

## ***Interactive comment on “Estimating catchment scale groundwater dynamics from recession analysis – enhanced constraining of hydrological models” by T. Skaugen and Z. Mengistu***

**Anonymous Referee #2**

Received and published: 6 April 2016

In the submitted manuscript Skaugen and Mengistu present a further development of the previously developed and published DDD model, in which they develop a discharge observation based approach to estimate the parameters of the subsurface routine of the model, hence avoiding the need for their calibration. They test their new approach on 73 Norwegian catchments with a wide range of characteristics by comparing the new version of their model with the previous model in which the subsurface routine's parameters had to be calibrated. They show that the performances of both models are comparable but that the new version of the model produces more realistic recessions. With these results the authors conclude that their new approach is another step towards simulation of ungauged basins.

C7038

The new approach absolutely presents a potential step forward towards model parameter estimation in ungauged basins. Hence the approach and the study have the potential to be a valuable contribution the HESS. However, major improvements have to be performed before it can be considered for publication:

First of all, I found the manuscript very hard to read. The theory is too long and the structure of the manuscript is structure confusing. This is particularly true for the explanation of the theory: I definitely recommend reordering the sections (2.1 Hydrological model, 2.2 Runoff dynamics, 2.3 Reformulation, 2.3.1 Estimating the mean storage, 2.4 Example. . .) The old calibrated model should be explained in much less detail supported by more detail in the appendix. The Reformulation should be structured in a better way and if there is no 2.3.2 there is no purpose in having a subsection 2.3.1, etc. Generally, discard all information that is not completely necessary.

Also, more focus should be put on the example where application, parameter estimation, evaluation and data should be explained in s structured way (more subsections). A lot of theory is also presented at the beginning of 2.4 (1st and 2nd paragraph), which should rather be moved to the discussion as the studies methods and the methods of other studies are quite mixed up now.

As new calibration is performed for DDD\_\_M a strict evaluation of the observation derived parameters of the subsurface routine is difficult. I recommend rather remaining with all calibrated parameters of the old surface routine with the old meteorological grid V1, which would allow estimating the skills of the new parameter estimation scheme without any calibration. Also this would make the approach simpler and the paper easier to read.

Finally, as the new parameter estimation scheme still requires discharge data I also do not see the real advantage in terms of simulating ungauged catchments. I agree with referee #1 that there is the need to apply the new approach for simulating catchments without discharge data as mentioned in the discussion. Most desirably at least first try

C7039

should be part of the study indicating the advantages of this new approach.

Please see the attached and commented pdf of the discussion paper for some more specifications.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/12/C7038/2016/hessd-12-C7038-2016-supplement.pdf>

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 11129, 2015.