Novel Modeling Tools for Propagating Climate Change Variability and Uncertainty into Hydrodynamic Forecasts

Andrew Gronewold, Tim Hunter, Craig Stow, Tom Croley

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Understanding impacts of climate change on hydrodynamic processes and ecosystem response within the Great Lakes is an important and challenging task. Variability in future climate conditions, uncertainty in rainfall-runoff model forecasts, the potential for land use change, and the broad range of spatial and temporal scales at which hydrological processes can be represented collectively contribute to significant gaps in this understanding. We attempt to help close some of these gaps through a two-step process. First, we employ an exponential-dispersion (ED) model to reconstruct long-term precipitation dynamics throughout the Great Lakes region. Because the parameters of the ED model can be interpreted as linear functions of common precipitation metrics (including event intensity, event duration, and the duration between individual events), we can combine results of the ED model calibration with output from regional scale climate models to simulate potential future precipitation dynamics scenarios. Second, we feed output from the ED model into two different rainfall-runoff models applied across a range of watersheds throughout the Great Lakes region. The results of our analysis help us better understand the relative magnitude of intra- and inter-model variability, and also how that variability might propagate into different (and perhaps conflicting) ecosystem management decisions under future climate change scenarios. *Although this work was reviewed by EPA and approved for publication, it may not necessarily reflect official Agency policy.*