Assessment of Hydrologic Forecasts Generated Using Multi-Model and Multi-Precipitation Product Forcing

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The study assesses the prediction capability of hydrologic forecasts generated using multiple distributed hydrologic models driven by multiple high-resolution precipitation forcing products. We use a mix-and-match approach to investigate the sources of uncertainty and skill due to different combinations of the precipitation sources and rainfall-runoff distributed model components. Examples include comparing two different routing schemes keeping everything else exactly the same, or using two different input products for exactly the same hydrologic model configuration. Inspection of the differences based on comparisons with streamflow observations together with river network-wide inspection of water transport dynamics leads to better understanding of the overall forecasting system requirements for skillful prediction. In this study, we use a variety of forcing products including MRMS, Iowa Flood Center (IFC), and NWS polarimetric QPE with/without HRRR QPF and drive the National Water Model (NWM) and the IFC Hillslope-Link Model (HLM). We consider all possible combinations of the modeling elements (forcing products and model routing components) to evaluate prediction capability affected by each one of them. The analysis framework investigates differences in multiple aspects of streamflow (e.g., peak flow) among different combinations and the behavior of these differences with changes in the upstream drainage network. We define forecast errors as a function of such variables as basin scale, forcing product resolution and uncertainty, and hydrologic model structure and components. We develop a web-based system that efficiently organizes, analyzes, and disseminates the mix-and-match analysis results. This system allows visualization of the comparisons and evaluation results within space and time context and communication with the NWS forecasters and researchers.