SPP 2115

PARA - PArameterization informed by RAdar - Update

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photo of Bonn X-band radar by V. Pejcic

Motivation and Objectives

- **Creation of a stratiform climatology of different ice-microphysical retrievals (IWC, N_t and D_m) and polarimetric variables using large BoXPol dataset**
- Comparisons of BoXPol statistics with profiles of ICON runs using EMVORADO as observation operator [Blahak, 2016]

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Filtering method example

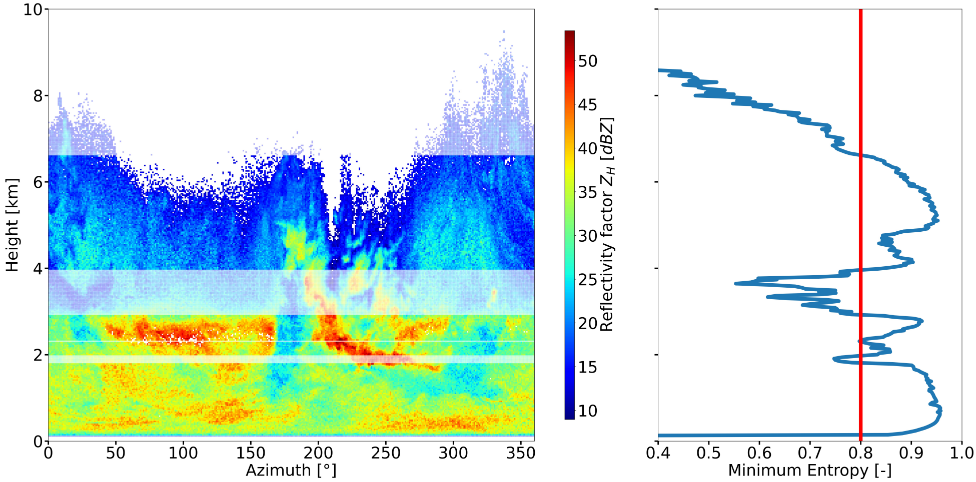

Figure 1: Horizontal reflectivity Z_H (left) monitored with BoXPol on 30 May 2016 at 03:06 UTC together with the profile of calculated minimum normalised Shannon information entropy (right). The applied threshold is indicated as red line and the excluded sequences displayed as transparent regions.

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Filtered stratiform datasets

- Filtering approach applied to synthetic and observation data:

  → 1168.5 hours of BoXPol observations from 627 different days (2014-2018)

  → 109.2 hours from 11 different days (2017-2018) for JuXPol + BoXPol synthetic data
- To increase statistical significance, ICON simulations of IWC, D_m and N_t of JuXPol + BoXPol in retrieval space are merged with all simulated C-band stations from DWD

Used ice-microphysical retrievals and simulated counterparts

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$$N_t = N_t(\mathrm{IWC}(K_{DP}, Z_{dr}, Z_h)) \tag{3}$$

following [Bukovčić et al., 2020], [Bukovčić et al., 2018], [Ryzhkov and Zrnic, 2019] and [Carlin et al., 2021]

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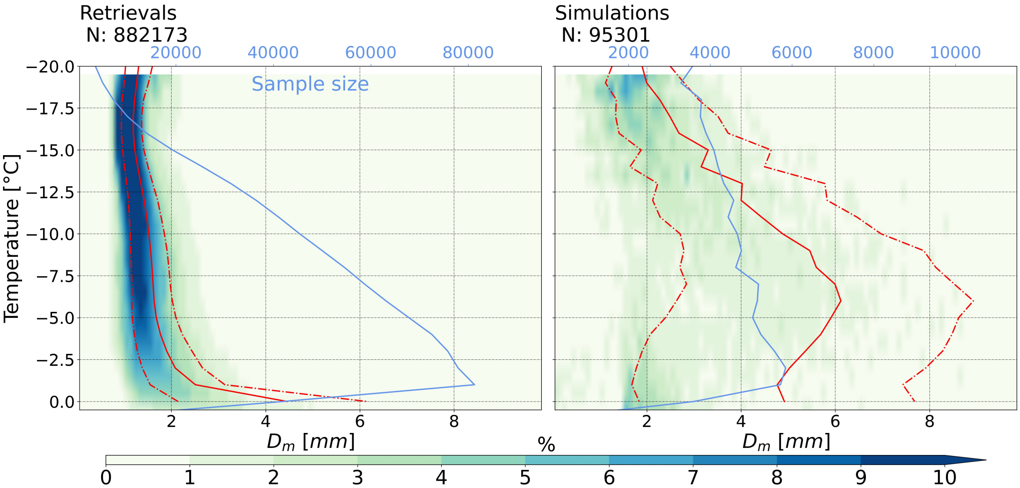

