



Oceanic Precipitation Measurement – Surface Validation

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State-of-the-art satellite derived and reanalysis based precipitation climatologies still show remarkably large differences in frequency, amount, intensity, variability and temporal behavior of precipitation over the oceans. Additionally so far appropriate in-situ validation instruments were not available for shipboard use. The uncertainties are largest for light precipitation within the ITCZ and subtropics and for cold season high-latitude precipitation including mix-phase and snowfall. Hence, a long-term issue on which IPWG and GPM-GV is urging more attention is the provision of high quality surface validation data in oceanic areas using innovative ship-based instruments. Precipitation studies would greatly benefit from systematic dataset collection and analysis as such data could also be used to constrain precipitation retrievals.

To achieve this goal, the KlimaCampus and Max Planck Institute for Meteorology in Hamburg, Germany funded this project that uses automated shipboard optical disdrometers, called Eigenbrodt ODM470, that are capable of measuring liquid and solid precipitation using drop size distributions in minute intervals on moving ships with high accuracy even under high wind speeds and rough sea states. Since the project start in 2009 the statistical basis for a conclusive validation has significantly improved with comprehensive data collection of more than 3 million minutes of precipitation measurements onboard six ships.

Currently, six ODM470 instrument systems are available of which three are long-term mounted onboard the German research icebreaker R/V Polarstern (Alfred Wegner Institut) since June 2010, on R/V Akademik Ioffe (P.P.Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russia) since September 2010 and on R/V Maria S. Merian (Brise Research, University of Hamburg) since December 2011. Three instruments are used for additional short-term shipboard campaigns and intercomparison projects. The core regions for these precipitation measurements comprise the Arctic and Antarctic Oceans, the mid-latitude storms tracks, the subtropical trade wind regions, the ITCZ, and the Southern Oceans.

This paper outlines results of the long-term precipitation measurements onboard the ships in all climatic regimes, in terms of time-series analysis, particle size distributions, documents precipitation extremes, gives statistics on the frequency and amount of rainfall, mix-phase and snowfall, shows case studies, and compares to satellite climatologies of GPCP, TRMM and HOAPS to discuss point to area resolution dependencies.