Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2020-128-SC2, 2020

Hydrology and Earth System Sciences
Discussions
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Interactive comment on "Technical note: "Bit by bit": A practical and general approach for evaluating model computational complexity vs. model performance" *by* Elnaz Azmi et al.

Robert Reinecke

reinecke@bafg.de

Received and published: 21 April 2020

Dear Azmi et al.,

I very much enjoyed reading your submitted manuscript. However, I would like add two notes on this interesting discussion:

Firstly, I was missing from the manuscript that we not only use models to distill that one perfect equation but continuously use them to further our system understanding. As you noted quite precisely natural systems are very complex and modeling, for example a watershed, requires to take into account many variables and simulate a large

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system. Because of that, and also because these systems almost always contain human interactions which additionally make everything more complex, building a model is never a finished process that ends with one equation that best describes the system. Often it is a first "educated guess" that is then used as a foundation to understand the system further e.g. by using sensitivity analysis. It would be great if this is a little more reflected in this paper. I would also like to mention Wagener, T., McIntyre, N., Lees, M.J., Wheater, H.S. and Gupta, H.V. (2003), Towards reduced uncertainty in conceptual rainfallâĂŘrunoff modelling: dynamic identifiability analysis. Hydrol. Process., 17: 455-476. doi:10.1002/hyp.1135 as a possible citation.

A second discussion point I would like to raise is that in line 308 you clearly state that you are maintaining a information-theoretic point of view, which is good and clearly sets the scope of the discussion; nevertheless, I think an important point is missing: the skill of a researcher to implement a model well enough. Lets say, for the sake of the argument, that our perceptual model (a term coined by Keith Beven) of reality is almost perfect and with our modeling approach, whatever technique we apply (bucket, neural network ...), we would theoretically reach a high level of model performance. But because implementing models is a hugely difficult task, amplified by the lack of computer science and computer engineering background in the natural sciences (Hutton, Christopher, et al. "Most computational hydrology is not reproducible, so is it really science?." Water Resources Research 52.10 (2016): 7548-7555.), we may reach a very high computational complexity but possibly also a low model performance. I think this discussion should be reflected in your paper. It doesn't make your approach less applicable but highlights that looking only at this metric is not enough to guide the community to better research!

Small notes on the abstract: 16: "length of the model" it is explained later in the manuscript but very misleading here. I was thinking of lines of code or runtime when reading it first 29: "low performance" unclear if it refers to computational performance or model fit to observations or expected system behavior

With regards, Robert Reinecke.

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