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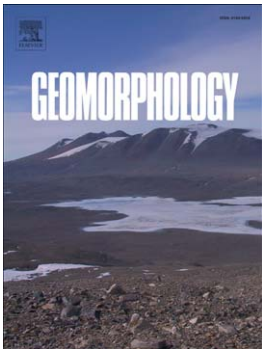

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Geomorphology as a first order control on the connectivity of riparian ecohydrology

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Abstract

Geomorphic controls on ecohydrological connections, while implicit in processes such as the derivation of transpired water from alluvial aquifers, have not been systematically investigated. In this article we test the hypothesis that geomorphic setting is an important control on groundwater-sourced riparian evapotranspiration (ET) through a statistical investigation of 30 years of daily flow data, monthly precipitation data, and semimonthly satellite images at fourteen 1-km-long river reaches representing a range of geomorphic settings in the semiarid landscape of New Mexico, USA. We focus on correlations between vegetation greenness (as a surrogate for vigor and transpiration rates), interannual variability in flow and rainfall characteristics, and valley metrics such as width, slope, and concavity. Sites were considered individually and in groups based on classification as perennial or intermittent. Principal component analysis (PCA) was used to distill related metrics into significant, uncorrelated, interpretable, underlying variables. Components were interpreted in the same manner as a factor analysis and were found to include overall magnitude of greenness, within-summer variability of greenness, overall wetness, rain vs. flow dominance, snowmelt vs. monsoon dominance, and mountain vs. basin geomorphic setting, among others. To broadly test the hypothesis that geomorphology affects the relationship

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