Geophysical Research Abstracts
Vol. 13, EGU2011-10675, 2011
EGU General Assembly 2011

Improving hydrological model predictions by incorporating rating curve uncertainty

Mark Thyer (1), Benjamin Renard (2), Dmitri Kavetski (3), George Kuczera (3), and Martyn Clark (4)

(1) School of Civil, Environmental and Mining Engineering, University of Adelaide, Adelaide, Australia (mthyer@civeng.adelaide.edu.au), (2) UR HHLY, Hydrology [U+2010]Hydraulics Unit, Cemagref, Lyon, France (benjamin.renard@cemagref.fr) , (3) Discipline of Civil, Surveying and Environmental Engineering University of Newcastle, Callaghan, Australia (dmitri.kavetski@gmail.com, george.kuczera@newcastle.edu.au), (4) National Center for Atmospheric Research, Boulder, Colorado, USA (mclark@ucar.edu)

This study identifies and analyses the sources of error in runoff estimation via rating curves. This was undertaken by applying the Bayesian Total Error Analysis (BATEA) Framework to the rating curve model used to transform river stage to runoff for the Mahurangi catchment – a heavily instrumented experimental catchment in New Zealand. The systematic errors due to rating curve uncertainty were the dominant source of uncertainty. This rating curve uncertainty is due to a limited number of uncertain runoff gaugings. The contribution of the random error component was small. This contradicts the common assumption of random runoff measurement error used in hydrological model calibration. The impact of rating curve uncertainty was incorporated into hydrological model calibration for the hourly Mahurangi data using the BATEA framework. Comparing these results to the typical standard least squares approach (with fixed rating curve) illustrated that incorporating rating curve uncertainty improved the reliability of the hydrological model predictions and caused a shift in the parameter distributions. These results have implications for hydrological model calibration and the estimation of model structural errors. Runoff data are typically assumed to be "observed" but rating curve uncertainty induces significant systematic runoff errors which can have a significant impact on hydrological model predictions.