Paper Entitled: Channel concavity controls plan-form complexity of branching drainage networks

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Recommendations:

This paper presents a framework to quantify channel networks' complexity based on the distribution of lengthwise asymmetry. Using both field observations and numerical simulations, the authors argue that the channel concavity index is the major control of planform complexity. The manuscript is interesting and written well. Given the data and the methodology employed, the article is relevant to the journal, however minor changes and clarifications ought to be made prior to its publication.

Below, I outline a few examples of specific points and clarifications:

- Page 15, Line 414: Do these computed or assumed θ values represent here single scaling regimes? For example, if computed from slope-area curve, θ value may be different for different range of scales for same topography and can vary with climate (see Hooshyar et al 2017). Also, smaller θ is usually associated with colluvial channels/sub-basins which tend to exhibit side-branching vs branching structures. Are these simple-looking configurations referred to such subbasins?
- How do topographies with multiple concavity index exhibit complexity? Are they more complex than topographies with single θ? Are there certain range of scales that dominate network complexity?
- Line 215: Is there a dependence (linear or nonlinear) of θ on climate aridity? Looking at figure 6, it is not very apparent as the data show high variability. Zanardo et al 2013 showed that the c-value (expressing side-branching in topology, a measure of RN's topological complexity) increases with increasing precipitation, whereas Ranjbar et al 2020 showed that the network complexity, quantified via entropy, increases with increasing c-value. I wonder if the authors observe similar relation of θ with climate aridity- perhaps such a curve of θ vs AI may be useful.
- Line 246: Power-law (typo)
- Figure 4: Although not in terms of θ, similar observations were made by AbedElmdoust et al 2016 (see their Figs 1 and 2).
- Line 80: How is the stationary defined? In X and Y only or in X, Y and Z as well?

Zanardo, S., I. Zaliapin, and E. Foufoula-Georgiou, Are American rivers Tokunaga self-similar? New results on fluvial network topology and its climatic dependence (2013), J. Geophys. Res. Earth Surf., 118, 166-183, doi:10.1029/2012JF002392.

Ranjbar S., A. Singh, and D. Wang (2020), Controls of the Topological Connectivity on the Structural and Functional Complexity of River Networks, Geophys. Res. Lett., https://doi.org/10.1029/2020GL087737.

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Abed-Elmdoust, A., M.-A. Miri, and A. Singh (2016), Reorganization of river networks under changing spatiotemporal precipitation patterns: An optimal channel network approach, Water Resour. Res., 52, doi:10.1002/2015WR018391.