

1 2nd review on “A New-Generation Internal Tide Model Based  
2 on 30 Years of Satellite Sea Surface Height Measurements:  
3 Multiwave Decomposition and Isolated Beams”

4 by Zhongxiang Zhao

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6 **1 General comments**

7 I thank Dr Zhao for his dedication in answering my numerous comments point-by-point. After  
8 reading his response alongside the tracked changes version of the manuscript, I consider he did a  
9 great job answering my earlier interrogations. I also think the revised manuscript gained in clarity  
10 and does not require another round of review. Still, there are three points I would like to raise (I  
11 let the author and editor judge the necessity of addressing these):

12 The first one concerns the denomination of the “apparent” and “real” or “isolated internal tidal  
13 beams”, i.e. the pattern originating from the interference of multiple internal tidal waves versus a  
14 single internal tidal wave originating from a finite-length source. I am unsure referring to the latter  
15 as a “beam” is correct (note I am not a native english speaker). Instead, I think a “real internal tidal  
16 beam” should simply be called an internal tidal wave. In my opinion, this would greatly improve  
17 the clarity of the text and be more consistent with the literature.

18 Second, as pointed out by the author, my plot (Figure 2) and comments relative to the SSH error  
19 were wrong. In the published dataset, the SSH error is given in unit mm while the SSH amplitude  
20 is in cm (I assumed everything was in cm). The units are indeed correctly specified in the data,  
21 however it requires special attention from the user (at least for users not relying on matlab) that

could be easily spared. Thus, I suggest using the same unit for both the SSH amplitude and error in the published data.

Lastly, Dr Zhao made available the error estimates for individual waves as well as the geographic mask corresponding to regions of strong mesoscale activity (<http://doi.org/10.6084/m9.figshare.28559978.v1>). However, this update is not visible from the main dataset page (<http://doi.org/10.6084/m9.figshare.28078523.v1>). Could a reference be added there ? (Maybe it is pending, in that case please ignore this comment).

## 2 Detailed comments

I list below a few suggestions for minor changes in the main text (lines are referenced to the tracked changes version).

l315: change “better resolve” for “better resolves”.

l352: “Mode-2 M2 internal tides are mainly associated with rough bottom topography, because they are also generated in the tide-topography interaction” drop “, because they are also generated in the tide-topography interaction” (confusing).

l353: change “Mode-2 M2 internal tides mainly occur at low latitudes” for “Mode-2 M2 internal tides are mainly detected at low latitudes”. Mode-2 waves not being seen by altimetry does not mean that they are not there. The stratification structure may cause the surface signature to be very small, still the waves can have non-negligible expressions at depth.

l534: change “the distances are needed for the internal tidal rays bounce to the sea surface for the first time” to “the distances are needed for the internal tidal rays to bounce at the sea surface for the first time”.

l547: “strong beats and weak beats” is unclear. In my original comment I was thinking of the beat translating into e.g. spring and neap tides.

l588-603: “Figure??”. Figure 21 (I assume) not correctly referenced throughout the paragraph.

l640: same, “Figure??” instead of Figure 21.

l647: change “Incoherent internal tides can be mapped from the de-correlation of covariance” to “Incoherent internal tides can be described statistically, and the associated variance has been mapped using realistic numerical simulations, as well as satellite altimetry and in situ observations.” Note a

recent pre-print by K. Shimizu improves upon the simple statistical model used in Zaron (2015) and Geoffroy and Nycander (2022) (<https://egusphere.copernicus.org/preprints/2025/egusphere-2024-4192/>). Also, Zaron (2017, 2022) might be worthy additions.

l652: “ZHAO30yr has significantly reduced model errors to lower than 1 mm” add “on a global average”.

l653: change “the minor and mode-2 internal tide constituents” to “the minor constituents and mode-2 waves”.

l654: same.

## References

Geoffroy, G., & Nycander, J. (2022). Global mapping of the nonstationary semidiurnal internal tide using argo data. *Journal of Geophysical Research: Oceans*, 127(4), e2021JC018283. doi: 10.1029/2021JC018283

Zaron, E. D. (2015). Nonstationary internal tides observed using dual-satellite altimetry. *Journal of Physical Oceanography*, 45(9), 2239 - 2246. Retrieved from <https://journals.ametsoc.org/view/journals/phoc/45/9/jpo-d-15-0020.1.xml> doi: 10.1175/JPO-D-15-0020.1

Zaron, E. D. (2017). Mapping the nonstationary internal tide with satellite altimetry. *Journal of Geophysical Research: Oceans*, 122(1), 539-554. Retrieved from <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/2016JC012487> doi: <https://doi.org/10.1002/2016JC012487>

Zaron, E. D. (2022). Baroclinic tidal cusps from satellite altimetry. *Journal of Physical Oceanography*, 52(12), 3123 - 3137. Retrieved from <https://journals.ametsoc.org/view/journals/phoc/52/12/JPO-D-21-0155.1.xml> doi: 10.1175/JPO-D-21-0155.1