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The role of the forecaster in a Nowcasting service

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A 1.5 km resolution convection-allowing Numerical Weather Prediction (NWP) with a rapid update cycle was trialled during an 11-week experiment named The Sydney 2014 Forecasting Demonstration Project (FDP2014). The purpose of the experiment was to understand how to make effective use of a high resolution model in a nowcasting service and to design such a service. The goal of the FDP was to explore the major limitations of the NWP if used in nowcasting. Another goal was to illustrate the value of the subjective evaluation in the early development and design of a new technology. The quality of the NWP systems were assessed via quantitative and qualitative methods. In this analysis the subjective evaluation revealed “themes” that need to be used to design a Nowcasting Service and the supporting training that is based on a high resolution convection allowing NWP. The main aspect that became evident from this analysis was the “predictability issue” and how the forecaster could understand and assess the “model behavior in different situations”.

Forecasters operate using different concepts based on whether they are in a nowcasting role or a short term range role. The nowcasting role is “radar centric” and operates on discrete objects such as storms and the extrapolation of their movement. The short term range role is “NWP centric” and involves meteorological fields that are quite different to those seen on radar displays. In between these two roles there is a gap, the “very short range role” that may be bridged by high resolution models with frequent outputs. And this is area where we see the future role of the forecasters. The 10 minute deterministic NWP outputs of rainfall look very much like the radar reflectivity or radar derived rainfall estimates. The forecasters can interpret the type of the event he/she might experience later during the day by analyzing the initiation mechanisms, the evolution and mode of convection in the 10 minutes outputs and can use the experience they have with storm objects and their environment.

The present role of forecasters is linked to their ability to improve on deterministic NWP forecasts. As the models improve and ensembles are used at higher resolutions, the future role of the forecaster will be in assessing the predictability of the respective situation and defining the policy on how to deal with it during the day. What should the forecasters do in the transition between the deterministic mode and the ensemble modes?

The total error in a nowcast of rainfall is the combination of the measurement error of the radar rainfall field and the unpredictability of the changes in the observed field after the time of the observation. The initial measure of the radar rainfall generates the uncertainty, and the forecast method used at nowcast scale, in this case the field advection, generates the unpredictability. The rainfall field evolves during the forecast period and there is a scale dependency of the skill of the advection method. The limits imposed by the predictability of the atmospheric state at the mesoscale challenges the forecasters to understand when and how they can add value to the nowcasting process. Understanding the predictability of the current situation will enable the forecaster to evaluate the likely skill of the nowcasts and subsequently communicate their degree of trust in the forecast to end users. STEPS is the first operational nowcasting system in the world that evaluates the uncertainty and the unpredictability in real-time and generates an ensemble that reflects the current total error in the rainfall forecasts.

This presentation will demonstrate a technique to assist in the forecast process of evaluating the practical predictability of rainfall through several case studies. The talk proposes the use of the scale dependent autocorrelation analysis that is used in the STEPS algorithms to quantify the rate of change as a function of scale and lead time. This analysis can be done on the outputs of the NWP rainfall 10 minute fields and on the actual radar rainfall. By analyzing these scales, forecasters can understand the scale role in each situation and can develop conceptual models of convection and dominant scales for particular situations and can develop expertise in operating with these new concepts.

The scale analysis should help the forecaster in understanding the type of situation and predictability whilst observations from weather stations, radar and satellites will highly influence the forecasters’ uncertainty estimations in the very short range.