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Advection correction of radar-based probability of hail in Belgium

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Storms that produce hail falls can be extremely localized and fast moving events. Using only reports of observers and/or data from hail-pad networks it is rather difficult to detect the hail storms with a small extent. Weather radars provide atmospheric observations at a high spatial and temporal resolution and have therefore high potential to detect hail events.
Detection of hail events of any scale within the radar range is possible with reflectivity data having sufficient vertical resolution. For the spatial analysis of fast moving storms the temporal resolution of the radar is often insufficient, producing the so called "fish-bone" effect on the daily overview of the hail detection product. This in its turn influences any type of spatial analysis whether it is verification or statistics. Applying an advection correction on the hail probability fields between successive scans can reduce this particular issue.
In this study we apply two distinct hail detection algorithms on the archived data of the C-band radar located in Wideumont, Belgium. The first algorithm is Holleman's version of Waldvogel's probabilistic detection of hail (Holleman, 2001). The second is the Witt's algorithm estimating the probability of severe hail with a diameter of at least 2cm (Witt et al., 1998). The advection correction is based on the optical flow algorithm of Bowler et al. (2004). The velocity vectors, applied for the advection, were calculated in two different ways for each hail event. In the first test the estimation of velocity vectors was done based on the apparent movement of the rain-rate product from the same scans used for calculating the probability of hail (POH). In the second test POH itself was used to estimate the velocity vectors. In most cases both tests show comparable results when applied to large hail storms. However, in the cases with localized hail storms the vectors calculated using the probability of hail product perform better in catching the hail-cell movement.

References:
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