

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
<https://doi.org/10.5194/hess-2021-479-RC2>, 2021
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Reply on AC2

Keith Beven (Referee)

Referee comment on "Morphological controls on surface runoff: an interpretation of steady-state energy patterns, maximum power states and dissipation regimes within a thermodynamic framework" by Samuel Schroers et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-479-RC2>, 2021

Well yes ... it seems a straightforward extension in theory, since again it is not too difficult to write down balance equations. But in practice you have now split your significant unknown term D_f into a number of unknown terms (even given the simplifying assumptions of steady state flows, well mixed sediment etc) that hydrologists and geomorphologists have struggled with for over a century (and we STILL resort to Manning's n or some assumed constant fraction of kinetic energy). So I think the critical thing in an revision is to really make it clear how this can help frame the problem of closing that energy balance and having some clearer understanding of how to evaluate the D_f term - splitting it into component parts might provide some cursory understanding - but what is needed to allow a proper evaluation (remembering that we are actually interested in transient dynamic flows when we often cannot easily close the mass balance equations in practice)?

Just to add - I certainly do not want to discourage this research programme but by staying in the "theoretical" domain it does not yet seem to be really addressing the most significant question.