



The new automatic precipitation phase distinction algorithm for OceanRAIN data over the global ocean

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The hitherto lack of surface precipitation data over the global ocean limits the capabilities to validate recent and future precipitation satellite retrievals. The first systematic ship-based surface precipitation data set OceanRAIN (Ocean Rain And Ice-phase precipitation measurement Network) aims at providing in-situ precipitation data through particle size distributions (PSDs) from optical disdrometers deployed on research vessels (RVs). From the RV Polarstern, OceanRAIN currently contains more than four years of 1-minute resolution precipitation data, which corresponds to more than 200,000 minutes of precipitation. The calculation of the precipitation rate requires to know the precipitation phase (PP) of the falling particles.

We develop a novel algorithm to automatically retrieve the PP using OceanRAIN data and ancillary meteorological measurements from RVs. The main objective is to improve accuracy and efficiency of the current time-consuming manual method of discriminating liquid and solid precipitation particles. The new PP distinction algorithm is based on the relation of air temperature and relative humidity (T-rH) with respect to PP. For first-time usage over oceanic areas, the land-retrieved coefficients of this empirical relationship are adjusted to OceanRAIN data. The measured PSD supports determining the PP in certain cases where large snow aggregates exist at distinctly positive air temperatures. The classification, based on T-rH and PSD, is statistically exploited and weighed with respect to the current weather conditions to obtain an overall PP probability at 1-minute resolution. The new PP distinction algorithm agrees in more than 92% (94% excl. mixed-phase) of precipitating cases with the manually-determined PP in the RV Polarstern data. The PP distinction algorithm complements the valuable information of OceanRAIN surface precipitation over the ocean.