

The RAP Seminar Series



NCAR

Short Term Ensemble Prediction System (STEPS): An empirical treatment of forecast uncertainty

by

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Foothills Lab, Building 2, Room 1001
9:30 a.m.*

Quantitative forecasts of rainfall contain errors that are not filtered out over scales that are typically of interest to flash flood warning systems. The uncertainty in the rainfall nowcasts can be represented to down-stream users by using space-time stochastic models to generate ensembles of nowcasts where each ensemble member is equally likely and the spread in the ensemble represents the forecast error.

Techniques to forecast rainfall at very short ranges (nowcasts) are based on advecting radar rainfall observations forwards in time. Uncertainty in the advection forecasts arises from errors in the initial estimations of rain field intensity and motion and from changes to the rainfall field and during the forecast period. The expected lifetime of a storm is a function of size and therefore uncertainty in the temporal development of a rainfall field depends on both the scales of the features that are being tracked and the lead-time of the forecast.

The skill of the advection forecasts declines rapidly with lead-time as the observed features evolve through their lifetime, and at some point the forecasts that are based on numerical weather prediction (NWP) models become the forecast of choice. The errors in the rainfall predictions based on NWP forecasts are also dependent on scale but are not as sensitive to lead-time in the short forecast period. STEPS models the various sources of uncertainty over a range of scales to blend the nowcast into the NWP in an optimal manner, and uses a number of stochastic models to generate an ensemble of perturbations of the deterministic forecast, thereby expressing the forecast uncertainty to the user.

This paper will present results of using STEPS to generate an ensemble of nowcasts for a 1-hour lead-time, and results where STEPS has been used to blend nowcasts with NWP forecasts for up to 6 hours.