Ocean Science

Discussions

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Interactive comment on "Accuracy assessment of global internal tide models using satellite altimetry" *by* Loren Carrere et al.

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General Comments:

This was a very detailed assessment and good comparison of available IT models supported by qualitative, quantitative and spectral analyses. The manuscript is in overall well structured, clearly written and organized. Starting from the abstract, all sections in the manuscript were captured concisely. Next, the introduction paragraph provided a summarized background on satellite altimetry and stated its limitations for tidal analyses, supported by relevant references. Also, it explains the need for a validation process for available IT models and delineates what to expect in subsequent sections

but omits some information on the resolution of altimetry data used. Next, in the presentation of the participating IT models' section, all the participating models were well described in terms of their methodology, except for Ray model. Next, the qualitative and quantitative comparison sections are well presented, requiring minor grammar corrections. All the plots are accurately described, but some plots were difficult to read due to their font size. Also, mathematical support or presentation of equations used (as cited in the literature), are rather necessary in the quantitative comparison section. Next, the presentation of the altimeter database section is well written and clearly indicate the reasons for selecting the J2 and C2 missions for the comparison. Next, the method of comparison section was well explained and follows a logical order but needs for a clearer or possibly an enumerated sequence. In the next section, variance reduction analysis using satellite altimeter data, SSH and SLA variances plots were produced for both the M2 and K1 constituents. The results were properly described, and variances of the corrections were stated for each participating IT model. Some plots were difficult to read due to their font size. Next, the wavelength analysis of M2 section corroborates previous results by estimating the amount of energy removed at from participating IT models. Results for this section are well described; only need to further elaborate on EGBERT's model performance in the Gulf of Guinea. Next, the discussion session clearly summarizes previous sections and offers conclusive explanations on the performance of each model based on final results. Finally, the appendices section supplemented the manuscript, with results of remaining constituents. This section was clearly described and presented similarly to the variance reduction analysis of M2 and K1 section. As previous sections, the font size on some plots were not legible.

Specific Comments:

1. Line 83: Remove "Altika". The mission is not used for the quantitative comparison or anywhere in the manuscript.

2. Line 84: The section omits the resolution of the altimetry databases used in the validation process e.g. HRM/LRM

3. Lines 135-144: RAY model needs to be better described in the presentation of participating internal tide models. The model methodology should be included as for other participating models or more information is rather necessary.

4. Lines 240-243: Consider mentioning why from all the seven regions of interest, NPAC and Luzon regions were selected for the comparison e.g. more energetic regions of all seven.

5. Line 294: Include Stammer, 2014 equations for the calculation of STD of IT models for the reader convenience.

6. Line 325: Here the resolution of 1-hz is indicated (LRM). Consider adding it to line 84.

7. Line 351: For future research: consider adding seasonal barotropic tide correction in best performing models.

8. Lines 371-408: This section explains well the methodology for the analysis. But would be convenient to enumerate each step to follow a sequential order.

9. Lines 416-425: Reiterate or remind that the quantification and regional impact of the M2 IT correction were performed using all participating IT models but not the same case for K1.

10. Line 450: Independent results from C2 shows similar patterns as J2 mission, albeit J2 bias in empirical IT models. From all IT models listed in table 1, only ZARON incorporates Altika mission. Consider adding Altika to support C2 independent results and further corroborate J2 bias towards empirical model.

11. Line 419-460: Speculate or provide a possible explanation of why Dushaw and HY-COM models rise SSH or SLA variances in some locations as supported by conclusive evidence in the variance computation e.g. areas of strong currents, others?

12. Line 559: Further elaborate on EGBERT model's performance in the Gulf of

Guinea. EGBERT model appears to reduce energy in shorter modes for this region, compared to other models.

Technical Corrections:

1. Line 32: add colon: "tidal constituents: M2..."

2. Line 33-34: ...Cryosphere Satellite-2 data. (Remove) "taking advantage of the long-term altimeter databases available"

3. Line 84: ...or C2 hereafter). (Remove) "taking advantage of the long-term altimeter databases available"

4. Figure 2: Capitalize first letter "amplitude"

5. Figure 3: Capitalize first letter "amplitude"

6. Figure 4: Capitalize first letter "amplitude", replace "on" with "in"

7. Line 32: include colon after constituents":"

8. Line 84: state the resolution mode of the altimeter databases selected: LRM/ HRM

9. Line 299: re-write sentence: ...Figure 5 and 6 (remove) "respectively" the mean (add) "amplitudes" and the standard deviation of the M2 and K1 models (add) "respectively".

10. Line 304: Capitalize first letter "oceans"

11. Line 305: abbreviate standard deviation (STD)

12. Line 306: abbreviate standard deviation (STD)

13. Line 308: Tahiti and Hawaii, and (remove) "also" in the Madagascar region.

14. Line 351: lower cap "Tide", lower cap "Other"

15. Figure 5: Capitalize first letter "global"

16. Figure 6: Capitalize first letter "global"

17. Table 2: re-write headers: Region, STD M2 (cm), STD K1(cm). Abbreviate standard deviation (STD)

18. Line 343: word of choice: "most difficult" instead of "trickiest". Abbreviate Jason (J2)

19. Line 371: (Remove) "The first step consists in generating" (add) First we generate the corresponding...

20. Line 375: Second, the altimeter...

21. Line 379: Third, the altimeter...

22. Line 383-388: re-write entire paragraph to connect with previous

23. Line 386: (remove) "As" (add) Since coherent IT have...

24. Line 390: Fourth, the maps...

25. Line 397: For J2, all latitudes are covered bu the number of points is are limited...

26. Line 398: equator and increase towards....

27. Line 399: Fifth, the mean...

28. Figure 7: Use larger font for bottom left plot. In the figure text, use exponent "(cm2)"

29. Figure 8: Correct plot top left plot "RRAY" to RAY. Use larger font for bottom left plot. In the figure text, use exponent "(cm2)"

30. Figure 9: Correct plot top left plot "RRAY" to RAY. Use larger font for bottom left plot. In the figure text, use exponent "(cm2)"

31. Figure 10: Use larger font for bottom left plot. In the figure text, use exponent "(cm2)"

32. Figure 11: In the figure text, use exponent "(cm2)"

33. Figure 12: In the figure text, use exponent "(cm2)"

34. Line 540: add comma (Zaron, 2017)

35. Line 567: Abbreviate internal tide (IT)

36. Line 572: Abbreviate internal tide (IT)

37. Line 576: Abbreviate internal tide (IT)

38. Line 581: add coma: IT modes, but...

39. Figure A1: Capitalize first letter "amplitude"

40. Figure A2: Capitalize first letter "amplitude"

41. Figure A3: Capitalize first letter "global"

42. Figure A4: Capitalize first letter "global"

43. Table A5: Capitalize first letter "mean"

44. Line 786: Abbreviate internal tide (IT)

45. Line 788: B1 and B2 respectively

46. Figure B1: In the figure text, use exponent "(cm2)"

47. Figure B2: In the figure text, use exponent "(cm2)"

48. Line 824: Abbreviate internal tide (IT)

49. Figure C1: In the figure text, use exponent "(cm2)"

50. Figure C2: In the figure text, use exponent "(cm2)"

51. Figure C3: add period "."

Please also note the supplement to this comment:
https://os.copernicus.org/preprints/os-2020-57/os-2020-57-RC1-supplement.zip

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C7