

Convective-Scale Data Assimilation

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Data assimilation at convection-permitting scales presents a number of fundamental challenges. Typically, convective-scale events develop on short timescales ranging from minutes to hours. It is therefore important to have both observations that sample fine-scale weather at high time-frequency (e.g. radar) as well as models that can accurately represent the important processes (e.g. convection, cloud physics, etc). Data assimilation techniques need to take account of nonlinearities and complex error structures of both observations and high-resolution models. Operational analyses need to be produced within a very short period of time, e.g. a few minutes if required for nowcasting severe convection.

This talk will provide an overview of the major fundamental challenges for convective-scale data assimilation, followed by a brief description of current and planned future data assimilation capabilities both at the Met Office and elsewhere. In parallel with the development of data assimilation techniques for convective-scale, a wide array of high temporal/spatial resolution observation types are being assessed/under development for application in km-scale NWP. These will be reviewed. Results from recent high-resolution observation system (OSEs) experiments will be presented, giving an indication of relative impact in high-resolution UK data assimilation.

The Met Office showcased a number of new capabilities during the London Olympics period (July-August 2012) in preparation for potential future operational implementation. These included a) A 2.2km/12 member convective-scale Ensemble Prediction System (MOGREPS-UK) to provide uncertainty information for DA and forecasting severe weather, and b) An hourly-cycling 1.5/3km 4D-Var NWP-Nowcasting Demonstration Project (NDP). The talk will end with an update on plans to bring both these demonstrators into operations.