**Hydrology and Earth System Sciences**

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Discussions

# Interactive comment on "PERSiST: the precipitation, evapotranspiration and runoff simulator for solute transport" *by* M. N. Futter et al.

## Anonymous Referee #1

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This paper presents a new model for runoff and solute transport simulation, named Persist, together with an application of the model to the Thames river basin (UK). The application focuses on the manual and automatic calibration on the model to the river basin and its subcatchments, using 8 discharge gauging stations.

Runoff and solute transport models are an interesting subject of research, and instruments for learning new things about how catchments work. Hence I think the Authors, by developing such integrated model, are going in the right direction. However, there are several issues that need to be addressed, and that weaken the intention and the message of the paper.

1. From the abstract and introduction, the expectation is that the Author will address

the problem of modeling simultaneously runoff and solute transport, presenting and applying an integrated model. However, from the presentation and application I only see a rainfall-runoff model, and no solute transport simulations are presented.

2. It is not clear to me what the real novelty of the paper is. The model is clearly different from others, but there are many models already available, and it is not clear why this particular model would be better than others, and in what respects.

3. In the Abstract, the Authors appear to suggest that their model would be an advancement with respect to the Superflex framework. As far as my understanding of Superflex goes, this framework would not be in contrast to distributed applications. In addition, I don't see in what the flexibility of Persist would consist.

4. Reducing hydrological modeling to the description of the relation of P=R-E is a bit reductive. Particularly since P is not equal to R-E, especially at the time scales the Authors are considering.

5. There is no mention about the numerical methods used to solve model equations, but from Equation 3 it is clear that the Authors are using the fixed time explicit Euler method. The Authors should be aware that this approach is highly inaccurate.

6. The MCMC is basically a standard Metropolis Hastings algorithm, used to sample the Nash and Sutcliffe objective function surface. I do not understand the claims done in the discussion, in the paragraph starting with the sentence "There are a number of different schools of thought about Monte Carlo analysis...". I don't think the Author are inventing or proposing anything new here.

7. Line 13 of page 8652. The upper and lower limit of the objective function should be plus infinite and zero. Please correct.

8. The Authors write that the Persist framework has been designed to be as simple as possible but no simpler. There is no evidence supporting this statement.

9. The Authors are trying to calibrate simultaneously 108 parameters with a single

objective function. I think the calibration problem may be ill-posed, and alternative strategies should be investigated.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8635, 2013.

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