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Towards an automatic precipitation phase distinction algorithm for optical disdrometer data

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For a realistic representation of relevant climate-related processes, accurate and continuous global observations of precipitation are required to evaluate model performance and thus increase our understanding of the climate system. Precipitation in particular is highly variable in space and time and its accurate observation is still challenging. Especially over the oceans satellites are inevitable to monitor precipitation with high spatio-temporal coverage. In order to validate satellite-retrieved measurements, such as e.g. the Hamburg Ocean Atmosphere Parameters and fluxes from Satellite data (HOAPS) satellite climatology, reliable surface in-situ data is needed. In that respect the quantification of uncertainty estimates is an important but challenging task as the reference data sets differ in resolution (point-to-area issue) and sampling rate (time lags). Whereas over land, gauges are available in many places, the ocean is almost void of surface measurements. To close this gap, the Ocean Rain And Ice- phase measurement Network (OceanRAIN) samples precipitation data with optical disdrometers deployed on several research vessels.

The optical disdrometer ODM470 measures the light extinction caused by hydrometeors falling through a sensitive cylindrical volume. Exploiting that information, drop sizes, number densities and fall velocities can be retrieved. Given that the precipitation phase (PP) is known from observation a rain or snowfall rate can be calculated. An automatic determination of the PP could lead to reliable precipitation rates when observations are unavailable or uncertain. However, this is a challenging task especially near freezing point. Therefore, this work is targeted to develop an automatic phase distinction algorithm by statistically analyzing and combining the above mentioned quantities retrieved from the disdrometer with simultaneously measured auxiliary data, such as wind speed and environmental temperature. Ultimately, the PP information can also be applied to satellite retrievals in order to unveil deficits e.g. with solid precipitation. Consequently, determining the PP is the first step in order to validate satellite retrievals and thus improve global monitoring of precipitation.