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Salinity and water cycle: Sea surface salinity drifter for SMOS validation and surface process studies

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Since 2005, we have worked with surface drifters to try to reliably measure surface salinity and temperature. Since then, and in particular since the middle 2009, we have deployed over 100 drifters of different makes in order to provide calibration data for the ESA/SMOS (European Space Agency/Soil Moisture and Ocean Salinity) satellite mission launched in November 2009. Most of these drifters have been equipped with unpumped Seabird sensors. The drifters have been deployed in various environments, in some rainy-dominated tropical regions, evaporation-dominated sub-tropical regions, mid-latitudes and even the Nordic seas, thus providing a wide range of conditions to test the life duration and reliability of the data collected, develop methods on how to validate the data, and expertise on how to use them. Most of these measurements have been made at a depth near 50 cm, although in some cases with additional sensors near 15 cm to estimate salinity near-surface vertical gradients during rainfall events. The life-time with usable data is highly variable: it has been smaller in the equatorial Atlantic Ocean that in other regions, smaller for drifters with additional air pressure measurements than without. Drogue loss has also happened on the average after less than 6-months, and is often a cause of early wreck on the coast. The errors in the data fall in two major categories: slow biases developing on seasonal or longer terms, maybe by small deposits over the cell or small drifts in temperature sensors, and large jumps or biases developing as the result of large objects getting stuck, sometimes temporarily in the cell. For the first kind of error, the use of collocated upper ocean Argo salinity data is often sufficient to correct the biases. For the second kind of errors, only large jumps or drifts can be unambiguously identified, whereas smaller short term jumps could also arise from real small-scale surface ocean variability. The temperature data also reveal some times larger biases than expected in the SST data of the SVP drifters, that are a major source of in situ data used to calibrate the standard SST products. The data are used to present statistics on surface response to isolated rainfall events and on the SSS diurnal cycles in some tropical regions.