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Melting Layer and Riming Detection from Vertically Pointing C-band Radar Observations

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The German weather radar network consists of 17 dual-polarization Doppler C-band radars that are operated by the German Weather Service (DWD). These radars are evenly distributed across Germany and record data continuously. One component of the scanning cycle is a vertically looking 'birdbath' scan, which is performed every 5 minutes for a duration of 15 seconds. While the zenith configuration is common for Ka- and W-band cloud research radars, it has mostly been used to calibrate ZDR in operational weather radars so far. Despite the lower temporal resolution, comparisons between zenith observations from cloud radars and weather-radar birdbath scans in close proximity with each other reveal remarkable agreement in the recorded large-scale patterns for various weather systems. In this contribution, we present two data products that can be derived from these scans: A melting layer detection and a classification of rimed particles. Both products make use of the Doppler velocity of falling hydrometeors. The melting layer detection is based on the sharp increase in Doppler velocity in the melting region, while the riming detection algorithm is searching for continuous regions of unusually high (>1.5 m/s) Doppler velocity above the melting layer. Unlike many cloud research facilities, there is generally no additional meteorological instrumentation at the operational sites, so our products must work solely on radar data. Both algorithms are designed to work without manual support, so that they can be used operationally. We will compare the melting layer and riming products to similar implementations previously developed for cloud radars and discuss the challenges and modifications needed to apply the algorithms to the operational weather radars. One benefit of transferring research products to operational radars is the large spatial coverage of such national weather radar networks (about 150 weather radar sites with profiling capabilities across Europe).

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