

Real-time estimation and correction for vertical profile of reflectivity in the Danish weather radar network

Rashpal S. Gill

Danish Meteorological Institute, Denmark

Sørensen, Martin B.

Bøvith, T.

E-mail: rsg@dmı.dk

A method has been developed to determine precipitation rates near the surface by estimating vertical profile of reflectivity (VPR) using the radar data from the individual elevation scans and correcting for the effect of radar beam broadening in real-time.

In the current method the raw vertical reflectivity profiles are uniquely modelled by a set of parameters; reflectivity value at the surface reference level, VPR gradients above and below the bright band, the top and bottom heights of the bright band plus the maximum reflectivity within it and its corresponding height. The VPR parameters from single radar are computed using raw data from previous 5 - 6 hours and at ranges 4 km – 40 km, so as to minimize the effects of ground clutter and beam broadening on the radar reflectivity. The heights of the melting layer computed from the high resolution local NWP model with rapid updates (every 1 hour) are used as guidelines to locate the bright band. The VPR correction factors are weighted average of three profiles; local VPR, network VPR and seasonal VPR. Local VPR refers to the profile computed using the data from the single radar, whilst network VPR is an average of the profile computed using the profile parameters from the regional radars with significant areal overlap which in the case of the Danish network means all five radars. Finally, seasonal VPR are computed using a longer time period profiles from the national radar network (typically 30 – 40 days). A major advantage of the current method is that realistic VPR correction factors can be applied to the reflectivity values observed by each radar during routine operations even though local VPR is not available because of either insufficient data or the precipitation fronts have not reached within the desired 40 km range of the radar site.