

A comparison of the baseflow recession constant (K) between a Japanese cypress and mixed-broadleaf forest via six estimation methods

ABSTRACT

The baseflow recession constant (K) is known to be a versatile parameter used in forecasting low flows, flow-frequency analyses, improving regional models, and other various hydrological analyses. This study took place in Inuyama city, Aichi prefecture, central Japan, where K for two catchments of differing vegetation [Japanese cypress (CF), 2.42 ha; mixed-broadleaf (MB), 2.08 ha] were produced via six estimation methods and compared. Water level was recorded by dataloggers (converted to daily discharge) and rainfall, by raingauges. Over 5 years (May 2013–April 2018), 18 baseflow recession events were qualified for analysis from which K were calculated. Overall, K in CF (0.969) was marginally higher than in MB (0.955), which translates to lower water depletion in CF possibly due to lower transpiration. In each catchment, K did not differ significantly between the growth and dormant period. Root mean square error (RMSE) is lower and less variable in CF than in MB. Reproducing baseflow using season-specific K values did not show any clear reduction in RMSE; hence, the complexity is not justified. In general, all K-estimators performed well (low RMSE) and can be used. Out of six K-estimators, two have relatively higher standard deviation (SD) and will underestimate baseflow especially when the K was produced from short (< 6 days) baseflow recession limbs. Others reproduce unbiased baseflow but have relatively higher SD and RMSE. None of the estimators were unusable, but two estimators that have the lowest SD and least bias were recommended.