

## ***Interactive comment on “Calibration analysis for water storage variability of the global hydrological model WGHM” by S. Werth and A. Güntner***

### **Anonymous Referee #2**

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#### General comments

The topic of the paper “Calibration analysis for water storage variability of the global hydrological model WGHM” by S. Werth and A. Güntner is of broad interest for scientists working in many different fields but especially such working in (global) hydrology, hydrological modeling, remote sensing and also climate impact research. Data scarcity is still one of the main drawbacks in global hydrological modeling and the authors present a promising methodology of how satellite-based estimates of total water storage changes can be combined with river discharge data in a multi-objective calibration framework to improve the model parameters of a global hydrological model.

The methodology and the results are mostly well presented and discussed in the paper.

The figures and tables support the understanding of the results. There are only some technical and scientific aspects, which have to be clarified and worked out in greater detail. Therefore, the paper should be subject to minor revision. My major request is that the authors should better describe the calibration process and how the additional data were used.

### Specific comments

2.2.2 How were the two observations (TWSV, river discharge) technically used to calibrate the model, was the overall objective function Pareto based?

2.3.1 Averaging the runoff data over 30 years can be misleading, if the data have a strong trend (e.g. the Niger). In this case, runoff of the last ~5-10 years can be well out of the uncertainty range of 20 %. Please discuss possible implications.

2.3.2 The temporal and spatial scale is not mentioned, only in the introduction, where it is said that the spatial resolution is some 100 kilometres and the temporal monthly (?). Please explicitly list in section 2.3.2 (where the data are described) the relevant scales.

3.1 please give the improved values not only in absolute values (in mm) but also as relative ones (in %).

4. The “conclusions” are more a “summary and conclusions” and could be shortened.

### Technical corrections

Introduction, last para: change “dealiasing” to “de-aliasing”.

2.1 first para: delete second “for”.

Page 4820, last para: change “according Suttleworth” to “according to Suttleworth”.

Page 4834, second last para: change “did not improved” to “did not improve”.

Conclusions, last para: change “GRACE-follow on” to “GRACE follow-on”.

Figure 8 is not readable, Figures 1, 9, 10 are too small.

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