Post-processing of NWP rainfall to facilitate blending with advection forecasts

Robert Brier, Bofu Yu, and Alan Seed
Griffith University, Australia, Engineering and Built Environment, Australia (robert.brier@griffithuni.edu.au)

Good short-term predictions of rainfall over a few hours can be made through advecting the current radar image. Numerical Weather Prediction (NWP) extrapolates high resolution models of the atmosphere. Advection forecasts are useful for a range of 0-3 hours and NWP forecast are generated up to days in advance. The question is to combine the two to optimize the forecast for the 3-24 hour period when information from the initial radar field may still usefully correct the NWP.

To achieve this blending, several questions need to be addressed. Firstly, the reliability of both types of the forecasts needs to be estimated. The reliability of advection forecasts is, to some degree, answered by Short-Term Ensemble Prediction Systems (STEPS) through creating ensembles of forecasts. This can also be applied to NWP's though the size of the datasets involved in this makes it unwieldy.

Furthermore, NWP forecast rainfall has systemic biases, underestimating the area of rainfall and skewing the probability distribution of rainfall rates at each pixel to the right, overestimating the maximums. Post processing of the NWP rainfall is done so the structure more accurately represents real rain fields.

Even with a post-processed NWP there remains the smoothing issue: if the advection and NWP forecasts locate the storm front at different places then blending is smoother than either, decreasing the variance in rainfall across the domain. Thus, we also consider how the real time radar image may be used to correct the NWP forecast in space and time to mitigate this smoothing effect.