Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2017-750-RC2, 2018

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Improving river flow generation over Great Britain in a land surface model required for coupled land-atmosphere interactions" *by* Alberto Martínez-de la Torre et al.

J Hamman (Referee)

jhamman@ucar.edu

Received and published: 25 April 2018

This paper presents an evaluation of the JULES LSM for 13 catchments in Great Britain, a sensitivity analysis of JULES with respect to runoff generation processes, and a new slope dependent runoff parameterization. The authors demonstrate the sensitivity of the JULES model to a selection of parameters and runoff generation schemes. Insensitive parameters and ill-performing schemes were incrementally removed from the pool of available options for improving the performance of the model. The paper is generally well written and is easy to read (with a few minor exceptions). I have 2 primary concerns with the manuscript.

Printer-friendly version

Discussion paper

General Comments

Based on the title and the introduction, it seems the authors are motivated by improving the JULES model for use in coupled land-atmosphere simulations. However, this point is not returned to in detail and the analysis and discussion do not provide the reader with insights as to how this work will impact the coupled behavior of the model. One potential improvement would be to add an analysis of the turbulent fluxes simulated by JULES. More generally, an acknowledgement that improving streamflow, by tuning parameters, may give the "right answers for the wrong reasons." This may be an important point to discuss given the motivation of using this model in coupled simulations.

The quest for suitable, preferably physically meaningful, model parameters is not new. The authors basically were looking for a method to determine a set of suitable parameters using their 13 catchments and then a method to regionalize those parameters in some meaningful way. In this work, the authors use catchment slope to regionalize the storage term in the runoff generation scheme. Are there other landscape or catchment attributes that hold meaningful information as the best way to distribute these parameters? A substantive discussion on how the method used in this study fits in with the larger context of parameter regionalization and model calibration would be quite instructive. The work by Samaniego et al (2010) and Mizukami et al (2017) provide two poignant examples of how this has been achieved for similar models. Another approach uses catchment similarity concepts for regionalization (e.g. donor catchments, Beck et al 2016).

Specific Comments

Page 7, line 23: In the figures showing all 13 catchments, it would be useful to group the catchments in some meaningful way (e.g. geographically).

Page 7, line 24: The rational for the range of parameters used in these tests should be explained. It seems, the largest b values give the highest NS performance. This indicates that the authors may not have sampled the complete parameter space.

Printer-friendly version

Discussion paper

Page 8, line 7 and Fig 6: The attempt to characterize the results in the previous subsections based on catchment attributes is commended. It may be useful to think more broadly about how to relate multiple attributes to parameters. Slope seems unnecessarily 1-dimensional. The figure itself could use a more descriptive caption or reformatting, as the functional relationship between slope and parameter is not made clear.

Page 9, line 3: The formulation of S0/Smax seems overly subjective. Perhaps a more complete description of how this formulation came about would help. It seems like a more data driven approach would be useful here.

Table 2: This table has basically identical information shown in Figure 7.

Page 9 Line 13: The acknowledgement that soil characteristics have an important role really highlights the point that the dependence on slope is likely missing other important catchment characteristics. Did the authors consider using a multivariate approach when formulating S0/Smax?

References:

- Samaniego, L., R. Kumar, and S. Attinger (2010), Multiscale parameter regionalization of a grid-based hydrologic model at the mesoscale, Water Resour. Res., 46, W05523, doi:10.1029/2008WR007327.

- Mizukami, N., M.P. Clark, A. J. Newman, A. W. Wood, E. Gutmann, B. Nijssen, O. Rakovec, and L. Samaniego, 2017: Towards seamless large domain parameter estimation for hydrologic models. Water Resources Research, accepted doi:10.1002/2017WR020401

- Beck, H. E., van Dijk, A. I., de Roo, A., Miralles, D. G., McVicar, T. R., Schellekens, J., & Bruijnzeel, L. A. (2016). GlobalâĂŘscale regionalization of hydrologic model parameters. Water Resources Research, 52(5), 3599-3622.

750, 2018.

Printer-friendly version

Discussion paper