Figure 2: CFTDs of retrieved D_m (left) and simulated D_m (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020] and ICON.

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CFTD of retrieved N_t and simulated N_t

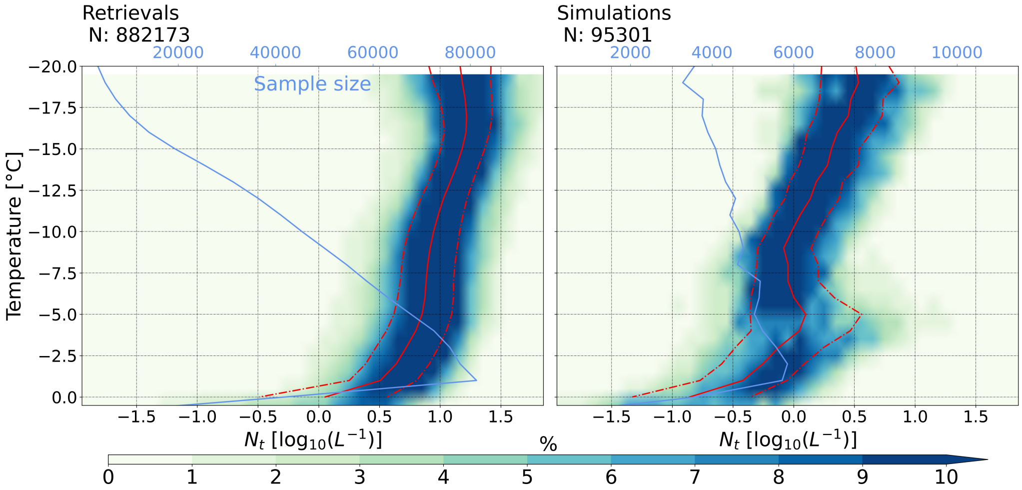

Figure 3: CFTDs of retrieved N_t (left) and simulated N_t (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020] and ICON.

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CFTD of retrieved IWC and simulated IWC

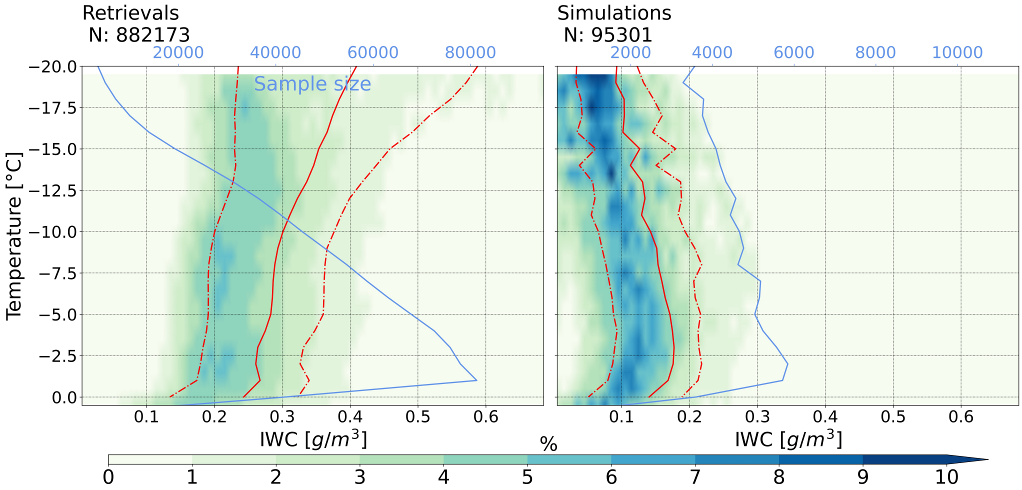

Figure 4: CFTDs of retrieved IWC (left) and simulated IWC (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020] and ICON.

