Routine monitoring of radar reflectivity observations at the Met Office and lessons for direct assimilation of radar reflectivity data in 4D-VAR

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The Met Office has demonstrated an hourly-cycling, NWP based nowcasting system, with 4D-VAR data assimilation of radar Doppler winds, wind profiler data, MSG SEVIRI water vapour channels, surface synoptic reports, AMDAR reports and EUMETSAT atmospheric motion vectors (AMVs). Radar reflectivity data were assimilated via latent heat nudging of surface rain rates. This system used a 1.5 km horizontal grid version of the Unified Model, running in a southern UK domain. Using the experience gained with this system, the Met Office is developing an hourly-cycling, 4D-VAR based forecasting system covering the whole UK domain, which will allow the direct assimilation of radar reflectivity volume data, together with radar Doppler winds, satellite, aircraft and surface based observations, in 4D-VAR operationally.

Radar reflectivity data are now routinely archived in the Met Office observation database, the MetDB. Generic software packages for observation monitoring have been developed: an observation visualisation system, Uvea, which uses the Met Office Python based visualisation system, Iris, and a scheduling system for monitoring, Komodo, which uses the cylc scheduling engine. These packages have been used to develop a system for monitoring radar reflectivity volume data, which is running routinely. The monitoring system includes comparisons of the raw observations, observations processed for assimilation, and the model equivalent observations derived from the operational UKV 1.5 km model, and is used to produce observation - background (O-B) statistics. The software packages are also being used to monitor backscatter observations from the Met Office ceilometer network, and radar refractivity observations.

Results from this monitoring system are used to inform the design of radar reflectivity assimilation trials, in preparation for the operational assimilation of radar reflectivity volume data in a UK domain 4D-VAR system. This paper will present an overview of the radar reflectivity monitoring system, research results from the monitoring system, and results from assimilation experiments.