

Review of 'Shoaling of internal solitary waves at the ASIAEX site in the South China Sea' by Lamb and Warn-Varnas (2014)

Investigation of internal wave dynamics in the northern South China Sea has been a hot topic since more than a decade ago. The ASIAEX experiment was the first systematic program that has given great insight in understanding internal wave characteristics in the slope-shelf region of the northern South China Sea. After that, several large field programs have been launched and a number of numerical studies on this topic have appeared. However, most numerical works focus on the internal wave generation in the Luzon Strait and propagation in the deep basin, and few has shed light on the internal wave shoaling process above the continental slope and shelf. This paper studied the shoaling process of internal solitary waves in the northern South China Sea by employing a 2D non-hydrostatic model with representative bathymetries and stratification. The authors examined a number of factors that could have influence on the wave shoaling, e.g., initial wave amplitude, water depth, stratification, etc. While some of the factors are more or less well understood, and the results were expected, this paper offers a very thorough examination on the wave shoaling dynamics and does a number of sensitivity experiments. This work will serve as a useful reference on the studies of internal solitary waves in this region.

I think that the paper fits the scope of Nonlinear Processes in Geophysics. I would recommend a minor revision before publication. There are a few points that the authors need to address though. My specific comments are listed as follows.

Major points:

1. May I suggest to highlight 'numerical simulation' in the title?
2. The abstract: it is mostly about 'what has been done' in the work, not 'what has been found'. It would be nice if the authors could consider improving this.
3. P1166, L8-16: Please improve this paragraph; the first citation and the third citation have a similar story.
4. About rotation: are the authors aware of the recent work by Grimshaw et al. (2014)? They studied the combined effect of rotation and shoaling topography on the propagation of internal solitary waves in the South China Sea. A major finding is that the combined effect results in the formation of a

secondary wave train after the leading wave passes by the shelf break. This secondary wave train, although being less pronounced, also appears in Fig. 18. The authors may want to discuss a bit around this. Grimshaw et al. (2014) also did some sensitivity runs which are also relevant to the topic of this paper.

(Grimshaw et al., Combined Effect of Rotation and Topography on Shoaling Oceanic Internal Solitary Waves, Journal of Physical Oceanography, 2014)

Minor points:

P1164, L3: solitary 'wave' train.

P1164, L15: in situ 'observations'?

P1167, L25: grammatical error.

P1169, L9-12: this should appear in the caption.

P1170, L27: is 'approached' they...

P1171, L18: '45.4' m

P1171, L18: what are 'Case 2 and 3'? Table 3 is not introduced before this.

P1174, L21: 'too' wide

P1174, L26: please explain a bit about ' $J=200$ '.

P1180, L5: grammatical error.

P1181, L12: steeper 'than'

P1182, L23: the wave 'has' reached

P1184, L8: 'e.g. $t_x=18$ '?

P1186, L16: consider case with an – specify which case?

P1186, L27: Incomplete sentence; informal in a paper.

P1187, L12: do the modeled characteristics of the second mode match those of observations (e.g., amplitude, location, etc.)? One may not expect a good

agreement with such an idealized simulation, but it would be helpful to discuss it a bit.

P1189, L9: I think it is 'northeastern' South China Sea.

P1190, L28: as 'they' shoal into

P1191, L25: '120 m'

Tables/figures:

Table 1: please explain the variables in the first row.

Table 2: the last sentence is incomplete.

Table 3: I do not see any 'vn' in the table... and delete one 'for' in the middle of the caption.

Fig. 1: please add information of isobaths and color bar.

Fig. 2: the grey lines in panels b and c are nearly invisible.

Fig. 3: please specify in the caption that panels a and b have different y-axis scales. I also found panel c not very readable and not necessary. Can the authors consider removing it?

Fig. 5: please specify in the caption that the scale of y-axis in panels a and b is different.

Fig. 9: please indicate in the figure the location of the mode-two wave.

Fig. 10: 1) Line 4 in the caption: 100 m (dotted); 2) incomplete sentences in the caption; 3) the last sentence in the caption: if the curve of the higher vertical resolution results is indistinguishable from the solid curve, I don't think it necessary to actually overlie and describe this curve; 4) please add legend in the panels. I have to refer back to the caption very frequently during reading; 5) It seems that the information in the caption is inconsistent with that described in the text.

Fig. 12a: Is the magnitude of the y-axis correct?

Fig. 13: please try to enhance the readability this figure.

Figs. 14 and 15: I feel that one figure would be enough to clarify the point. It is up to the authors.

Fig. 18: please indicate legend in the panels providing information of cases and time. Again I have to refer back to the caption all the time. Also, if there is a curve that is indistinguishable with the other, I don't think it necessary to plot it.

Fig. 19: incomplete sentences; very informal.