Implementation of the WRF-Hydro Model in the Great Lakes Region: A Maumee River Test Case

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Introduction
Beginning in the summer of 2016, the NOAA National Water Center (NWC) in partnership with the National Centers for Environmental Prediction (NCEP), the National Center for Atmospheric Research (NCAR) and other academic partners have produced operational hydrologic predictions for the nation using a new National Water Model (NWM), which is based on the community Weather Research and Forecasting model (WRF) extension package (WRF-Hydro) modeling system (Gochis et al. 2015). The WRF-Hydro modeling system is a physics-based, distributed hydrologic modeling system and has been used in several streamflow prediction applications in the U.S. and around the world.

Purpose
• The Great Lakes basin is not entirely included in the current NWM
• Implementation of the WRF-Hydro: preparing high-resolution terrain data; parameterizing lakes and reservoirs; calibrating the model parameters.

Approach
Preparation of High-resolution Terrain Data in the Great Lakes Basin
- Hydrofabric
- National Hydrography Dataset (NHD) Plus version 2 in U.S.
- Great Lakes Hydrography Dataset (GLHD) for Canada
- Gauges
- U.S. Geological Survey stream (USGS)
- Environment and Climate Change Canada (ECCC)

Experimental Designs
- Offline WRF-Hydro (250 m)
- North American Land Data Assimilation System version 2 (NLDAS2)
- Special Precipitation: NCEP/CPC Stage IV
- Coupled WRF/WRF-Hydro (250 m)

Results I: Forcing Sensitivity

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<tr>
<th>Experiments</th>
<th>Meteorological Forcing</th>
<th>Precipitation</th>
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<tr>
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<td>NLDAS2</td>
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<td>Stage IV</td>
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<td>NLDAS2</td>
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Validation of the Channel flow at Maumee River

Conclusion and Discussion
- Conclusion from Preliminary Experiments
  - The WRF-Hydro capable of reproducing the channel flow variability
  - More sensitive to precipitation compared to meteorological forcing
  - Baseflow important in the Great Lakes region

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