Three-Dimensional Reflectivity Composite created from Radar Volume Data

Michael Mott
Forschung und Entwicklung - Zentrale Entwicklung, Deutscher Wetterdienst, Germany
Diederich, Malte (University of Bonn, Hans-Ertel-Centre for Weather Research, Germany)

E-mail: michael.mott@dwd.de

The creation of composite products from multiple radar scans offers a number of advantages compared to the contemplation of single scan data. The investigation of large-scale storms is only possible with composite products due to the limited coverage of single radar sites. Compromised measurements, for example by beam blockage, attenuation, excessive beam broadening, or contamination with ground clutter, can be replaced by data from less affected scans at the affected locations. For this reason, 2D and 3D composite products from radar volume data in high spatial and temporal resolutions are generated, with the intention of supporting meteorologists as well as numerical weather models.

While a 3D composite can be achieved by horizontal 2D composite creation in multiple height layers, the structure of vertical cross sections is of special interest for understanding the microphysical processes involved in the rain event, which in return can find direct use in nowcasting, data assimilation, and object based analysis. Due to the fact that the vertical structure is rarely well-resolved in radar volume data, our focus is on the type of 3-Dimensional interpolation/extrapolation done in between radar beams.

The first implementation of a 3D composite within the POLARA framework of the German Weather Service uses nearest neighbor mapping to sample the spherical data onto the given grid. For value retrieval three interpolation methods (linear, cubic and linear smoothed by cubic spline) are implemented.

Issues such as advection during the scanning process, attenuation, and detectability will be discussed in relation to a weighting/merging scheme which is separately developed by the OASE working group of the Hans-Ertel Centre for Weather Research.

The advantages and drawbacks of both schemes (POLARA / OASE) are presented, discussed and possible synergies are identified