

Ocean Sci. Discuss., referee comment RC1
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Comment on os-2021-112

Anonymous Referee #1

Referee comment on "Data-assimilation-based parameter estimation of bathymetry and bottom friction coefficient to improve coastal accuracy in a global tide model" by Xiaohui Wang et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-112-RC1>, 2022

General comments

This manuscript deals with data assimilation-based parameter estimation of bathymetry and bottom friction coefficient to improve coastal accuracy in a global tide model. Ultimately, the purpose of this study is to improve tidal prediction accuracy of their GTSM through data assimilation using FES2014 and tidal gauge data. Regarding this point, I wonder if the GTSM in tidal prediction can be better than the FES2014. If not, what is advantage of use in the GTSM? Just computation and memory efficiency? In addition, with respect to the parameter estimation of bathymetry, I suggest that the authors compare their model initial bathymetry and corrected bathymetry with that of FES2014. These results may provide useful information on their input bathymetry's suitability.

In general, I do not think that the manuscript is well written because of a lot of unclear and repeated explanations. The authors should be avoid report style and should make the manuscript concise with stressing their novel scientific findings. Additionally, the location map with names should be added for readers to easily understand locations mentioned in this study. Therefore, as it is, it seems to me that this manuscript is not appropriate to publish in Ocean Science.

Some specific comments follow to help the authors address their manuscript's weakness:

- Title

- The authors should change the title to contain key words (e.g., Data assimilation based parameter estimation of bathymetry and bottom friction coefficient to improve coastal

accuracy in a global tide model).

- Abstract

- I think that the authors need to include the specific parameter estimation scheme name used for an efficient computation and memory efficiency.

- Section 1 (Introduction)

- On p. 3 lines 68-69: The authors need to clearly explain how the energy dissipation by bottom friction in shallow water also change the tides in the adjacent deep ocean.

- Section 2 (Method)

- The authors should make it clear whether they adjusted the model bathymetry or not. Because GEBCO 2019 is sourced from navigation chart data, the chart datum can be not mean sea level but lowest astronomical tide (LAT) or a datum as closely equivalent to this level. Thus, particularly in tidally dominated shallow coastal regimes, the GEBCO 2019 should be adjusted. I also recommend that the authors compare their model depth data with that of FES2014 which can be provided as request.

- On p. 4 line 108: Need to put reference for Chezy formula.

- On p. 4 line 110: As far as I know, the value of C varies with depth range. Need to check it and clarify it.

- On p. 4 lines 117-118: As the authors showed in Table 1, even though the resolution of TPOX09 is higher than that of FES2014, they used FES2014 without any clear explanation. With respect to this point, they need to clearly explain the reasons. Did they calculate RMSE of TPOX09 and compared with that of FES2014?

- On p. 5 lines 130-135: Need to explain the advantages and disadvantages of DUD compared the other data assimilation algorithms.

- Figure 1a: If possible, in Figure 1a, the authors need to put numbers used in y-axis of Figure 1b as area identification number.

- Figure 1b: put titles of x-axis and y-axis.

- On p. 9 lines 216-219: The authors need to rewrite the sentences. Is there any reason to choose the specific year of 2014? Did you predict tides of 2014 along with tidal harmonic analyses?

- Section 3 (Estimation of Bottom Friction Coefficient)

- Figure 3a: What do the numbers (1, 2, and 3) in Figure 3a mean?

- On p. 12 lines 262-263: The authors need to put names including Foxe Basin, Hudson Strait and Ungava Bay in a location map.

- On p. 12 lines 264-269: The authors should rewrite these sentences to make them clear. What kind of "parameters" do you mean? What is "the form of tide components"? Does it mean "harmonic constants for tidal constituents"? How long do you use "model output of time series"?

- On p. 12 lines 284-285: The authors need to put names such as Scotland, the Faro Islands and Shetland in a location map. There were twice "The region of Scotland, the Faro Islands and Shetland have mountainous". Remove one.

- Section 4 (Numerical Experiment and Results)

- On p. 14 lines 312-319: I think that these sentences were mentioned in previous sections.

- On p. 14 line 315: Is there any reason to select "September" and "2014" for a period of one month?

- On p. 15 line 328: Are there any reason or reliable source to give the values of 5% and 20% uncertainty for bathymetry correction factor and bottom friction coefficient, respectively?

- On p. 18 line 357-359: There were twice "It is observed that in the Arctic Ocean, the initial RMSE with the value of 11.03cm is larger than other regions.". Remove one.