Geophysical Research Abstracts
Vol. 19, EGU2017-5791, 2017
EGU General Assembly 2017

Identifying dominant storage-runoff processes to constrain structures and parameters of rainfall-runoff models: moving from model calibration to custom-made modeling

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The present study aimed at developing a data-based rainfall-runoff modeling methodology with continuous hourly precipitation and discharge data to transition from deductive to inductive modeling approaches. This methodology follows the steps as (1) identification of characteristic recession curves and recession time constants from a hydrograph, (2) separation of the hydrograph into several components with numerical filters characterized by the recession time constants, (3) formulation of storage-runoff relationships for each runoff component separated by numerical filtering and (4) identification of model structures and parameters reflecting the number of runoff components and storage-runoff relationships for each runoff component. The application showed that this methodology is considerably powerful in identifying dominant rainfall-runoff processes and constructing a rainfall-runoff model that reflects the dominant rainfall-runoff processes. Therefore, the series of results obtained by this methodology should be useful in constraining the general behaviors of distributed rainfall-runoff modeling in a data-rich environment.