

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2022-108

Anonymous Referee #2

Referee comment on "Implementation and sensitivity analysis of the Dam-Reservoir
Operation model (DROP v1.0) over Spain" by Malak Sadki et al., Geosci. Model Dev.
Discuss., <https://doi.org/10.5194/gmd-2022-108-RC2>, 2022

General comments

The authors examined parameterizations of reservoir operations in Spain. They employed a series of formulations developed by Hanasaki et al. (2006) that reproduce reservoir release and storage. They conducted intensive parameter sensitivity tests and identified several highly sensitive parameters. They also analyzed the performance of 215 reservoirs to discuss why they performed better or worse.

The formulation of Hanasaki et al. (2006) has been employed in many global hydrological models, but is rarely additionally and carefully validated. This study is unique because it presents the results of intensive validation in 215 reservoirs in Spain where reliable data are well accessible. Another interesting result, somewhat surprisingly, is that the simple formulation works well with observations in many cases.

The manuscript is quite well written and clear. I only noticed that a few technical clarifications are necessary in several parts as detailed below.

Specific comments

Line 82 "direct runoff Rd": What is this? Is this different from "tributary inflows"?

Line 135 "Unlike Hanasaki et al. (2006) scheme...": It is a bit unclear as to what exactly is different from Hanasaki et al. (2006). Does it mean that industrial and domestic water requirements are not considered in this study? For readers' convenience, it would be nice if the authors add a list of the major changes from Hanasaki et al. (2006).

Line 400-415 "When using Sobol indices, ...": I couldn't follow the discussion for these two paragraphs. In short, I couldn't understand what Figure 12 is showing. What does it mean by "shifts in C_{2M}"? What is the PDF being discussed here? A bit more detailed and readable explanation is needed.

Line 452 "Zhou et al. (2021) suggested an efficient way to overcome this issue...". I couldn't fully understand what issue is focused on here and how Zhou et al. (2021) solved it. It would be helpful for readers if you could elaborate further. Perhaps, I guess this part discusses the cells that should be included in the estimation of irrigation water demand. The spatial resolution of Hanasaki et al. (2006) was 1 degree by 1 degree, or 110 km by 110 km at the equator. Therefore, it seemed that summing the grid cells direct downstream would be sufficient to estimate irrigation water demand for large reservoirs. However, the spatial resolution in this study is 5 km by 5 km. It seems necessary to include not only the direct downstream grid cells, but also the surrounding ones. Some of the latest global hydrological models with a high spatial resolution have started to transfer water from main stream to the surrounding grid cells (e.g. the "aqueducts" of Hanasaki et al. 2018, 2022). Maybe such a concept is needed to estimate downstream water demand reasonably.

References

Hanasaki, N., Yoshikawa, S., Pokhrel, Y., and Kanae, S.: A global hydrological simulation to specify the sources of water used by humans, *Hydrol. Earth Syst. Sci.*, 22, 789-817, 10.5194/hess-22-789-2018, 2018.

Hanasaki, N., Matsuda, H., Fujiwara, M., Hirabayashi, Y., Seto, S., Kanae, S., and Oki, T.: Toward hyper-resolution global hydrological models including human activities: application to Kyushu island, Japan, *Hydrol. Earth Syst. Sci.*, 26, 1953-1975, 10.5194/hess-26-1953-2022, 2022.