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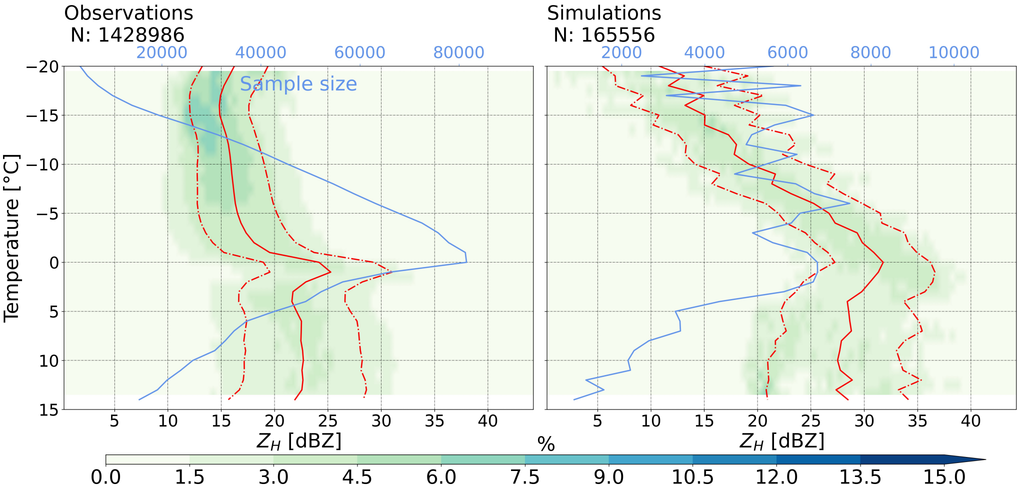

Figure 5: CFTDs of observed Z_H (left) and synthetic Z_H (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020] and ICON.

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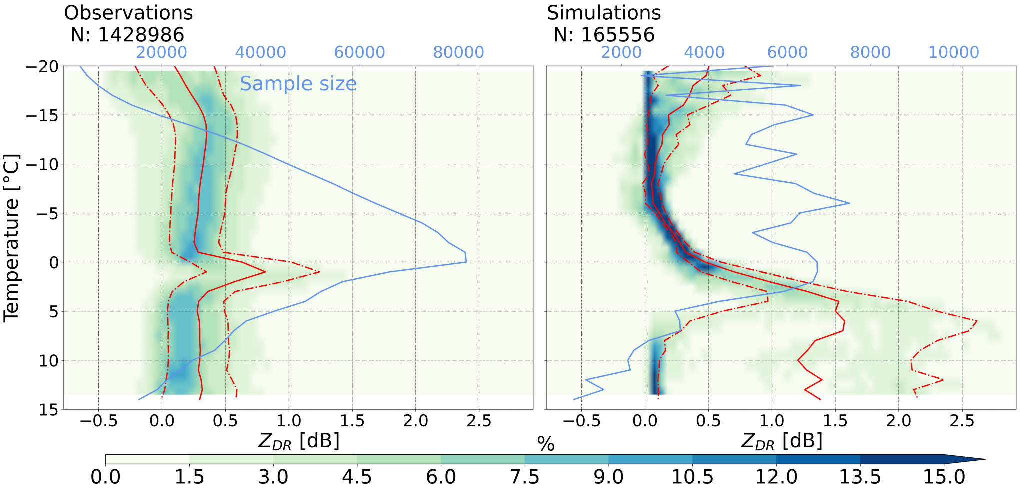

Figure 6: CFTDs of observed Z_{DR} (left) and synthetic Z_{DR} (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020] and ICON.

