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Landscape and Storm Controls on Recession Coefficients over Small Mountainous Catchments in Taiwan

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Recession characteristics of catchments is one of the main concerns of runoff generation, water resources and aquatic ecosystem management. Numerous previous studies accessed the relationship between recession and landscape characteristics to estimate the recession behavior in ungauged watersheds. However, most studies used the single ‘representative’ recession parameter to correlate with landscape features. Fewer studies combined the landscape features with multi rainstorms to determine the change of recession parameters in different landscape conditions. Meanwhile, the recession behaviors in small mountainous rivers are rarely documented and discussed. Here, we collected hourly streamflow observations from 19 subtropical mountainous catchments with over 600 rainstorms to evaluate recession coefficients of quick and slow recession segments (Tq and Ts). Results revealed that Tq and Ts are 8.6±6.2 hr and 30.7±18.5 hr for the watersheds indicating the travel time in this region is in the hourly scale. Both Tq and Ts are fairly good related to several landscape characteristics, notably drainage density ($R2 > 0.39$, power) is negative to both Tq and Ts , and slope of stream network ($R2 >0.45$, exponential) is positive to both Tq and Ts . In addition, Both Tq and Ts are fairly good related to several storm characteristics, negative to peak flow ($R2 >0.20$, power), positive to duration of rising lamb ($R2 >0.59$, exponential). Besides, and initial flow is positive ($R2 =0.28$, linear) correlated to both Tq and Ts as well. Both Tq and Ts increase (Tq from 5 to 12 hr, Ts from 25 to 43 hr) with the decrease of drainage density. Meanwhile, both Tq and Ts decrease 1 to 3 hr with increase of peak flow. The difference of Ts caused by rainstorms decreases with the increase of drainage density. Therefore, the drainage density, slope, and elongation are the first-order factor for recession behavior. The storm magnitude and duration play a secondary role in the recession behavior. The relationship between recession coefficient and landscape characteristics can facilitate the understanding of recession analysis and applicability in ungauged watersheds.