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Developing a Seamless Hydrologic Forecast System: Integrating weather and climate prediction

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Skilful and reliable forecasts of land surface hydrologic conditions from daily to seasonal scales will facilitate the management of reservoirs, agriculture and urban water resources, and provide early warning of flooding and droughts. With the improvement of numerical weather and climate predictions, dynamical model-based short-term or seasonal hydrologic forecasts have been widely implemented. However, limited dialogue exists between the hydrometeorological forecasting and the hydroclimate prediction communities. Given that the weather-climate prediction problem is seamless, and phenomena often occur at all time-scales, atmospheric scientists have been developing seamless prediction system in recent years using unified modeling systems to predict both weather and climate. Therefore, it is now time to develop seamless hydro-meteorological forecast systems that can provide forecast capability from flash flooding to seasonal droughts within a common system. Such a system would also allow one to investigate the interaction of hydroclimatic processes across scales and should enhance hydrologic predictability. In this presentation, several decades of 16-day reforecasts from NCEP's latest Global Forecast System (GFS) and 9-month reforecasts from its Climate Forecast System version 2 (CFSv2) will be used to investigate how the two-week weather forecast that has higher resolution and more observations in its data assimilation contributes to seasonal hydrologic predictability, and whether the seasonal climate forecast model that fully resolve the ocean-atmosphere-land coupling system is useful to extend the 1-2 week short-term hydrologic forecast up to 3-4 weeks. The Ohio basin in mid-western United States will be used as a case study.