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Supplement of

The TRIple-frequency and Polarimetric radar Experiment for improving process observations of winter precipitation

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S1 Stratification of DWR with temperature

Figure 9 in Dias Neto et al., 2019 shows the stratification of the DWRs limited to temperature warmer than -30 °C. The reason for this limitation is that both DWRs are mainly distributed around 0 dB for temperatures colder than -30 °C. Figure S1 shows the DWR_{KaW} (Panel a of Figure S1) and DWR_{XKa} (Panel b of Figure S1) at all available temperature levels.

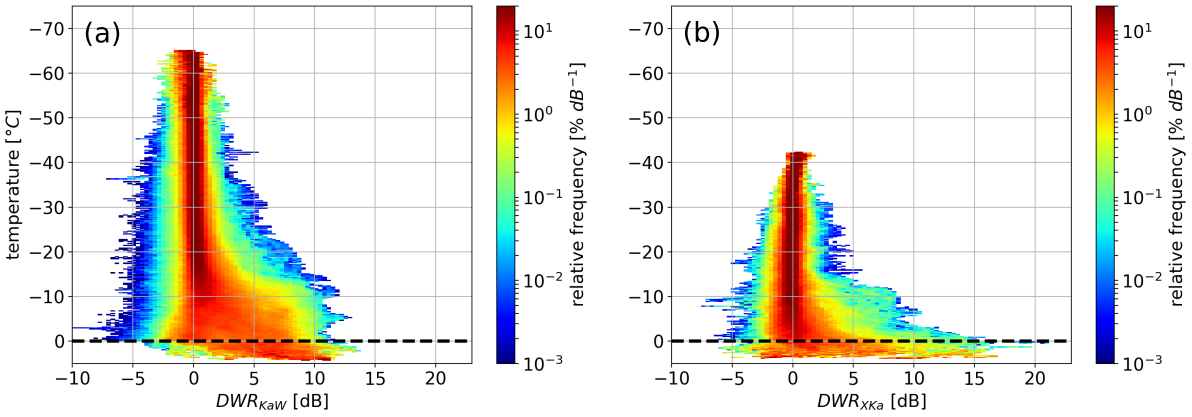

Figure S1: Two dimensional histograms (Contoured Frequency by Altitude Diagram (CFAD)) of DWR against air temperature for the entire TRIPEx dataset. The dashed line indicates the 0 °C isotherm. The data below the dashed line are collected only from the cases where a melting layer is observed. Panels a and b show DWR_{KaW} and DWR_{XKa}, respectively. Note the log-scale of the colorbars.

S2 Uncertainties of Ze calculations due to scattering model for rainfall

The T-matrix approach is an analytic solution of the electromagnetic scattering problem and the uncertainties on that might arise only from an inappropriate selection of the drop shape model or water refractive index. We have adopted the state of the art assumptions as described in the manuscript (see Section 3.3). However, for the studied cases the computed reflectivity is very close to the Rayleigh approximation (1 dB, Figure S2). As a consequence, we strongly believe that uncertainties in the scattering calculations can be considered negligible.

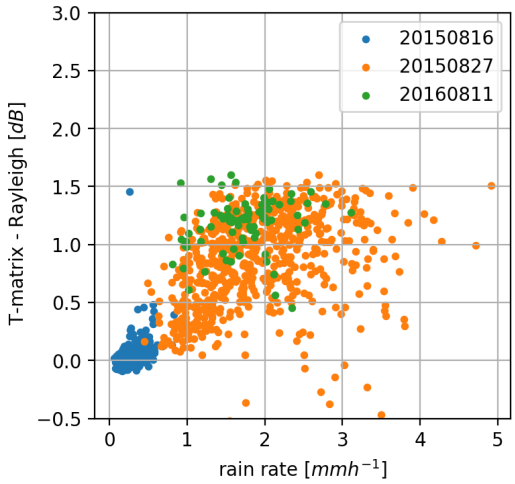

Figure S2: Difference between radar reflectivities (Ka Band) calculated with T-matrix method or Rayleigh approximation based on drop size distributions from Parsivel distrometer. The three selected days are the same as used in Section 3.3 for assessing the absolute calibration accuracy of the Ka Band radar.