Testing a new Winter hydrometeor classification algorithm for distinction between ice pellets and freezing rain

Brandon Hickman¹, *Raquel M Evaristo¹, Silke Trömel¹, Clemen Simmer¹

¹. Institute for Geoscience and Meteorology, University of Bonn

Winter precipitation may have a large societal impact, like traffic accidents, power outages, property damage and loss of life. Ice pellets seem to be mostly inoffensive, compared to freezing rain. However, the thermodynamic conditions aloft that dictate which of these precipitation types will fall at the surface are only slightly different, and the result is a difficulty in the nowcast of these cases.

Polarimetric radars have shown the ability to detect a refreezing signature, which consists in a decrease in reflectivity (Zh), and an increase in differential reflectivity (Zdr) and cross-correlation coefficient (ρ hv). In cases of temperature inversions aloft this is seen as a horizontal band in quasi-vertical profiles (QVPs). Based on the signature described above, a refreezing factor (RFF) was developed, and applied to QVPs. RFF varies between 0 and 1, with higher values indicating a higher likelihood of refreezing. This coefficient is then integrated in a hydrometeor classification algorithm (HCA) through an empirical membership function. The output of the new HCA includes 2 new types: freezing rain and ice pellets.

In this presentation the HCA will be applied to a large number of cases observed by the German Deutsche Wetterdienst (DWD) C-band dual-polarization radar network, composed of 17 radars. Dual-polarization was completed in 2014 and a few winters of observations provide a number of cases where both freezing rain and ice pellets were observed. This allows for a statistical verification of the performance of the HCA.

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