

Nonlin. Processes Geophys. Discuss., referee comment RC2
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Comment on npg-2021-31

Anonymous Referee #2

Referee comment on "Regional study of mode-2 internal solitary waves in the Pacific coast of Central America using marine seismic survey data" by Wenhao Fan et al., Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2021-31-RC2>, 2021

The manuscript seeks to quantify the relationship between the propagation speed and wavelength of mode-2 ISWs and a number of parameters (e.g. depth). Data is from measurements taken during a field campaign off the coast of Central America. The manuscript is difficult to read and its scientific conclusions are weak. I have worked on mode-2 waves for some time, and the question of propagation speed/wavelength variability never struck me as a pressing issue. This doesn't mean I wouldn't want to read about it, but it does mean I would like some motivation for doing so. The authors hint at links with actual dynamics of the mode-2 waves (lines 30-50) but never really return to these ideas when discussing their results.

The authors appear to have some rather basic points of theoretical misunderstanding; for example there is repeated mention of phase velocity, but ISWs do not have a phase velocity. Only linear waves have a well-defined distinction between phase and group speeds, something that goes back (at least) to the classical work of Whitham in the 1960s. In a similar vein, ISWs are "long waves" so why does the frequency appear in the TG equation on line 400?

The technical English of the manuscript is quite poor (there are more issues with plural vs singular and verb tense than I could count), to the point of interfering with the scientific messaging. I suppose this could be cleaned up during the peer review process, but the fact that equations are not properly type set, making the quantitative aspects very difficult to judge, suggests not enough care was placed on communication and that this goes beyond language issues. As a simple example, in equation (1) were the fraction typeset as a fraction, the symbol $*$ would be unnecessary and potential confusion with the use of $*$ to denote convolution could be avoided.

The technical graphics (13 figures) are quite good, with nicely put together Matlab figures and a very nice diagram in Figure 2. Some figures could use grid lines, and Fig 9 could

use a better symbol (a filled triangle, '^', or pentagram, 'p' with 'MarkerFaceColor' set in the plot command). I was really surprised that no plots of the density profile the waves propagate on were provided (even in schematic form).

Many of the fits shown are very poor (Fig 7,8,10) to the point where there really isn't much one can conclude scientifically (e.g. saying that the red crosses in Figs. 7,8 follow Kozlov and Makarov, as the authors do is rather dubious). For Figure 12, what would a "good fit" be? The procedure for how the red curve in this figure is computed is not clearly described.

I don't want to pile on, and I feel the methodology is quite novel and hence deserves its place in the literature, but the theoretical errors must be fixed before this work is published. So let me lay out what I feel the bottom line is:

- 1) The theoretical side of this manuscript needs to be cleaned up. The term "phase velocity" needs to be removed, or the authors have to define what it means for ISWs. Equations must be properly typeset, and not just thrown into text as ratios (you could for example define commonly used ratios (e.g. $\tilde{a}=2a/h_2$ and then refer to \tilde{a} in the text).
- 2) Fits need to have R values computed (Matlab will do this via the "tools" button on the figure, or from the command line) and these need to be reported in tables.
- 3) Give some idea as to the vertical structure of the density field. The readers should understand why the authors want to provide the fits that they do, and they need to have a context for how the density may be changing due to various environmental factors.
- 4) I would strongly suggest having a look at the various JPO papers on the Pt Sal internal wave "mega project"; the two McSweeney et al papers especially. Some of these papers included using KdV theory to examine environmental variability in a way that may be useful to the authors, others adopted different points of view which the authors may find useful to put their results in context.
- 5) Ask a colleague to read strictly for language. Even those like myself, for whom English isn't their first language, could catch simple mistakes (e.g. tense).