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A Statistical-Distributed Hydrologic Forecast Strategy

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To meet the National Oceanic and Atmospheric Administration (NOAA) objective to increase lead-time and accuracy of flash flood forecasts, the NOAA National Weather Service (NWS) Office of Hydrologic Development (OHD) is investigating the use of distributed hydrologic models forced by high-resolution precipitation observations and forecasts. Unlike lumped river models, distributed hydrologic models can run at the spatial and temporal scales necessary to model flash floods. However, hydrologic model errors tend to increase with decreasing basin sizes, and the scales at which we can benefit from high-resolution models are not well known. Recently, simulation experiments using the OHD Hydrology Laboratory (HL) Research Distributed Hydrologic Model (HL-RDHM) and a statistical-distributed post-processor have shown improvements over the current NWS Flash Flood Guidance System (FFG) for basins down to 40 km2 in area. Further tests on even smaller basins are planned. The statistical-distributed post-processor is a recently developed capability designed primarily for flood forecasting for ungauged locations. The statistical-distributed algorithm produces high-resolution grids of forecast flood frequency in each model cell for an event. These flood frequency values provide historical context for assessing the severity of an event, and the algorithm includes an inherent bias correction that reduces errors in model predicted peaks. In addition, a number of forecasting case studies have been run using data from the OHD Multisensor Precipitation Nowcaster (MPN) to force HL-RDHM. Results from these studies will be presented and discussed. Suggestions will be presented for future studies that might be useful to help understand the strengths and weaknesses of the statistical-distributed modeling approach to account for the effects of uncertainty on hydrological forecasts.