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Persistence of Rainfall Imprint on SMOS Sea Surface Salinity

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The Soil Moisture and Ocean Salinity (SMOS) satellite mission monitors sea surface salinity (SSS) over the global ocean for more than 5 years. In previous studies, Boutin et al. (2014) have shown a clear freshening of SMOS SSS under rain cells of about -0.14pss/mm/hr at moderate wind speed (3-12m/s). This order of magnitude is compatible with in situ drifters observations taken at 45cm depth while SMOS SSS are at about 1cm depth and at a mean spatial resolution of 43km. Using Aquarius satellite SSS, Meissner and Wentz (2014) found a SSS decrease under rain cells of -0.12pss/mm/hr at 7 m/s wind speed, consistent with SMOS estimate considering the lower spatial resolution of Aquarius SSS (about 150km); Santos-Garcia et al. (2014) found an influence of the rain history preceding by a few hours the Aquarius measurement. In most cases, drifters observations also suggest that about half of the freshening observed locally disappears after one hour, likely because of mixing with surrounding waters. In this presentation, we will investigate the temporal and spatial evolution of SMOS SSS after a rain event. Rainfall information will be either derived from SSM/Is measurements (during periods when three SSM/Is satellites provide adequate sampling before and simultaneous to SMOS measurements) or from the NOAA CMORPH products. In order to separate instantaneous from historical effects, we distinguish two cases: 1) rainfall occurs at less than 30mn from SMOS observation but no rain occurred before; 2) rainfall occurred previous to SMOS observation (up to 3 hours before) but has stopped at least 30mn before SMOS acquisition. In addition to looking at the temporal evolution of SMOS SSS under the rain cell, since both vertical mixing and horizontal stirring may occur, we also investigate the size of the fresh SSS region relative to the size of the rain cell.

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