Geophysical Research Abstracts
Vol. 20, EGU2018-10673, 2018
EGU General Assembly 2018

Predicting runoff signatures for Australian catchments using regressions and hydrological modelling

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A runoff signature refers to a distinctive set of runoff or streamflow indices for a catchment. They include runoff coefficient, zero flow ratio, flows at different percentiles, a measure of runoff seasonality, and flow duration curves. They are essential for water resource management, catchment classification and runoff predictions. This study predicts thirteen runoff signatures for 605 Australian catchments by using three approaches: multiple linear regression, regression tree ensemble, and hydrological modelling. We found that all the three approaches perform well for predicting mean annual and high flow signatures. But, they perform quite differently for predicting low flow and flow dynamic signatures. The regression tree ensemble outperforms the other two, multiple linear regression is intermediate and the hydrological modelling performs worst. Our results suggest that the regression tree ensemble offers significant potential for large-scale runoff signature predictions in ungauged catchments and in the future.