

## **A high-resolution atmospheric, wave and circulation forecast system for the Great Lakes region**

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The Great Lakes region contains many shallow coastal areas that are vulnerable to flooding and poor water quality (e.g., Saginaw Bay, Green Bay, Grand Traverse Bay). These regions feature complicated atmospheric conditions and irregular bathymetric characteristics, which are not well resolved by NOAA's current structured grid operational models WAVEWATCH III and the POM-based Great Lakes Operational Forecast System (GLOFS). Atmospheric models over the Great Lakes also require high resolution (e.g. < 2 km) to adequately resolve various physical phenomena. This paper presents the development of a next-generation, coupled wave and circulation operational model to address these needs, which is based on FVCOM and an unstructured version of WAVEWATCH III. As part of the initial system development presented here, WRF model runs were conducted at various spatial (1-12 km) and temporal (10-60 min) resolutions for a series of significant storms. These were subsequently used to force FVCOM and WAVEWATCH III simulations at resolutions down to 200-500 m. The results show the significant impact of the WRF model resolution on capturing atmospheric structures over the lakes, as well as the critical role of the higher nearshore resolution in reproducing waves and surge at vulnerable coastal locations.