



Benefit of high resolution data assimilation and observing systems in the Met Office UK NWP model

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Experiments to measure and apportion the benefit of the 3D-Var data assimilation system in the 4km 'UK4' model are reported. Three principal versions are compared: a continuous data assimilation system, a similar configuration omitting those observation types exclusive to the high-resolution UK4 assimilation system, and a baseline 'no high-resolution DA' beginning from a 25km global analysis downscaled to 4km. By configuring our trials in this manner we can distinguish between the impact due to the higher grid resolution and that arising from the additional high-resolution observation types.

Results from four representative multi-week trial periods spanning July 2011 to March 2012 show that continuous UK high resolution assimilation yielded overall benefits for three of the four periods, relative to starting from the downscaled analysis. The detrimental signal for the fourth period was dominated by poor cloud and screen temperature performances over a 5-day stratocumulus episode. The overall benefit could principally be attributed to assimilating at a higher grid resolution, whereas the contribution from the high-resolution observation types appeared mixed. Investigation of this mixed impact pointed mainly to problems with cloud assimilation, in which recent further progress has been made.

Further observing system experiments were carried out to determine the relative contribution of individual observing networks to the overall performance of the UK4 data assimilation system.

The component which delivered the greatest benefit to forecasts of surface weather variables, as judged by the UK Index impact metric in a data denial experiment, was the surface network of land and marine observations, which was foremost in delivering benefit to visibility, 2-metre temperature and 10-metre wind forecasts.