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Surfacewater-groundwater interaction inferred from discharge vs. basin area curves

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Peak discharge (Q_P) vs. basin area (A) curves have been studied for long time leading to the development of some of the promising hydrological response models. In this study we also analyze discharge vs. basin area curves for recession periods. We denote the characteristic discharge, Q_n, as the discharge observed in the n-th day after a peak, then for each value of n we analyze Q_n vs. A curves, which typically follow a power law equation of type: $Q_P = A^{\theta_n}$. The exponent θ_n for $n = 0$ is known to take value between 0.5 and 1 (note that $Q_n = Q_P$ for $n = 0$), and the commonly accepted theoretical explanation for it is that Q_P is controlled by width of channel network and effective rainfall duration. This premise is based on the assumption that surface flow dominates during a flood event in a basin and that flow velocity is constant everywhere in the stream network of the basin. As n increases, i.e. during recession periods, Q_n is expected to be controlled by subsurface flow. According to the geomorphological recession ow model Q_n for higher values of n is controlled by the dynamics of saturated channel network, and for this case the value of θ_n is close to 1. Results here show that θ_n increases and approaches 1 as n increases, conforming the notion that a transition from surface water dominated flow process to subsurface water dominated flow process occurs with time during a recession event.