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Reply on RC1

Samuel Schroers et al.

Author 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-AC1, 2021

First, we would like to thank Keith Beven for his time, effort and insightful comments. We also very much welcome the upload of a commented manuscript and will gladly incorporate his suggestions to clarify the presentation of our approach in a revised manuscript.

As we understand the principal point of criticism made by KB, we agree that the manuscript will benefit from a clearer definition of our theory and a reflection of the main simplifications. We also agree that the results and inferences made apply to landscape forms that are primarily formed by overland flow and the related forces and energy conversions. We will clarify this in the revised manuscript.

Keith Beven's suggestion to highlight the different behavior of the D_f component of the energy balance for surface runoff with and without sediment load is appreciated. We agree that there is an important difference between viscous dissipation of energy due to friction and energy transfer to the sediment. The former implies that free energy is indeed lost, while the latter means that free energy creates motion of the sediment particles. A water and sediment balance of the rainfall runoff simulation experiments by Gerlinger revealed that suspended sediments may increase the density of the fluid-sediment mix up to 10%. Unfortunately, the available measurements and data are too limited to analyse underlying dynamics and include this into the analysis. In conclusion, we admit that the description of the residual of the energy balance needs some clarification, and it is a good idea to elaborate on the differences of D_f between surface runoff with and without sediment transport. This has direct implications for the inference of Maning's *n* from such rainfall simulation experiments.