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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Do land parameters matter in large-scale terrestrial water dynamics? – Toward new paradigms in modelling strategies" *by* L. Gudmundsson and S. I. Seneviratne

Anonymous Referee #2

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General Comments:

This paper addresses an important problem, namely the relative contribution of climate drivers and model parameters to the uncertainty of large scale hydrological or land surface models. The authors compare the skill of CLPH, a model that predicts discharge based on atmospheric variables alone to the skill of a set of land surface and hydrological models that have a spatially variable representation of the land surface. CLPH is based on gridded fields of 8 atmospheric variables and has 11 parameters that are found using the Random Forest Approach. The main conclusion is that land parameters are less important and that discharge can be skillfully estimated using atmospheric

parameters alone. From this the authors conclude that substantial progress in modeling and forecasting can be achieved but do not offer any details on how exactly this could be achieved. If the goal is to simulate mean monthly discharge, then this could be achieved using atmospheric variables alone (or time series models of discharge). The reason we are adding complexity to models is to study processes and interactions between them. This is particularly true for the impact of humans in the water cycle (not discussed at all by the authors). The main conclusion of the paper is neither new nor surprising but has been discussed for a long time in the large scale hydrological modeling community (e.g. Fekete et al. 2004, Biemans et al., 2009). Furthermore, the method used to arrive at the conclusion is not clearly described, partly confusing and a lot of important assumptions are buried in the appendices (see specific comments below). Overall, the paper Is not well written (too much theoretical background in the introduction that is not relevant of the paper, unclear description of the methods and no conclusion that helps addressing the uncertainties in large scale models).

Specific comments/questions:

Do all WATCH models really use all climate variables ? If not, are you comparing apples and oranges when some models use temperature and precipitation alone and others (including the CLPH) use the whole set ? Furthermore, all the LSM model will have parameters that control the water balance balance. These will not be calibrated whereas the CLPH-RF model simulates the water balance with 11 time lag parameters that are found through an optimization process ("training on ∼400 catchments in Europe). Is this really a fair comparison ? What criteria were used to select the 400 catchments ? What is the area distribution of those catchments ? Are all catchments large enough to justify the application of a model with a resolution of 0.5 degrees ? How are these basins impacted by human activities ? What was used for comparison (p. 13201) ? Basin values ? Grid cell values ? This is very unclear. What is meant by "if more than one gauging station occurred in one catchment the area weighted average runoff rate was used". Why not use the upstream area of the gauging station ? Some

of the appendices contain essential information for understanding the methods, I would suggest to merge this so that the manuscript is easier to read. The discussions about scales (sec. 2) and the constant land parameter hypothesis is rather lengthy and not really relevant to the rest of the paper.

Fekete, Balázs M., Charles J. Vörösmarty, John O. Roads, Cort J. Willmott, 2004: Uncertainties in Precipitation and Their Impacts on Runoff Estimates.J. Climate,Âă17, 294–304.

Biemans, H. , Hutjes, R.W.A. , Kabat, P. , Gerten, D. , Rost, S.Âă: Effects of precipitation uncertainty on discharge calculations for main river basins, Journal of Hydrometeorology 10 (2009)4. - ISSN 1525-755X - p. 1011 - 1025.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 13191, 2013.