We sincerely thank the reviewers for their valuable comments and suggestions, which have significantly contributed to improving the manuscript. Below, we have reproduced the reviewers' comments in black font, followed by our responses in blue font.

General comments

Interesting study on the use of different DEM inputs into a specific 1D-2D flood model. In the first part, the most accurate global and airborne DEMs are determined. Using these two DEMs as input, the resulting flood model maps are compared with 2 reference flood maps. Surprisingly, the global flood-optimized FABDEM derived from TanDEM-X achieves only slightly worse flood modelling quality statistics than the higher-resolution airborne DEM version LDD-JICA DEM.

The paper is generally well structured and balanced, but the context and objective of the two parts are not consistently clear.

The claimed objective of your study to present two new workflows for updating 1D-2D flood models is not plausible. It seems like your starting point for this study was "what can we do with EO data", but what you describe is how to test the input DEMs and validate your results. I can't see any real improvement in the 1D-2D flood model itself:An extensive DEM evaluation does not make sense for every new 1D-2D flood model, as the number of input DEMs is limited and you have shown extensive evaluation here. Similarily, the validation of flood modeling results with existing flood maps is not an integral update of a model.
In my opinion, there is a simple way out: move the “workflows” to the discussion/ conclusion and stick to terms like “evaluation of DEMs for” … and “validation of flood model results” … .

However, please clarify this throughout the paper, even in the title!!!

The objective of this study is to enhance the performance of a 1D-2D flood model using Earth Observation (EO) data, with a focus on improving the accuracy of flood inundation simulations through Digital Elevation Model (DEM) analysis. We aim to refine the approach to 1D-2D flood modeling by integrating EO data into two key workflows: DEM analysis and flood map analysis. These workflows are designed to produce more accurate flood model results. Accordingly, we will change the title from “Upgrading 1D-2D flood models using satellite laser altimetry and multi-mission satellite surface water extent maps” to “Enhancing the performance of 1D-2D flood models using satellite laser altimetry and multi-mission surface water extent maps from Earth Observation (EO) data.”

Specific comments

1. Please improve the abstract (and title) with regard to the readability and research focus of your study. Main point: The paper gives a kind of performance test. So, your description given in 4.2. (“ .. to evaluate the performance of simulated flood maps … using various DEM products”) comprises the content more appropriate than an “upgrade by two workflows”.

As explained in response to General comments, we will revise its.

2. In that sense, unclear in the abstract: are you evaluating the 1D-2D model results with the surface water extent maps or has this any relation to the DEM analysis part? Scientifically using SWE maps are for validation.

We used the two best DEMs, one from local and one from global sources, as inputs to a 1D-2D flood model to simulate flood inundation. The simulated flood map was then evaluated against a satellite-derived Surface Water Extent (SWE) map. We will refine the abstract to make it more precise.

3. The same applies to the title. Please use a more precise title (laser altimetry was solely used for performance assessment, same applies for the water extent maps (validation, not for an software/model udgrade itself, …) Something like Influence of DEM quality /Performance assessment using global DEM / …

As explained in response to General comments, we will revise the title.

4. Abstract/Intro: The first part "DEM analysis" evaluates 10 DEMs compared to ICESat-2. Please explain your motivation. -> advantage of EO DEMs. The DEM choise is rather heterogenious -> Please categorize the used 10 DEMs e.g. from satellite to airborne DEMs.

We will revise and motivate advantage of EO DEMs into the introduction section.

5. In General: There might exist some specific/logical requirements for DEMs to test or mentioning in advance if they are suited for flood modeling (e. g. like in Gesch, Front. Earth Sci., 2018, Best Practices for Elevation-Based Assessments of Sea-Level Rise and Coastal Flooding Exposure, https://doi.org/10.3389/feart.2018.00230). Against this background, please justify why you start analyzing for so many DEMs the quality from scratch!

The DEMs selected for this study were chosen due to their widespread use in large-scale flood modeling, availability in both free versions and locally collected surveys from Thai sources, and their variations in resolution, methodologies, and data sources. These DEMs are commonly utilized in global and regional flood studies. By comparing them with ICESat-2 ATL08 data, which serves as a high-accuracy reference, the objective was to evaluate their suitability for flood modeling in the Chao Phraya River basin. This thorough analysis ensures the chosen DEM meets the precision required for large-scale flood simulations.

6. Methodology: Chapter 4, Your goal is to find out the best DEM : better in terms of the most accurate DEM compared to ground control points

The primary objective of this chapter is to identify the most accurate Digital Elevation Model (DEM) by evaluating various DEM products against ground control points. In this analysis, ICESat-2 ATL08 elevation data serves as a high-precision reference, effectively functioning as a "ground truth." This role of ICESat-2 ATL08 should be further articulated to underscore its significance in the validation process. Once the optimal DEM is determined through comparative analysis, it is integrated into a 1D-2D flood model. The resulting simulated flood inundation map is subsequently validated against satellite-derived Surface Water Extent (SWE) maps to rigorously assess its accuracy in representing real-world flood events.

