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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Polarimetric radar observations during an orographic rain event and the performance of a hydrometeor classification scheme" *by* M. Frech and J. Steinert

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First we thank for the helpful and constructive comments by the reviewers. We first of all have a general statement, as this seemed to be an issue for all of the reviewers. This indicates to us the necessity to sharpen the manuscript so the main points become clearer.

Since the birdbath scan is part of the operational scanning this scan opens the opportunity to provide high-resolution information on the precipitation process to the (end-) user that has not been available before. Furthermore the combination of operational

high resolution profile measurements (birdbath scan), surface measurements and visual observations is in our opinion a unique combination to investigate radar products based on volume scans. To our knowledge there aren't that many studies published where this operational set-up is available. So in the first part we demonstrate what can be seen in birdbath scan, focusing on an observation above the melting layer that is not often revealed, but which has a direct link to surface rain rate, especially if the orography plays a crucial role.

response to the reviewer:

with respect to the comment relating to unusal observations:

this is exactly why we present this case, as it is not what we would expected - it is simply not a text book example. There is no reason and indication to question the measurements here. The suggestion, that this might be downdraft is in our opinion not plausible considering that this is not a convective situation (where one could expect strong downdrafts). Aside from this, if it would be a downdraft associated to a synoptic front for example, at least a hint in frontal activity should be seen in surface pressure. And this is not the case. Also the time scale associated with this event is too large to argue with a strong downdraft. The findings in Houze and Medina (2005) support the intial interpretation of our results. This will be detailed in the revised paper.

regarding the comment about the configuration of the membership functions (MBF) and the usage of S-band thresholds:

Though the implemented hydrometeor classification follows the algorithm of Park et al. (2009) with the related S-band MBF the used thresholds have just an initial status for the usage with C-band measurements. Especially for hydrometeor types consisting of small hydrometeors below the resonance effect (with dimension less than a tenth of the wavelength) this first guess is considered appropriate. For other hydrometeor types based on larger hydrometeors like the big drops or the hail class, which aren't in the focus of this weather case study, a nearly frequency independence isn't fulfilled.

To handle the mentioned relation of the reflectivity intensity to the polarimetric measurements for the rain classes, 2-dimensional MBF as function of the reflectivity are used for ZDR and KDP, cf. the method in Park et al. (2009). Furthermore, for every additional input parameter as HZEROCL, SNOWLMT and the ML history trapezoidal MBF are used for each hydrometeor class. An adaptation of the MBF parameters is envisaged in the course of the testing and verification phase of the hydrometeor classification scheme (if necessary).

Specific comments by the reviewer:

comments related to p8847 line 13: to p 8853 line 2:

we will consider those editorial remarks

p 8853 l 21: will be reformulated

p 8853 l 22: will formulated to be more precise.

p 8853 l 27: melting layer thickness: This is based on the observation in the earlymorning hours, where the melting layer was above the radar site (see Figure 5)

p 8854 l 5: agreed; this will be included as an explanation

p 8857 l 11: will be reformulated.

References:

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Houze and Medina (2005), Turbulence as a Mechanism for Orographic Precipitation Enhancement. Journal of Atmospheric Sciences Vol. 62., pp. 3599–3623.

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