The evaluation of updrafts in an operational high-resolution NWP model using single-Doppler radar measurements

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As part of the Dynamical and Microphysical Evolution of Convective Storms project (DYMECS), this work concerns the evaluation of updraft size and strength in high-resolution runs of the UK Met Office Unified Model (UM). Updraft velocities have been estimated from range height indicator (RHI) scans using the Chilbolton Advanced Meteorological Radar based on mass continuity and the vertical integration of the observed divergence (or convergence) along the plane of the radar scan. To be precise, such estimates require that the cross-plane divergence is negligible and that the boundary conditions correspond with negligible vertical air motion. For convective rainfall, these conditions are clearly far from assured. To address this problem, velocity fields from the UM at a resolution corresponding to the radar observations have been used to investigate the errors inherent in these assumptions. The similarity found between vertical velocity estimates in a statistical sense, based on the convergence along a single horizontal dimension from both the radar and the UM, has lead to the derivation of mapping functions, which relate these estimates to the actual velocities represented in the model. These functions are then used to provide a best estimate of the true vertical velocities observed by the radar, allowing a statistical evaluation of updrafts in the UM as a function of horizontal grid-length (from 1500m down to 100m) along with other dynamical and microphysical parameterisations.