7. 4.1.1 Not described: how do you use/prepare ICESat-2 ATL03 data? If you don't explain it, omit it.

ICESat-2 ATL03 data represents the raw data collected by ICESat-2 before being processed into ATL08. In this study, we did not use ICESat-2 ATL03 for comparison with DEM products. Therefore, we will exclude the ICESat-2 ATL03 section and provide a more detailed explanation in the ICESat-2 ATL08 section, which is derived from the processed ATL03 data.

8. Comment: Apart of the point comparison I like the additional value of grid and track-wise comparison.

Thank you for comment. We comparison in three comparisons, we can see the overall comparison from point and see the spatial map from grid comparison and elevation profile from track-wise comparison.

9. Results: Sec. 5.2.1 To what table do you refer with the statement given in l.444 (global DEM products was +1.62 m)? Same for statistics in line 449 (no common global DEM statistic in table given).

We will revised the table 6 as shown below:

Table 6: Table of statistical metrics, comparing 10 DEM products against the ICESat-2 benchmark. The resulting averages are computed across the datasets in study area.

DEM product	Scale	Statistical method				
		ME (m.)	MAE (m.)	MSE (m.)	RMSE (m.)	PBIAS (%)
LDD	Local	-1.30	1.64	5.45	2.33	-34.76
JICA	Local	-0.65	1.04	3.51	1.87	-17
merged LDD-JICA	Local	-0.68	1.08	3.74	1.93	-15.38
Average local DEMs		**-0.88**	**1.25**	**4.23**	**2.04**	**-22.38**
ASTER	Global	+4.77	5.57	44.28	6.65	47.71
SRTM	Global	+2.04	2.58	12.92	3.59	27.99
MERIT	Global	+1.56	1.79	6.76	2.6	22.99
GlO30	Global	+0.84	1.3	5.89	2.43	13.87
FABDEMv1-2	Global	+0.25	0.8	3.79	1.95	4.59
TanDEM-X	Global	+0.94	1.73	13.29	3.65	15.24
TanDEM-EDEM	Global	+0.91	1.43	7.74	2.78	14.84
Average global DEMs		**+1.62**	**2.17**	**13.52**	**3.38**	**21.03**

10. please omit the wording “over- and underestimation” when describing small biases of 1-2 m without regarding the RMSE. (i.e. having an RMSE of 2m: an ME of 1 m is within the noise level! No real over- or underestimation) Please scan the whole document! Better use neutral terms like small positive/negative bias.

Yes, we agree. We will revise all wording “over and underestimation” to positive and Negative bias.

11. Please re-work the text in Section 5.3. to make it more readable and comprehensive.

We will revise it more readable and comprehensive

12. Section 6.2.: Message is unclear, as the different maps for validation seems to have its deficits.

We will revise Section 6.2 to improve clarity and provide a more detailed explanation of the observed Surface Water Extent (SWE) data from the GISTDA and WorldWater projects. The SWE data were generated using different algorithms and satellite sources, leading to different in the results. These observed datasets were then compared to simulated flood maps derived from various Digital Elevation Models (DEMs).

13. Please just list the used data sets / days in Appendix Tables A1 or omit table completely, Table A2 can be omitted completely. It is a service with regular, almost daily acquisitions.

We agree to revise Tables A1 and A2 by excluding them and referencing the dataset from the WorldWater project or Sentinel data instead.

14. The visualization of the geoid models Fig A2 should be omitted.

We will exclude it

<u>Minor comments:</u>

1. Abstract:" Given the current uncertainties stemming from changes in weather patterns affecting flooding, reducing inaccuracies in flood models is imperative": Please be more precise. Are the uncertainties improving?

We will revise it

2. Include in abstract: Which DEMs are finally used for your flood map analysis and why (motivation to chose one global and one local DEM)

We will revise and motivate it.

3. l23-l25: Abstract: Think about your message! EO data for validation of DEM and Flood model maps were used. Conclusion/Result?

We will revise abstract

4. Line 480 … which can be attributed to the fact that vegetation and buildings are eliminated in this DEM …

Yes, the FABDEMv1-2 DEM employs machine learning techniques to effectively remove buildings and forested areas from the elevation data.

5. Line 514: we implemented: please re-word to e.g. "performed test with two DEMs,…"

We will revise it.

