

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-479

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-RC1>, 2021

I fully understand that this is a contribution that forms part of an on-going research program to introduce and explore the consequences of thermodynamic principles in hydrological theory. As such the attempt to do this for hillslope runoff is of interest, despite the rather restrictive assumptions under which the analysis is carried out. My main comment is that the discussion should reflect those limitations more, rather than making inferences that are far beyond the results presented.

It would be also useful (I think to this research program as a whole) if some of the concepts could be discussed more clearly. In this case in particular it is the D_f component of the energy balance. This is initially the energy dissipation that is the residual of potential and kinetic energy components, and then suddenly becomes equivalent to stream power in a discussion related rivers and sediment transport (even when sediment transport is never actually considered in the analyses). I think a section that discusses how D_f should be characterised for laminar/transitional/turbulent flows before and after a threshold for sediment mobilisation might be really useful to the reader. As it is, it seems only that a constant Manning n is used to convert to velocity, which is certainly one characterisation but surely might not be considered adequate. Perhaps this suggests a bit more than minor revision.

Further comments are included on the manuscript.

Keith Beven

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-479/hess-2021-479-RC1-supplement.pdf>