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Evaluating the usefulness of spatial forecast verification methods for developing a short-term hydrometeorological prediction system

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The Short-term Explicit Prediction (STEP) program at the National Center for Atmospheric Research (NCAR) is undertaking development of a short-term hydrometeorological prediction demonstration system, following the chain of predictions from QPE to nowcasting to QPF to streamflow. The goals of the project are to improve prediction of heavy rainfall, flash floods and streamflow along the Colorado Front Range; conduct research to identify and produce an optimal mix of observational systems and NWP for real-time nowcasting and forecasting of heavy rainfall and streamflow; and in 2014, test an end-to-end hydrometeorological system in real-time. For initial investigation and development, a number of case studies have been identified in the Colorado Front Range – including several flooding cases – over the last several years. The prediction systems are initially being tested and will be optimized for these cases before follow on evaluation of cases identified in 2013 and in a real-time evaluation in 2014.

Forecast verification and evaluation is a fundamental aspect of this project, and will be used to inform choices related to all steps in the prediction process (i.e. from QPF to streamflow). Spatial verification methods have shown promise for many aspects of this type of prediction, but have not gained wide use by researchers or in operational setting. The goal of the verification component of the project is to identify methods and metrics that can provide meaningful information to the forecast developers, and to demonstrate how these methods can help in optimizing the full forecasting system.

In the first phase of the project, a variety of methods are being applied to sample forecasts for the case studies. The targeted methods include traditional contingency table statistics (as a baseline methodology), neighborhood approaches, object-based methods, and field deformation techniques. Results of these investigations will be demonstrated to the forecast developers and compared to determine which approaches are most informative for this end-to-end forecasting system. The benefits of the spatial methods will be carefully considered in terms of their ease of application and the kinds of information – specifically relevant for this project – that they yield. Results of these initial investigations, along with the overall goals of the project, will be described.