

Interactive comment on “FES2014 global ocean tides atlas: design and performances” by Florent H. Lyard et al.

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This is a nice overview of the evolution and present status of the FES series of global tidal models. Brief descriptions of the major components in the model (e.g., finite element/volume approaches, assimilation techniques and data, self-attraction and loading, bottom friction and internal drag coefficients, barotropic to baroclinic conversion) are given along with numerous figures illustrating improvements from earlier versions, and comparisons with other global models. Though I recommend publication, I feel the paper would be stronger if the following, generally minor, issues could be addressed.

General Comments:

1. Though the manuscript title specifies “atlas design and performance” (I suggest

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making “performances” singular), I would like to see more information on the atlas itself. The manuscript states (page 4, line 22) that the actual FES tidal constituent harmonics can be found on an “AVISO+” website, but I think the specific URL should be given (here or in an Appendix) (<https://www.avisio.altimetry.fr/en/data/products/auxiliary-products/global-tide-fes.html> ?) along with a short summary of what (not only data but software?) is available.

2. Though the numerous global maps have lots of information, not all of the details are accessible. Specifically, as a coastal modeler I would not only like to see the M2 and K1 amplitudes in the specific region where I work but also the location of assimilated tide gauge, cross-over, and along-track data. (This information will assist in determining whether: i) FES could be used to provide boundary conditions for a regional model, and ii) the FES de-tided altimetry is likely to have adequately removed smaller scale tidal variations.) For many of the global figures in this manuscript, even when I zoomed-in, it was not possible to see this information clearly. I don’t know how this manuscript will be published electronically but urge the authors (and the journal’s scientific and technical editors) to provide sufficiently, highly-resolved figures so that when zoomed-in, interested readers can pick out the details they want. On Figures 2, 3, 9, 10, and 13 for example, this may require changing the dot scaling so that as one zooms-in, the dots become smaller so their precise locations become evident. In the case of Figs 2 and 3, smaller dots would no longer obscure the background image but perhaps also allow more amplitude contours to be displayed.

3. Along the lines of comment 2, I also would like to see the actual FES model grid (page 6, lines 14-22), especially its coverage and resolution in shelf and coastal regions. Figure 1 partially addresses the resolution issue but even when zoomed in, it doesn’t provide the detail I would like to see. Perhaps an image of this grid (with zoom-in capability) exists somewhere on an AVISO+ or LEGOS/CRNS/CNES website but I couldn’t find it in a quick search. If it does exist, then that location should be given. If it doesn’t, then I strongly recommend that be done, as again, the information would be

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useful for regional and coastal modelers.

Specific Comments:

1. Page 3, line38-40: What other norms can be used? A reference should be given.
2. Page 5, line 5: remove "about"
3. Page 5, line 33: Has NCP1 been defined?
4. Page 6, line 5-8: Give a reference for this statement.
5. Page 6, line 10: CFL vs CLF ?
6. Page 6, lines 19-22: As above in general comments 2 and 3, it appears from zooming-in on Fig 1 that Juan de Fuca and Queen Charlotte Straits (south and north of Vancouver Island) are in the grid (resolution 5-10km?) but the Strait of Georgia (which has a partial TPJ track) and its northern passages are not. Presumably you compensate for this by assimilating crossover, tide gauge and along-track data. Zooming-in on Figs 9 and 11, I can see what crossover and tide gauge data are used but not so for locations of the along-track data in Fig 10. Furthermore, zooming-in on Fig 3 doesn't provide the detail to see, for example, if those data have caused the FES solution to at least partially capture smaller scale features like the surface signature of K1 shelf waves off the Vancouver Island coast.
7. Page 6, line 27: Gb vs Go ?
8. Page 7, line 24: It's not clear if these coefficients are spatially constant over the entire globe or they differ within say, the polygons in Figs 7 and 8.
9. Captions to Figs 2 and 3: These are not clear. The a), b), and c) references suggest there should be 3 panels, yet only 2 are presented. If a zoom-in capability were available for these figures, you could probably include the shallow/coastal crossover locations too.

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10. Section 3: I wonder about non-stationarity, especially in coastal regions where seasonal changes in river discharge, winds, and ice cover may interact with the tides. Is this considered?
11. Page 9, line 20: Give a reference for Parceval's rule.
12. Page 10, line 14: In the Canadian Arctic, the additional drag from seasonal ice cover changes the constituent amplitudes and phases at some coastal locations. Can this non-stationarity be accounted for?
13. Page 10, lines 19-22: I'm interested in more details on this. Is there a reference?
14. Page 10, line 29: The text says the filtering wavelength is in km while the Fig 5 caption says it is in number of along-track points.
15. Page 11, lines 28-30: Why is that?
16. Page 11, line 37: Presumably there was a dissipation cutoff to determine these polygons, as not all purple regions warranted one. What was it?
17. Page 12, line 23: The polygons on Fig 8 are not numbered.
18. Page 12, line 32: Does it have to be the same everywhere? You probably need 10m in regions like the Bay of Fundy but it shouldn't have to be that large in many other coastal areas.
19. Page 14, line 18: "used in" vs "kept from" ?
20. Page 15, line 36: It seems that TPX09 is more accurate than FES2014b in the shelf and coastal regions. Can this be attributed to their generally higher (1/30 degree) spatial resolution?
21. Page 17, line 6: Why is there a peak at about 14km from the coast in the left panel of Figure 17?
22. Page 17, line 28: Give a URL for this portal.

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23. Page 17, line 36: Often phase lags are included in these ellipses by showing the current vector position at the time of maximum tidal potential at Greenwich. Also, an arrow is sometimes placed on the ellipse itself to denote the sense of rotation. Were these not done in Figs 19 and 20 because they would make the figures too complex?
24. Page 17, line 42: You should change the scale to make the ellipses larger for K1. Perhaps a zoom-in capability (ellipse size changing as you zoom-in) is needed here in order to decipher which ellipses belong to which dot.
25. Page 18, line 11: I can guess which station this is but maybe you should give the approximate lat/lon to help readers.
26. Figure 21: A zoom-in capability that doesn't blur the color details would be useful here.
27. Page 19, lines 5-6: Why does the lower panel of Fig 22 show wave-like (Gibbs?) patterns, for example radiating eastward and westward from the Canadian Pacific coast?

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