6. Figure caption: difference of Fig. caption A7 and A9 not clear; RMSE?

We will revised the caption figure A7 to A9

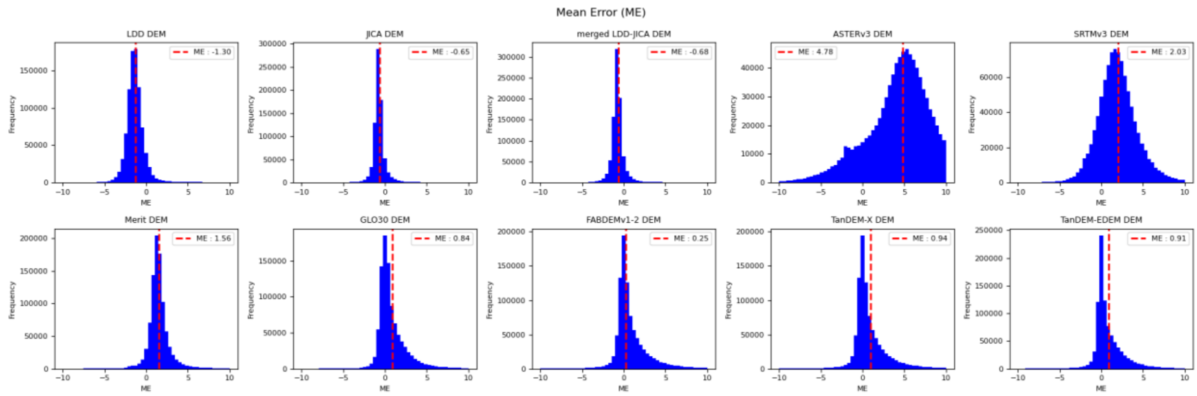

Figure A 7: The histogram distribution of the mean error (ME), comparing 10 DEM products against the ICESat-2 ATL07 benchmark.

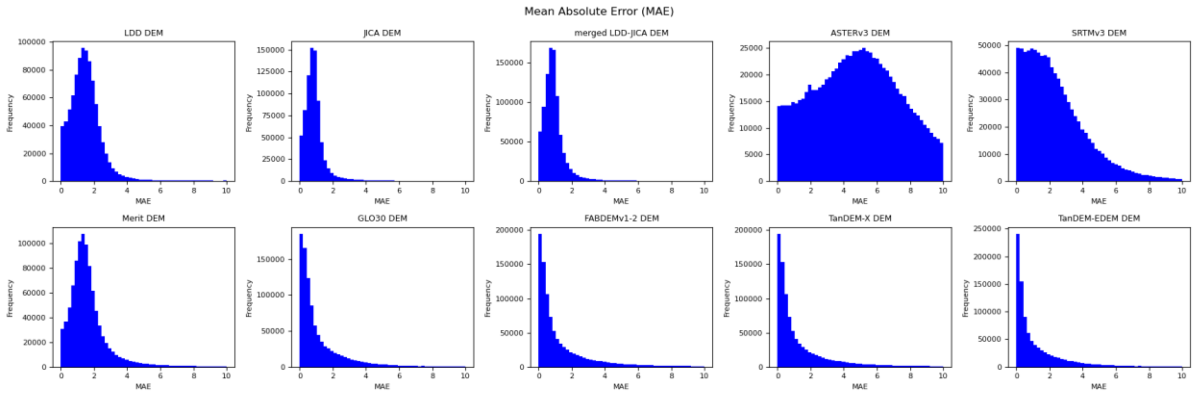

Figure A 8: The histogram distribution of the mean absolute error (MAE), comparing 10 DEM products against the ICESat-2 ATL07 benchmark.

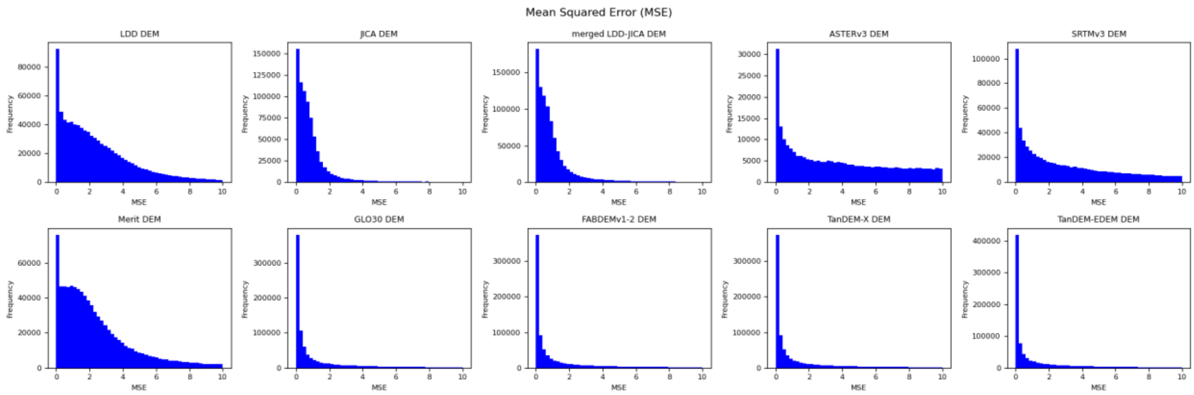

Figure A 9: The histogram distribution of the mean square error (MSE), comparing 10 DEM products against the ICESat-2 ATL07 benchmark.