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HOAPS precipitation validation with ship-borne rain and snow measurements over the Ocean

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Measuring precipitation over the oceans is still a challenging task. The main reason for a lack of such data can be attributed to the difficulty of measuring precipitation on moving platforms under high wind speeds.
The progress in satellite technology has provided the possibility to retrieve global data sets from space, including precipitation. Levizzani et al. (2007) showed that precipitation over the oceans can be derived with sufficient accuracy from passive microwave radiometry. On the other hand, Andersson et al. (2011) pointed out that even state-of-the-art satellite retrievals and reanalysis data sets still disagree on global precipitation with respect to amounts, patterns, variability and temporal behaviour.
This creates the need for ship-based precipitation validation data using instruments capable of accurately measuring rain rates even under high wind speed conditions. In the present study we use ship rain gauges (Hasse et al., 1998) and optical disdrometers (Großklaus et al., 1998), the latter is also capable to measure snow (Lempio et al., 2007). Measurements are point-to-area collocated against Hamburg Ocean Atmosphere Parameters and fluxes from Satellite (HOAPS) data (Andersson et al., 2011). The used HOAPS-S data subset contains all retrieved physical parameters at the native SSM/I (Special Sensor Microwave Imager) pixel-level resolution of approximately 50 km for each individual satellite. The algorithm does not discriminate between rain and snowfall. The satellite data is compared to the in situ measurement by the nearest neighbour approach. Therefore, it must be ensured that both observations are related to each other, which can be determined by the decorrelation length. At least a number of 660 precipitation events are at our disposal including 127 snow events. The statistical analysis follows the recommendations given by the World Meteorological Organization (WMO) for dichotomous or binary forecasts (WWRP/WGNE: http://www.cawcr.gov.au/projects/verification/#Methods_for_dichotomous_forecasts). Taking into account that precipitation has to be regarded as a rare event, a better estimate of the performance is the so-called threat score or critical success index (CSI) instead of the proportion correct. The CSI reaches values up to 0.71 for all events and 0.65 taking only snow measurements into account. From accumulated precipitation rates can be concluded that the HOAPS precipitation rates are in a good agreement to measurements.

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