

Interactive comment on “Scaling, Similarity, and the Fourth Paradigm for Hydrology” by Christa D. Peters-Lidard et al.

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I think the authors address an excellent point by stating that progress in scaling can benefit from utilising data wisely instead of focusing on modelling all the time.

While reading the paper I came across a few things that potentially (/hopefully) help to improve the manuscript. This short comment is NOT intended as a full review of the paper.

Overall I enjoyed reading the paper, but I refrain from giving an explicit opinion on the suitability of the manuscript for HESS, because: (i) I am not asked to review the paper, (ii) I did not fully review all aspects of the paper, and (iii) one of the authors (Ross Woods) is my current PhD supervisor.

C1

- While reading the paper I was expecting a clear definition of “the fourth paradigm”. While the reader will eventually grasp your opinion on this, it seems that the paper can benefit by adding a clear explicit definition of the 4th paradigm early on in the manuscript (e.g. in the final part of the introduction or maybe even in the abstract).

- Your definition, or at least emphasis, for the “fourth paradigm for hydrology” seems to be on systematic testing of hypotheses. This is narrower than the definition of the fourth paradigm as discussed by Hey et al. (2009) (which is something like “insights are wrested from vast troves of existing data”). In the latter definition, there is more emphasis on the data-driven discovery of new laws, rather than the focus on testing (existing) concepts. Do in interpret that correctly? If no: addressing the previous comment may resolve my misinterpretation. If yes: is it worth emphasising the difference between the definitions?

- Connected to the previous point: (In my view), it is the combination of the 4 paradigms (empiricism, theory, modeling, systematic testing models/theories with data) that will lead to advances. Should the connection between the four paradigms not be discussed explicitly? Or is there no place for empiricism, new theories and model development in the future of scaling?

- Very little is said about past work that tried to systematically assess the validity of scaling hypotheses. Especially, since the paper is introduced at a “review” rather than an “opinion paper” I expected to read more about past efforts before you introduce the need for a fourth paradigm.

- Can you summarize the vision of your paper in a Figure? I think the paper will be more appealing with such a figure

Technical comments:

Line 14: “larger/longer” suggests that scaling is limited to “upscaling”. Why not change it to “other” so it refers to both upscaling and downscaling?

C2

References

- In the text there is one citation of Albergel et al (2012). However, in in the reference list, there are two articles by Albergel et al (2012).
- Berghuijs et al. (2014) is listed in the references, but not cited in the main text.
- Köhli et al (2016) does not include the journal it is published in (WRR?)

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