

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-442

Anonymous Referee #1

Referee comment on "Hydrology without dimensions" by Amilcare Porporato, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-442-RC1>, 2021

I am probably very biased given that my PhD was in fluid mechanics and I then transitioned to working on hydrologic systems during my postdoc, but from the very beginning of my research experience it was hammered into me that dimensional analysis and the Pi theorem are two of the most valuable tools available when trying to study anything, particularly when there is any degree of complexity involved. Unfortunately few geoscientists get a truly rigorous exposure to such approaches and while there are several studies that use these principles it is not as widespread as it should be in my opinion. Dimensional analysis allows us to do all of the things that Porporato highlights here and more. It is the reason why we can run a benchtop laboratory experiment and infer things that are happening at global, planetary and astrophysical scales. It should be something that is part of the core curriculum for all earth scientists in my view, whether they are pursuing experimental, modeling or purely theoretical work. While I, for personal reasons may have picked a few different examples, I think the ones chosen here are excellent and have indeed taught me something new. I found the paper to be sufficiently comprehensive for someone with a rudimentary analysis of dimensional analysis to get a lot from it as well as deep enough in examples for someone who knows a good bit more to still enjoy it. If I had one minor suggestion it might be that this paper espouses all the benefits of dimensional analysis, but only a very limited discussion of possible shortcomings - this is a very minor point and perhaps does not really apply in the context of this paper, but I have seen very interesting discussions in the context of for example sociohydrology, where in some instances there are elements of interest where it is not even clear what variables and what dimensions are involved (i.e. outside of standard M,L,T,theta approaches). This is a very minor point though and I'm not sure that it really requires anything additional in this paper as it has been touched upon briefly in other review like papers cited in this work.

For all of the reasons above I think this is an excellent contribution and I for one will most definitely use it when educating graduate students in our program. Thank you very much for taking the time to write this paper!