

*Review of*  
**“Spatial and temporal variability of mode-1 and mode-2 internal solitary waves  
from MODIS/TERRA sun glint off the Amazon Shelf”**

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This paper documents the spatial and temporal variability of mode-1 and mode-2 internal solitary waves off the Amazon shelf using sun glint images from MODIS/TERRA satellites. Only off-shore propagating waves are considered. The images span a period of 17 years and two time periods are considered because of differences in the background stratification and hence wave properties: spring (March to June) and fall (August to December). The most interesting result is the number of presumed mode-2 ISWs there are and their seasonal variation.

The paper makes a valuable contribution however I did find it rather dry and tedious to read. Perhaps some of the details can be put in appendices or supporting material? With that in mind the authors could try to reduce the paper by a few pages and think about what is really essential. The paper also suffers from a lack of physical insight - there is a lot of reporting about what the images show and there could be more on why. There is some mention of the seasonal variation of the stratification and ocean currents. It would help if there were some plots to illustrate this and perhaps some plots showing the model structure in the different seasons and in different areas. How are the variations in the number or type of ISW related to variations in internal tide energy flux?

The writing could also be improved. I think it needs a rather thorough revision before I could recommend it for publication.

### **Comments**

1. ISWs are categorized as mode-1 or mode-2 waves based on the distance between successive wave packets: if the separation distance is approximately equal to a mode-1/mode-2 internal tide wavelength they are called mode-1/mode-2 ISWs. While this assumption seems a reasonable one there is no in situ data reported on that confirms the vertical structure of the ISWs. Can the authors comment on this?
2. In section 2.3 the viscous Taylor-Goldstein Equation (TGE) is discussed. It is used to compute the mode-1 and mode-2 internal tide wavelengths and propagation speeds. Rotational effects are not included which is reasonable for such a low latitude but perhaps should be commented on. The values of the eddy viscosity and diffusivity used in the calculations are not provided. What values were used and why? How much does the inclusion of these terms affect the results?
3. At times the discussion of the regions where the waves appear is confusing. For example in the first paragraph of section 3 on page 8 sites A, B, F, etc. are referred to. These appear to refer to regions where ISWs appear. Later the

terminology areas A, B, etc. is used (see top of page 15 for example). This change in terminology is confusing. In Figure 2 there are locations labelled A, B, C and D. These I take to be generation sites. But in the text sites A, B, etc. are often large areas in which ISW surface signatures are seen. And the various sites appear to overlap. For example it appears that site A is not disjoint from site D. It would be helpful to add boxes to figure 2 showing where site (or area) A, B, etc. are. It would also be helpful to use consistent terminology that clearly distinguishes the generate site and the region where waves generated at the site are observed. Please also explain how the generation site of an ISW is determined. For example in Figure 5 it is stated that the red lines indicate ISW emanating from generation site F. How do you know they came from F and not E?

Also, the text refers to site F in the first paragraph of section 3 (page 8) when Figure 2 is being discussed but there is no E or F on Figure 2. One has to wait for Figure 5 to see where they are.

4. Is there some meaning to the ordering of the generation sites A, B, C, etc.? They are not east to west for example. Are they ordered in order of importance in generating ISWs? IT energy flux amplitudes?
5. Page 9, line 201. How were the number of mode-1 and mode-2 wave signatures normalized?
6. Figure 8 and 9. It appears the captions are mixed up: the caption for figure 8 should be for figure 9?
7. Lines 296–297. Here it is stated that the TGE calculations do not reproduce difference in propagation speeds at spring and neap tides. I don't understand why this is stated as the TGE equation is a linear equation which can't take into account changes in the strength of the barotropic tidal currents.
8. Line 140. "The buoyancy perturbations vertical and velocity ..." doesn't make sense.
9. Line 160. "... the phase speed is depicted complex number whose imaginary part ..." is ungrammatical. It doesn't make sense anyway because in (9)  $c$  is defined to be  $\omega/k$  where  $\omega$  is the negative of the imaginary part of  $\sigma$  so  $c$  is real.
10. Line 209. When I look at figure 4 it doesn't look like the probability of finding a mode- signature is more than 4 times the probability of finding a mode-2 signature. Please explain.
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