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Estimating uncertainty of HOAPS precipitation rates from satellite data over the Atlantic Ocean

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The global hydrological cycle as an essential part of the Earth's climate system is closely linked to the global energy cycle. In order to understand the climate system and thus predict its changes, Earth system models are applied. Aiming at a realistic representation of the relevant climate-related processes, accurate and continuous global observations are required to validate the models. Precipitation in particular is highly variable in space and time dimension which is why its observation is still challenging. Especially over the oceans and sparsely populated areas satellites are inevitable to monitor precipitation with high coverage. Still, the coarse spatial resolution and a rather low sampling rate by polar-orbiting satellites constrain these space-borne measurements. However, the Hamburg Ocean Atmosphere Parameters and fluxes from Satellite (HOAPS) data set showed good performance exhibiting a comparatively high sensitivity for light rain intensities. But HOAPS is still lacking uncertainty estimates that are also important to know when modeling the climate. Furthermore the retrieval of precipitation from brightness temperatures contains an uncertainty. For that reason, a recently collected ship-based in-situ precipitation data set will be explored to estimate the uncertainty of HOAPS. Thanks to the optical disdrometer measuring drop size spectra, this data set provides also information about the precipitation type which can be used to unveil deficits in HOAPS that is not able to distinguish between such. These goals are embedded within the DFG funded project 1740 aiming at "A new Approach toward Improved Estimates of Atlantic Ocean freshwater Budgets and Transports as Part of the Global Hydrological Cycle" in collaboration with the CM-SAF of the German Weather Service.

As previously stated, precipitation estimates are still afflicted with large uncertainties due to high temporal and spatial variability as well as retrieval constraints. Therefore the quantification of uncertainty estimates is an important but challenging task because the reference data sets differ in resolution (point-to-area) and sampling rate (time lags). In addition, ground-based precipitation measurements possibly observe different amounts of precipitation as significant parts might evaporate again before reaching the ground. These cases need to be considered when estimating the uncertainty. This kind of information would also reveal areas that are specifically challenging for precipitation measurements from space.