

Interactive comment on “Niger discharge from radar altimetry: Bridging gaps between gauge and altimetry time series” by Stefan Schröder et al.

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We thank referee 1 for her/his time and effort and for providing constructive comments.

RC: General comment: In this paper, the authors present several interesting contributions to the hydrology, hydrologic modeling and river altimeter communities, with the Niger River basin as platform for case study. The authors present a method of retracking for handling the “hooking” effect that works well even on complex braided systems. The authors confirm that time series from neighboring altimeter crossovers agree well, at distances as large as 70 km. The authors demonstrate effectiveness of two different discharge models in the region, and their limitations, citing the importance of choice in forcing data. Finally they present a method of generating discharge with altimetry

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data where they first create a rating curve based on modeled discharge for the time period in question. For the most part I find that the work meets the standards required of HESS publications and that with a few minor revisions it will be ready for publication.

AR: Thank you for the structured overview. Your comments were very helpful. We provide our responses and respective changes below.

RC: Comment 1: Page 5 Lines 5-9: In your discussion of bias here you cite : Tourian, M., Tarpanelli, A., Elmi, O., Qin, T., Brocca, L., Moramarco, T., and Sneeuw, N.: spatiotemporal densification of river water level time series by multitemporal satellite altimetry, *Water Resour. Res.*, 52, 1140–1159" 2016. The issue is that the only discussion in this paper with regard to RMSE is in comparison of densified time series (heavily processed, not direct measurements) with gages in a specific river (the Po). I think the numbers used are from table 5. There is a section on handling relative altimeter bias with its own table (4). The authors are careful to point out that they compared with a tide gage on at the mouth of the Po to get these values and that altimeter bias is regionally specific. It's okay to cite this information here if present the correct numbers, but only if it is noted that this is not a general rule that is broadly applicable. Alternatively the authors could cite a range of absolute errors present in the literature and avoid the bias issue entirely.

AR: Thank you for pointing out the details behind the numbers we cited. The author is right in saying that the "70-80cm" RMSE is not a general rule. We decide to cite a range of errors coming from more than just this one study. In alignment with the comment of reviewer 2 we modify the sentence to "Relative altimeter errors (...) are thought to be at the level of 20-80 cm Root Mean Square Error (RMSE) e.g. for Jason-2 dependent on river width (Papa et al., 2012, Seyler et al., 2013, Tourian et al., 2016)".

RC: Comment 2: Page 10 Line 27-page 11 Line 5: I assume you are using the same forcing data here that you use to run GR44J ? I think citing a publication about your model rather than going into specifics is fine here, but you haven't explicitly stated

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what forcing data is used for GBVlite, and importance of forcing data is mentioned throughout the paper.

AR: Thanks for pointing out that we missed stating which forcing data we used for HBVlight. We used the same forcing data as for GR4J. We add the sentence "We used the same forcing data and calibration period as for GR4J." after "As the second model, HVBlight..."

RC: Comment 3: Page 13 lines 1-5: DAHITI is a great source of data, but I find performing a fit evaluation with it to be quite odd. It's essentially comparing one non-validated set of altimetry elevations with another. Making a comparison is fine, but It should be clear to the reader that the DAHITI database is also altimeter data and in this case non-validated.

AR: It is true that both our time series and the DAHITI time series are unvalidated and we cannot know the truth in that case. We add the sentence: "This does not validate our time series but it gives a measure of how much impact the retracking has."

RC: Technical corrections: Roscher et al. (2017) is cited, but not included in the list of references

AR: We added the reference.

References

- Papa, F., Bala, S.K., Pandey, R.K., Durand, F., Gopalakrishna, V.V., Rahman, A., Rossow, W.B., 2012. Ganga-Brahmaputra river discharge from Jason-2 radar altimetry: An update to the long-term satellite-derived estimates of continental freshwater forcing flux into the Bay of Bengal. *Journal of Geophysical Research: Oceans* 117. <https://doi.org/10.1029/2012JC008158>
- Roscher, R., Uebbing, B., Kusche, J., 2017. STAR: Spatio-temporal altimeter waveform retracking using sparse representation and condi-

tional random fields. *Remote Sensing of Environment* 201, 148–164. <https://doi.org/10.1016/j.rse.2017.07.024>

- Seyler, F., Calmant, S., Silva, J.S. da, Moreira, D.M., Mercier, F., Shum, C.K., 2013. From TOPEX/Poseidon to Jason-2/OSTM in the Amazon basin. *Advances in Space Research, Satellite Altimetry Calibration and Deformation Monitoring using GNSS* 51, 1542–1550. <https://doi.org/10.1016/j.asr.2012.11.002>
- Tourian, M., Tarpanelli, A., Elmi, O., Qin, T., Brocca, L., Moramarco, T., and Sneeuw, N.: Spatiotemporal densification of river water level time series by multimission satellite altimetry, *Water Resour. Res.*, 52, 1140–1159, 2016. <https://doi.org/10.1002/2015WR017654>.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, <https://doi.org/10.5194/hess-2019-36>, 2019.

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