

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1  
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## Comment on nhess-2022-101

Anonymous Referee #1

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Referee comment on "Multi-mission altimetry data to evaluate hydrodynamic model-based stage-discharge rating curves in flood-prone Mahanadi River, India" by Pankaj R. Dhote et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-101-RC1>, 2022

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### General Comment:

The authors attempted to use altimetry data from multiple satellite sources and attempted to evaluate the rating curves developed from hydrodynamic models. The research work proposing a virtual river monitoring tool is a new attempt. However, the research paper has some limitations which should be addressed. The specific comments are given below.

### Specific Comments:

- Abstract, Line 29-30: @The validation of hydrodynamic.....missing." There is a sudden jump. Either elaborate more or remove it.
- Expand the following: WSE, HEC-RAS, ALOS PALSAR, DEM, BRAT, EGM
- Table 1: Separate the different parameters with ",", such as discharge, river cross-sections (bathymetry), roughness coefficients
- Table 1, First Column and Last Row: The purpose is not clear. As I understand it is "Rating Curve Generation"
- Introduction: The title of the manuscript specifically mentions "multi-mission", the authors also discussed available satellite-based altimeters (multi-mission), however, the advantage of multi-mission couldn't be highlighted in the introduction. Which dimension is going to improve with multi-mission and why? As I understand and the title of the manuscript suggested, some improvements have been done to flood-related studies by incorporating multi-mission space-based altimeters, however, this aspect is completely lacking in the Introduction and conclusion sections.
- The authors have done a comprehensive review, however, more emphasis is required on "what research gap authors identified from the literature review listed in Table 1. And how they addressed this gap in the present study.
- While introducing the data scarcity globally, the authors suddenly mention the study area. The connection between lines 56 to 59 could be improved

- Figure 1: Please label the inset map as well, like India. If possible, use the recent India State Boundary. What text in red colour represents, specifically the numbers?
- Spelling error in line 70: Interferometers
- Why did the authors explain more about the upcoming mission (SWOT) in the introduction section? This could be well placed in discussion or conclusion.
- The inclusion of accuracy values of the previous studies would add value to the study
- The problems in the single mission satellite altimetry are not well defined in the introduction. Also, the need for multi-mission satellite altimetry is missing in the introduction section.
- What is "category c of Table 1)?"
- Line 109: appropriately use power notation
- Study area: Please provide the geographic lat-long in the manuscript
- Include Mundali location in the study area map, since this defines the extent of the study area (lines 111 to 114)
- Lines 130-138: Various datasets are discussed, it is suggested to specify their broad use in the study such as topography, roughness, etc.
- The authors should discuss the multi-mission satellite data component briefly. The data section lacks the details of the satellite imagery. Even though table 4 gives the range of data period, which data was used in this study is not clear.
- The date of acquisition of satellite data should be included in the study area section
- Expand acronyms while introducing them in the text – (eg. SARAL, BRAT )
- Rewrite the sentence in lines 165 – 168. The authors should include why these inputs are not within the scope of this study. Please elaborate
- Rewrite sentence – lines 174 – 176
- Fig 3. An extra legend. Please rectify
- ISRO IGBP LULC map procured during 2006 and google earth high-resolution images are used to identify different classes in the floodplain. Since the floodplain area varies with time, how do the authors address the difference in data periods?
- Please verify, is it "Indian Space Research Organisation – International Geosphere-Biosphere Programme" or "Indian Space Research Organisation –Geosphere-Biosphere Programme". If it is ISRO-GBP correct it everywhere.
- Table 2: Please provide the sources with further details for the benefit of the readers.
- Lines 192-193: "This resulted ....." Check the sentence or reframe it.
- Table 3: What do RT and LT stand for?
- Line 225: all "n" should be in italics.
- Line 230: You have not developed the model. Therefore, modify the sentence as "... This model is set up in two phases."
- The captions in Figure 4 could be improved.
- In lines 232 to 234, the authors state the calibration was done for the 2015 season and validation during 2018 (see lines 240 to 242). But the authors have shown in the Fig 4 caption – calibration during 2018 and validation during 2015. Both are contradicting. Please rectify
- Figure 4 c lacks one legend (simulated stage)
- Line 250: Earlier the authors have mentioned 7 VSs, now, suddenly 8 VSs. Please verify.
- Lines 252-261: It is suggested to provide the working principle of altimeters for the benefit of the readers.
- There are some spelling mistakes in the manuscript: Line 254: retracing; page 17, Line 296: "Courser"
- Please provide the equation for average RMSE (line 311) in the methodology section
- The fonts in Fig 6, 7 and 8 are not readable. Please increase it

**Overall comments and recommendations:**

The English language should be improved throughout the research article. The authors have contrasting statements regarding the calibration and validation samples. Equations for the metrics are not provided. In the Overall discussion, the study results are not compared with previous literature model results. Since the Authors have used many satellite data, the results should be compared with individual data analyses.

The manuscript requires major revisions before it can be considered for publication in the NHES.