

We would like to thank the reviewer for the time and effort they have put into reviewing our manuscript, as well as for the helpful comments they have provided. We have copied the reviewer's comments in black, and added our responses in red type.

Comment 1:

“Most importantly, when I tried to access the data via the link provided in Section 4, I could not. Please verify the url is correct. I think the ‘ftp’ should be ‘http’. I was able to get to the data viewer site at OSU, but this only provides images, and not the data itself. I was able to perhaps get to the correct data site. However, it seemed the data there were metadata and not the time series of river elevations. Since I could not access the data I cannot provide a thorough review of the data usefulness or completeness. I apologize if I am missing something.”

Response:

The link to access the data has changes since the original submission of this paper. We have updated section 4 to read as follows:

GRRATS (DOI 10.5067/PSGRA-SA2V1) is available at https://podaac.jpl.nasa.gov/dataset/PRESWOT_HYDRO_GRRATS_L2_VIRTUAL_STATION_HEIGHTS_V1 for non-commercial use only (Durand et al., 2016). An interactive map of the data is located at <http://research.bpcrc.osu.edu/grrats/>.

Comment 2:

“Second, the article needs more information, or a description, of the concept of a virtual station. It is never really clearly described what a VS is and thus it may be difficult for someone new to the field and data to understand what is being compared to in situ data.”

Response:

We have updated the description of virtual stations in the introduction (page 3 line 20-22) to read as follows:

“VS are locations where ground tracks of exact repeat altimetry mission orbits cross rivers, enabling the development of a time series of water elevation observations. VS can be thought of much in the same way as an in situ river gaging station, but are entirely derived from remote sensed measurements of river surface elevation.”

We have placed this text as its own paragraph in the introduction to allow readers to find it more easily.

Specific comments:

1. “Page 1 Line 20: in “either quantitatively for VS where : : :” should it not be “VS levels where : : :.””

Response:

We have changed this sentence (Page 1 Line 20) for clarity based on the reviewer's suggestion. It now reads as follows:

“We evaluated every VS, either quantitatively for VS locations where in-situ gages are available, or qualitatively using a grade system.”

2. “Page 1 Line 21: As these are multiple VS, should this be VSs? I also wonder about the grammatical use of VS throughout the paper.”

Response:

While there is some precedent for using VS for both the singular and plural of virtual station, within the river radar altimeter literature, we agree with the author the using VSs for the plural from increases readability. We have changes 43 instances of VS to VSs throughout the document.

3. “Page 3 Line 27: This is the first instance of VS in the main Text , please spell it out.”

Response:

This line of text was corrected to spell out VS and is now included in a separate paragraph ahead of its previous location as a part of our response to specific comment 3.

4. Page 3 Line 28: Same with GRRATS, and with all the several acronyms throughout the paper.

Response:

We changed this use of GRRATS (now Page 3 Line 20) to read as follows:

“Virtual Stations (VSS) are the fundamental organizational element for the Global River Radar Altimeter Time Series (GRRATS), as well as other altimetry datasets for rivers.”

Additionally corrections were made for the following acronyms.

Page 3 Line 24 changed to “Database for Hydrological Time Series over Inland Waters (DAHITI)”

Page 3 Line 25 changed to “River&Lake Near Real Time (NRT)”

Page 4 Line 30 changed to “Global River Widths from Landsat (GRWL)”

Page 5 Line 7 changed to “Earth Gravitational Model 2008 (EGM08)”

Page 5 Line 9 changed to “Digital Elevation Model (DEM)”

Page 5 line 11-12 changed to “Shuttle Radar Topography Mission (SRTM), Global Multi-Resolution Terrain Elevation Data (GMTED), and Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER),”

5. Page 4 Line 29: Its unclear where this polygon came from. Would calling it the ‘mask’ be more informative, as it was earlier? How was this polygon defined? This is not described in the text.

Response:

We have changed polygon to mask, and included a bit more description of mask construction. It now reads as follows:

“We extracted altimeter observations at the VS from the GDRs; this consisted of three steps. First we spatially joined Landsat imagery (selected from times of mean river discharge) compiled for the Global River Widths from Landsat (GRWL) river centerlines dataset (Allen & Pavelsky, 2015; Allen & Pavelsky, 2018) with satellite ground tracks to define the width extent of the mask used for the extraction of water elevations. Each mask was constructed using the width extent and upstream and downstream limits that were 2km perpendicular to the crossing location.”

6. “Page 6 Line 20: Maybe rename this section ‘Data Description’”

Response:

We prefer to retain the name ‘Data Evaluation’. This sections describes how we went about evaluating each VS to create the evaluation data included with the final product.

7. “Page 6 Line 21: is this a typo: ‘50.M’?”

Response:

Corrected the above to read 50M.

8. “Page 9 Line 16: The authors note there are two streams illustrated in Figure 4, but there are three.”

Response:

We have edited this section to read as follows:

“Therefore, we compared three VS locations that are in each of the four datasets discussed (one on the Amazon, Congo, and Brahmaputra). Figure 4 (a-c) show time series anomaly at each VS and the closest gage. Note that time series lengths are limited to the shortest time series in the comparison and do not match the coverage of any particular mission, and that River&LakeNRT data was unavailable for the VS location on the Brahmaputra.”

9. “Figure 1: Is the black background really the best choice?”

Response:

We tried quite a few options in preparing this figure, and have consistently found that black does the best job providing a contrasting color for the two different color schemes presented in this figure.

10: Figure 4: "A legend would be very helpful. Same in Figure 5."

Response:

We have added a legend to Figure 4 and updated the caption with the following:

"Note that the legend in panel (b) applies to all of figure 4."

We have also added a legend to each panel of figure 5.