Geophysical Research Abstracts
Vol. 18, EGU2016-7887-1, 2016
EGU General Assembly 2016

Global maps of streamflow characteristics based on observations from several thousand catchments

Hylke Beck (1), Ad de Roo (1), and Albert van Dijk (2)

(1) European Commission, Joint Research Centre (JRC), Ispra (VA), Italy (hylke.beck@jrc.ec.europa.eu), (2) Fenner School of Environment & Society, Australian National University, Canberra, Australia

Streamflow (Q) estimation in ungauged catchments is one of the greatest challenges facing hydrologists. Observed Q from three to four thousand small-to-medium sized catchments (10–10 000 km^2) around the globe were used to train neural network ensembles to estimate Q characteristics based on climate and physiographic characteristics of the catchments. In total 17 Q characteristics were selected, including mean annual Q, baseflow index, and a number of flow percentiles. Testing coefficients of determination for the estimation of the Q characteristics ranged from 0.55 for the baseflow recession constant to 0.93 for the Q timing. Overall, climate indices dominated among the predictors. Predictors related to soils and geology were relatively unimportant, perhaps due to their data quality. The trained neural network ensembles were subsequently applied spatially over the entire ice-free land surface, resulting in global maps of the Q characteristics (0.125° resolution). These maps possess several unique features: they represent observation-driven estimates; are based on an unprecedentedly large set of catchments; and have associated uncertainty estimates. The maps can be used for various hydrological applications, including the diagnosis of macro-scale hydrological models. To demonstrate this, the produced maps were compared to equivalent maps derived from the simulated daily Q of four macro-scale hydrological models, highlighting various opportunities for improvement in model Q behavior. The produced dataset is available via http://water.jrc.ec.europa.eu.