

Reviewed by: Jason Otero Torres & C.K. Shum  
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General Comments:

The manuscript explains improvements achieved in FES2014b compared to its previously released versions. The FES global hydrodynamic ocean tide models have been a 'gold' standard of physics-based finite-element computational regime for the oceanography, geodetic, geophysical and other community, for a variety of applications and scientific research. The methodology for the model development is clearly and concisely described, without overburdening the reading with well-established theoretical background, which is already readily available in the cited literature. However, while we understand the convenience to synthesize the overall communication, we expected to see additional details in several sections to better assess the presented results. In addition, we urge revising for grammar, presentation and descriptions in figures, and re-working the abstract to include general details found in subsequent sections. In sum, we recommend its publication provided that the authors adequately address the general and specific comments

Specific Comments:

1. Can the authors concisely explain why this new ocean tide model is named FES2014b? We understand that may be there is an upcoming FES2022 (?) model, it would be good if the authors explain the historic, current and future development of this very unique global hydrodynamic ocean tide modeling, for the benefit of interested users. This is also requesting to more clearly delineate FES models 2014, 2014b, 2014c, e.g., for clearly recommending to the users which model should they use?
2. The abstract overemphasizes the improvement of the new model from its previous releases. It is ok to highlight this in one or two lines, but please also include summarized details of each main section.
3. Abstract. Define ITRF; however, the authors may have meant IERS Standards, 2010? If so, please also define IERS and others in the manuscript as appropriate. For example, AVISO+, LEGOS, T-UGOm, CEFMO, LGP<sub>1/2</sub>, NCP<sub>1</sub>, GEBCO, ETOPO, RTOPO<sub>1</sub>, etc.
4. We note that various bathymetry models, including the one inverted using satellite radar altimetry (Sandwell & Smith). Can the authors comment on the applicability of the satellite inverted bathymetric model which would not be sensitive to the gravity signals resulting from coastal sediment compaction and loading? It would be great if the authors could characterize, approximately, the impact of the state of the art bathymetry model on coastal ocean tide modeling. For example, for the FES model is the bathymetry model accuracy still the limiting error, or other errors sources, in the state of the coastal ocean tide modeling?

5. Along the lines with the good discussions of  $S_2$ ,  $K_1$  aliasing (dependent on different altimeter data in the tidal solution), please discuss the issue of  $S_1$ , and also may be pole tides?
6. Section 3.2: Removing the entire  $S_a$  and  $SS_a$  constituents, or just the non-tidal contribution in  $S_a$  and  $SS_a$ ? Please clarify. Also further elaborate on GLORYS-v1.
7. Section 3.4: Explains the ice coverage problem in high latitudes. It seems that this section only applies to unbalanced observations caused by ice coverage and not other phenomena affecting the tidal estimates e.g. ocean circulation. This is explained in section 3.2 and in section 4.3 where fewer crossover data were added for the data assimilation process because of the large contamination of mesoscale processes. Please consider adding these effects (or others), affecting the separability and possibly state their impact on the **extended** frequencies in the FES2014b model version.
8. Figure 2-3: The details at some regions lost at the coastal regions for both the upper panel and lower panel. Consider an alternate symbology for the presentation of vector differences.
9. Figure 11: Add source for tide gauge database and each of the respective data count.
10. Related to above on pelagic tide gauge data validation of tide models. Can you comment or would you have cases where the tide gauge data used to initialize/constrain FES model are used and not used to evaluate the FES model?
11. Figure 16: A slight rise in variance is visible around Lapdev and Kara Seas for Altika mission altimeter data, when using FES2014 and FES2012 models as tidal corrections. Speculate on the reasons for such a rise in variance.