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Exploring light rain in the trades as observed by satellite- and ground-based remote sensing

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Satellite climatologies are usually expected to have difficulties to properly capture light rain from shallow marine clouds due to limited spatiotemporal resolution. In order to evaluate this, ground-based radar data from the RICO (Rain in Cumulus clouds over the Ocean) campaign is compared with rainfall estimates of three different satellite climatologies over the subtropical North Atlantic.

In particular, these satellite products are the Hamburg Ocean Atmosphere Parameters and fluxes from Satellite data (HOAPS), the Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis (TMPA) and the Global Precipitation Climatology Project (GPCP). Different footprint sizes and temporal resolutions among the used satellite products require an up-scaling of the data to facilitate a fair comparison. Apart from that, recent micro rain radar data from the Barbados Cloud Observatory (BCO) is analyzed to further explore the nature of light rain over the subtropical ocean at a higher temporal resolution.

In the trades, the dominance of light rain, i.e. low rain intensities, is ubiquitous as previously observed in several field studies. However, some of them even seem to be conservative in their estimation of light rain contribution to total rainfall according to recent BCO measurements. For active and passive satellite sensors the light rain detection still remains a challenging task. However, as main result, satellite products showed to be partly able to resolve light rain events from shallow clouds during RICO. HOAPS detects most and GPCP least of them while TMPA performs similarly to HOAPS. But along a mean trade-wind trajectory starting at the Canaries, TMPA detects less light rainfall compared to HOAPS, especially in the Caribbean region. Currently collected ship-based rain data sets will be used to further evaluate the performance of HOAPS and TMPA over larger areas of the subtropical Atlantic.