DEPARTMENT OF GEOGRAPHY

INDIANA UNIVERSITY
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Hydrology of the people, by the people, for the people: bringing together citizen science and hydrologic forecasting

Abstract: For many years, researchers have successfully modeled the large-scale dynamics of river discharge, water temperature, and fish habitat across basins throughout the world. A limitation of the application of these large-scale eco-hydrological models to smaller basins is that fine-scale data used to calibrate the models are typically inaccessible for small stream networks due to the large costs of obtaining and maintaining data. Local communities, most of whom are experts on the local environmental setting, are perhaps the missing link for the collection of this type of data. Here, we use citizen science observations of stage height and water temperature as calibration/validation data for a hydrologic model developed for a small basin (184 km^2) in northern Michigan where a citizen science network (CrowdHydrology) is already in place. Within this framework, the hydrologic model is re-calibrated on a bi-weekly schedule using assimilated citizen-science data. The hydrologic model shows improvement with each calibration iteration, with overall increases in the Nash-Sutcliffe model efficiency coefficient (-0.71 after model development to the present-day value of 0.53) and the refined index of agreement (0.45 to 0.74) for downstream sites. The calibrated model is used to present 7-day forecasts of streamflow, water temperature, and aquatic species habitat (brown and brook trout) throughout the river basin using precipitation and temperature forecast data from the *National Centers for Environmental Prediction.* The forecasts are displayed on a user-friendly website that, based on interviews with the community, is specifically designed to increase citizen-science participation rates, which, in turn, increases the accuracy of the hydrologic model. We show that this novel approach can benefit small communities by providing real-time, useable information on local water resources derived from complex hydrologic models. Using the methods developed here, real-time forecasting based on citizen-observed data could be adapted to better manage freshwater resources.

Friday, November 8, 2019

3:35 p.m. in the

Student Building 005

(Refreshments provided at 3:15 p.m. in Student Bldg. 018)

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