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SMOS ocean salinity: what is achieved after four years of data acquisition?

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SMOS (Soil Moisture and Ocean Salinity), launched on November 2, 2009, is the first satellite mission addressing sea surface salinity measurements from space. Its unique payload is MIRAS (Microwave Imaging Radiometer using Aperture Synthesis), a new two-dimensional interferometer designed by the European Space Agency (ESA) and operating at the microwave L-band. In this presentation we address the quality of the salinity products now being operationally delivered, following algorithm improvements achieved from the analysis of four years of data. The pioneer nature of this mission, both from the technological and data processing points of view, implies many challenges and several issues that are still being addressed by the SMOS team. These are mainly related to low level data processing (instrument calibration stability, interferometric image reconstruction, contamination from external radiation) but also to the retrieval of salinity from radiometric measurements, with the need to correct for other geophysical effects as the impact of sea surface roughness in ocean L-band emission. Detailed analysis of the SSS fields retrieved by SMOS (reprocessed according to the present stage of algorithms development), and comparison to other data sources like the Argo array of profiling floats or ship data, evidence that in tropical/subtropical regions, provided that large scale seasonal biases are removed, the precision of SMOS salinity at monthly/100km scale is 0.2, while in some regions the results are degraded due to geophysical unfavourable conditions (cold waters where the brightness temperature sensitivity to salinity in smaller, difficult roughness correction under high or very low winds, impact of land or RFI contamination). Some examples will be presented of the use of SMOS salinity data in different oceanographic applications where the available in situ data have too coarse spatial or temporal resolution or do not provide information on salinity in the very top ocean layer.