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Hydrology and Earth System Sciences Discussions

Interactive comment on "Evaluation of drought propagation in an ensemble mean of large-scale hydrological models" *by* A. F. Van Loon et al.

A. F. Van Loon et al.

anne.vanloon@wur.nl

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Author comments by A.F. van Loon, M.H.J. van Huijgevoort, and H.A.J. van Lanen

We want to thank the anonymous referee for his/her positive response to our manuscript. Below, we will address the minor suggestions provided by the referee.

Thank you for pointing out some English mistakes in our manuscript. We will check it again and correct any mistakes.

In the Methodology section, we do mean to say "Mean discharge" because there we mention observed values at the outlet of the catchment. We will change it into "Mean measured discharge".

We did not aggregate the data from sub-daily to daily temporal resolution ourselves. That was done by the modellers involved in the WaterMIP comparison of WATCH. It was performed simply by taking the daily sum for fluxes and daily average for state variables. As the time step of the respective models is not relevant in this study, we will delete this column from Table 1.

We did not look at the performance of each individual model in detail, but we do not expect to see a clear difference in drought simulation between the models due to differences in time step. The most important deficiencies of the large-scale models in simulation drought propagation are related to storage, snow, and evapotranspiration. Storage typically acts on time scales longer than a day, so modelling at an hourly time step cannot solve issues related to storage. In snow simulation, differences in time step go hand in hand with differences in snow scheme. Global Hydrological Models use the degree-day approach, whereas Land Surface Models use the energy-balance approach. Haddeland *et al.* (2011) found that, on average, the GHMs simulate higher values for Snow Water Equivalent (SWE) than the LSMs, but the differences between the models within both classes are also large. This is even more so for the simulation of evapotranspiration. Differences in evapotranspiration between models within both classes are larger than interclass differences and they cannot be related to the model time step. The conclusion of Haddeland *et al.* (2011) is that "no major differences in the interannual variations have been found between the models run at daily or subdaily time steps or between models using different evapotranspiration or runoff schemes."

Yes, the Narsjo-catchment has a significant snow storage of, on average, 7 months in

winter (Table 2). We will include a sentence referring to this in the manuscript.

We will replace “panels” with “rows”.

References

Haddeland, Ingjerd, Clark, Douglas B., Franssen, Wietse, Ludwig, Fulco, Voss, Frank, Arnell, Nigel W., Bertrand, Nathalie, Best, Martin, Folwell, Sonja, Gerten, Dieter, Gomes, Sandra, Gosling, Simon N., Hagemann, Stefan, Hanasaki, Naota, Harding, Richard, Heinke, Jens, Kabat, Pavel, Koirala, Sujan, Oki, Taikan, Polcher, Jan, Stacke, Tobias, Viterbo, Pedro, Weedon, Graham P., & Yeh., Pat. 2011. Multi-model estimate of the global terrestrial water balance: Setup and first results. *Journal of Hydrometeorology*, **12**(5), 869–884.