Hydrology and Earth System Sciences

Discussions

Open Access

HESSD

Interactive
comment

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

...

Christa D. Peters-Lidard et al.

christa.peters@nasa.gov

Received and published: 8 June 2017

Please find below the comments of U. Lall and our replies (preceded by "»").

My recommendation is to publish with minor revision. This recognizes that the paper is part of the set for the Wood symposium, and addresses a specific audience. My main reactions are: 1) I am lukewarm to the idea of the 4 paradigms that the authors mention. I am not sure that there is such a clear, sequential separation.

»Based on comments from other reviewers, we have expanded the definition of the 4th paradigm and also included Figure 1 to help explain that they are all interconnected in the scientific method.

2) I am very sympathetic to the idea that data at multiple scales be used simultaneously

[Printer-friendly version](#)

[Discussion paper](#)

in the context of setting up a model and exploring what constitutes similarity. The authors really touch this only towards the end, and do not really develop a mutual information based approach that they promise in the beginning of the paper

»Based on comments from another reviewers, we have expanded some of this discussion, but we do also rely on the citations to present the background on the method.

3) The authors had me confused with their title – I expected that the paper would develop some notions of self similarity, fractals and emergent behavior across scales from the interactions across coupled hydrologic systems. This would have been an exciting idea for the fourth paradigm, I suppose, albeit not new. However, they are really talking about how to better parameterize surface hydrologic models in a multi scale context, and are developing the notion of similarity and homogeneity that Wood introduced, in parallel to the subsurface literature where such concepts were also being explored. This is perhaps a useful direction for the researchers involved in such an enterprise, and the references to VIC and recent improvements are helpful. Perhaps, I am the only one likely to be confused by the scaling and similarity notions expressed here versus the fractals and nonlinear dynamics literature, but it may be useful to draw the distinction early on

»We agree that the scope is more narrowly focused on scaling and similarity in hydrology, with the main contribution being to use "big data" to test hypotheses. We have attempted to clarify this in the introduction.

4) I am quite averse to the whole bias correction game that seems endemic in our models nowadays. The one paragraph devoted to it seems to suggest that the authors do not think it is a great idea in the present context, but stop shy of actually trying to clarify that it is not a good thing to do. I would suggest that they make this a stronger statement and emphasize that ideally one needs to use the multiscale data in a way that best leverages it and demonstrates the ability of the models to reproduce processes at the scales at which those data are available, without any bias correction. Where

they talk about dynamics, it would be useful to discuss the reproduction of attributes of dynamics, such as the time rate of decorrelation using an information metric, and the mutual information across variables, space and time. Of course I realize that most of my suggestions reflect my idiosyncratic views and the authors may or may not agree with them

»This is a good point. We were mostly acknowledging the issue without providing a clear statement of how to apply the multiscale data to address it. We now include statements about both multiscale data and attributes of dynamics.

»Thank you for your constructive comments.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2016-695, 2017.