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Vertical variability of Near-Surface Salinity in the Tropics : Consequences for SMOS Calibration and Validation

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The ESA/SMOS (European Space Agency/Soil Moisture and Ocean Salinity) satellite mission aims to detect Sea Surface Salinity (SSS) using L-band radiometry. At that frequency, the skin depth is 1 centimeter. However, the calibration and validation of SMOS measurements will be done with in situ measurements, mainly taken at 5 m depth. In order to anticipate and understand vertical salinity differences in the first 10 m of the ocean surface layer, in situ vertical profiles are analyzed. Measurements come from autonomous drifter and Tropical Atmosphere Ocean (TAO) moorings for observations on local scale and from thermosalinographs (TSG), floats, eXpendable Conductivity-Temperature-Depth (XCTD) and CTD on the entire tropical band (from 30°S to 30°N).
For the first time, vertical salinity differences, classified according to their vertical position, are collocated with precipitation computed by satellite. A rain parameter, 3D max rain rate, is defined to take into account the history of rain events. Vertical salinity differences higher than 0.1 pss-78 are observed in the 3 oceans, mainly between 0° and 15°N, coinciding with the average position of the InterTropical Convergence Zone. The highest differences are mainly located near river mouth. Some differences exceed 0.5 pss-78 locally and persist for more than 10 days, unlike the spatial average of salinity differences between 10 m and 1 m, which stay close to 0. A statistical approach is developed to be used for predicting large vertical salinity differences.