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Geomorphological and hydrological implications of a given hydraulic geometry relationship, beyond the power-law

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Channel geometry and hydraulic characteristics of a given river network, i.e., spatio-temporal variability of width, depth, and velocity, can be described as power functional relationships of flow discharge, named 'hydraulic geometry' (*Leopold and Maddock*, 1953). Many studies have focused on the implication of this power-law itself, i.e., self-similarity, and accordingly its exponents. Coefficients of the power functional relationships, on the contrary, have received little attention. They are often regarded as empirical constants, determined by 'best fitting' to the power-law without significant scientific implications.

Here, we investigate and claim that power-law coefficients of hydraulic geometry relationships carry vital information of a given river system. We approach the given problem on the basis of 'basin hydraulic geometry' formulation (*Stall and Fok*, 1968) which decomposes power-law coefficients into more elementary constants. The linkage between classical power-law relationship (*Leopold and Maddock*, 1953) and the basin hydraulic geometry is provided by *Paik and Kumar* (2004). On the basis of this earlier study, it can be shown that coefficients and exponents of power-law hydraulic geometry are interrelated. In this sense, we argue that more elementary constants that constitute both exponents and coefficients carry important messages. In this presentation, we will demonstrate how these elementary constants vary over a wide range of catchments provided from *Stall and Fok* (1968) and *Stall and Yang* (1970). Findings of this study can provide new insights on fundamental understanding about hydraulic geometry relationships. Further, we expect that this understanding can help interpretation of hydraulic geometry relationship in the context of flood propagation through a river system as well.

Keywords: Hydraulic geometry; Power-law; River network

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