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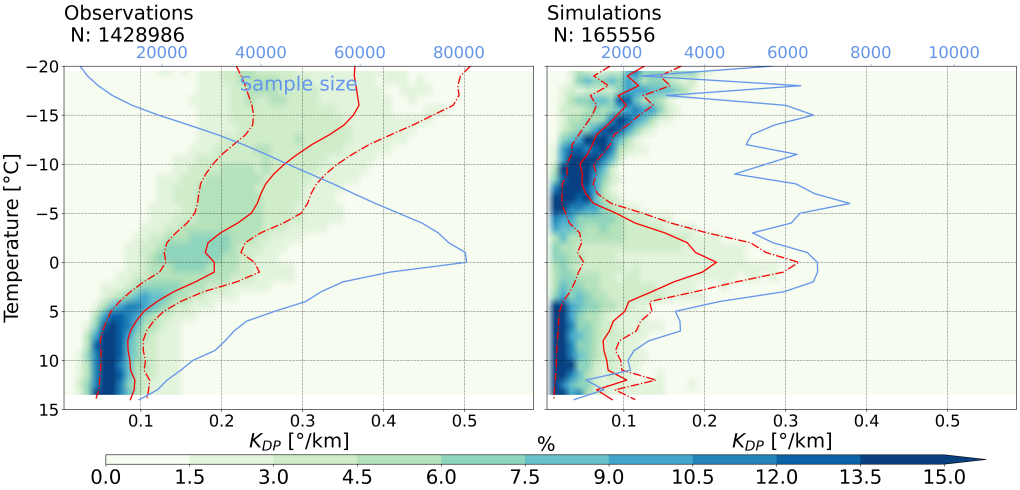

Figure 7: CFTDs of observed K_{DP} (left) and synthetic K_{DP} (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020].

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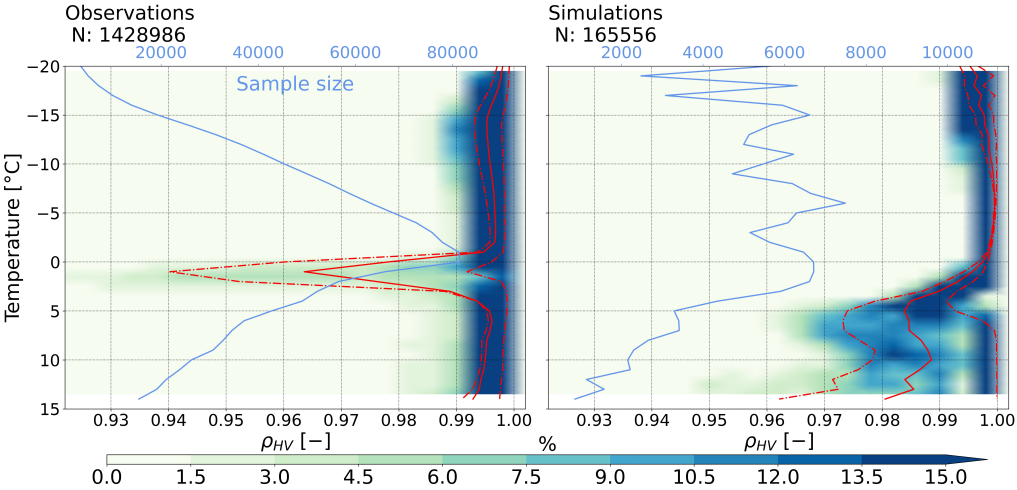

Figure 8: CFTDs of observed ρ_{HV} (left) and synthetic ρ_{HV} (right), with The solid red line representing the mean and the dashed red lines the 20th and 80th percentiles. The blue line shows the number of samples in a 1 °C layer. Temperature information is taken from ERA5 [Hersbach et al., 2020] and ICON.

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Conclusions

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