6.9 WIND TURBINES SEEN IN RADAR DATA WITH THE BIG DIFFERENCE METHOD

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Erroneous radar measurements due to wind turbines are easily seen by eye in radar images. In order to identify these errors quantitatively, we evaluate the differences between two plan position indicator (PPI) scans taken at two adjacent elevation angles. Big differences ("BD" hereafter) in radar reflectivity (dBZ) and Doppler velocity (m/s) are attributed to wind turbines, affecting the radar data on either one or both elevation angles. The range of radar reflectivity considered for this study starts at 5 dBZ, hence neglecting the highly random behaviour of weaker reflectivities. The BD-method works best close to the radar (when the vertical distance between the neighboring elevation angles is small), well below the melting layer (when the radar values remain quasi-constant in the vertical), and when the advection effects caused by fast echo motions and large horizontal gradients in the radar patterns are negligible.

The BD-method is used to assess the size of the volumes around wind turbines that may contain erroneous radar data. We evaluate a 9-hour data set of the DWD-radar at Trkheim, Germany. The data passed the filtering by the radar processor, but did not pass any post-processing to correct erroneous data. The data cover a period with dry weather and heavy thunderstorms followed by stratiform precipitation. The size of the radar pixels is 1 km in range and 1 degree in azimuth. We investigate three wind parks which are in a distance of 2.5, 5 and 7 km from the radar. We define an "influencing volume" ("IV") and a "neighboring volume" ("NV" hereafter). The IV of a single wind turbine is composed of two radar pixels in range, and three radar pixels in azimuthal direction. The NV is composed of two adjacent rows of pixels on the left, back and right side of the IV, seen from the radar site.

We found that the effects of the wind turbines producing BD are restricted to the IV of the wind parks at 5 and 7 km distance from the radar. In the NV, the number of the BD is almost zero, as also far away from the wind parks. Some few BD are still present in the NV of the closest wind park (2.5 km distance to the radar). Inside the IV, the number of the BD decreases with increasing average rainfall intensity. These properties of the BD facilitate the identification and correction of the radar data affected by wind turbines.