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Assimilation of radar reflectivity into the LM model with a high horizontal resolution

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An assimilation of radar reflectivity into a numerical weather prediction (NWP) model with a horizontal resolution of 2.8 km is presented and applied to three severe convective events. The used assimilation method takes into account the differences between the model and radar-derived precipitation in modifying vertical profiles of water vapour mixing ratio in each model time step by the nudging approach. Version 3.9 of the LM (Lokal Model COSMO) - NWP model employed in this study includes the explicit formulation of cloud and rain processes involved. Two variants of the assimilation technique are designed and outputs of their implementation are compared. The first variant makes use of the ground data only while the second one utilizes vertical profiles of precipitation water. Both variants provide an improvement of the precipitation forecast results in comparison with the outputs of the control run without assimilation procedures applied. When the assimilated radar data indicates the initial precipitation near an expected storm then the NWP model is capable of forecasting basic features of the storm development 2-3 hours ahead. For one event, the assimilation method taking into account the vertical structure of the precipitation water yields better results than the other that utilized the ground data only. However, for the remaining two events both types of the assimilation method produce comparable results.