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Inter-relationship between scaling exponents for describing self-similar river networks

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Natural river networks show well-known self-similar characteristics. Such characteristics are represented by various power-law relationships, e.g., between upstream length and drainage area (exponent h) (*Hack*, 1957), and in the exceedance probability distribution of upstream area (exponent ε) (*Rodriguez-Iturbe et al.*, 1992). It is empirically revealed that these power-law exponents are within narrow ranges. Power-law is also found in the relationship between drainage density (the total stream length divided by the total basin area) and specified source area (the minimum drainage area to form a stream head) (exponent η) (*Moussa and Bocquillon*, 1996).

Considering that above three scaling relationships all refer to fundamental measures of 'length' and 'area' of a given drainage basin, it is natural to hypothesize plausible inter-relationship between these three scaling exponents. Indeed, *Rigon et al.* (1996) demonstrated the relationship between ε and h. In this study, we expand this to a more general ε-η-h relationship. We approach ε-η relationship in an analytical manner while η-h relationship is demonstrated for six study basins in Korea. Detailed analysis and implications will be presented.

References

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