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H51L-1461: The National Ecological Observatory Network: Creating stage-discharge rating curves by combining physical inputs with probabilistic modeling techniques

Friday, 14 December 2018

08:00 - 12:20

📍 *Walter E Washington Convention Center - Hall A-C (Poster Hall)*

A detailed characterization of channel geometry is a critical component in developing stage-discharge rating curves that can enhance the forecasting of hydrologic events. The National Ecological Observatory Network (NEON) collects physical streamflow gauging measurements and high-resolution channel geometry data at 27 stream and river monitoring sites across the United States over a 30-year period, beginning in 2018. NEON creates stage-discharge rating curves using a Bayesian modeling (BaM) technique developed by the Bayesian Rating Curve Advanced Graphical Environment (BaRatinAGE) development team (Le Coz et al., 2013; Le Coz et al., 2014).

Each rating curve relies on a "prior" model that is developed based on hydraulic channel controls that govern the stage-discharge relationship in a given aquatic reach. Section and channel controls are characterized by analyzing long-profile and cross-sectional survey data derived from high-resolution total station surveys. The physical dimensions of the channel, the number of hydraulic controls selected, and the physical dimensions of the hydraulic controls are all derived from these survey data. NEON then calculates exponential equations for each channel control which include associated uncertainty values. A "posterior" rating curve is then fit using the "prior" model and the gauging records using Bayesian estimation of the rating curve and a Markov Chain Monte Carlo (MCMC) sampling (Le Coz, 2014). These methods provide 500 realizations from the posterior distribution, which are used to quantify uncertainty in continuous discharge values (Le Coz et al., 2014).

By combining prior knowledge of channel controls (with associated uncertainties) with uncertainties contained in individual streamflow gauging measurements, rigorous stage-discharge rating curves can be developed and maintained that result in accurate streamflow forecasting. Over the next 30 years, NEON aims to serve these data to the research community in order to better understand the degree in which aquatic ecosystems are changing at the continental scale.

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