase.

Prior to launch, the Level 1 Prototype Processor (L1PP) included already several experimental algorithms different from the ones existent in the operational chain. These algorithms were tested during Commissioning and some were included in the final processing baseline as a result of the planned studies. Some unforeseen algorithms had to be defined, implemented and tested during the Commissioning Phase itself and these will also be described below.

In L1a, for example, the calibration of the Power Measuring Systems (PMS) can be done using a cold target as reference, i.e. the Sky at $\sim$3 K. This has been extensively analyzed and the results will be presented here. At least two linearity corrections to the PMS response function have been tested and compared. The deflection method was selected for inclusion on the operational chain and the results leading to this decision will be also presented.

In Level 1B, all the foreign sources algorithms have been tested and validated using real data. The System Response Function (G-matrix) computed for different events has been analyzed and criteria for validation of its pseudo inverse, the J+ matrix, have been defined during the Commissioning Phase. The impact of errors in the J+ matrix has been studied and well characterized. The effects of the Flat Target Response (FTR) have also been addressed and the criteria for an acceptable Flat Target Transformation auxiliary data file have been assessed and implemented during the Commissioning Phase.

In L1c, the performance of L1PP's geolocation routines has been analyzed by comparing the estimated and real positions of known land features.

An important activity during the Commissioning Phase was the study and impact of Radio Frequency Interference (RFI) sources in the final reconstructed image. The quantity of expected RFIs has been under-estimated and, therefore, error mitigation techniques had to be developed to overcome these unwanted sources of errors. In this presentation the latest news and results for this issue will be presented.