Sizing and Nowcasting Severe Hail Exploiting a Polarimetric C-band Radar Network

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Hail is a frequently occurring and potentially destructive phenomenon especially during summertime convective events. Hail stones with diameters up to 14 cm have been reported in the recent years in central Europe. Concepts and algorithms to detect hail and estimate its size with polarimetric S-band radars do exist. However, most weather radars in Europe operate at C band for which hail size discrimination is more difficult. We here report about a new algorithm based on the attenuation hotspots often generated by hail. The adaptation to hail events, however, requires early warnings. We will show, that hail growth can be predicted from updraft behavior and the spatial and temporal gradients of the specific attenuation. Strong updrafts can be identified and their strength or vertical velocity estimated from $Z_{\text{DR}}$-column heights in convective cells tracked over time. Intensive updrafts allow large hail to grow several minutes before hailstones reach their critical size and begin to fall out. We show examples when column growth is followed up by sudden increases in attenuation most probably due to descending and possibly further growing hail. Thus, $Z_{\text{DR}}$-column tendencies can be used to nowcast hail occurrence and size with considerable lead times

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Figure 1: Radar-based prediction of the maximum possible hailsize category together with reported hail-diameters in the European Severe Weather Database (eswd.eu) for a tracked hail event on 5 July 2015 monitored by the polarimetric C-band radar in Neuheilenbach, Germany.