

## ***Interactive comment on “Kinematic parameters of internal waves of the second mode in the South China Sea” by Oxana Kurkina et al.***

**Anonymous Referee #3**

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General comments:

The paper is devoted to the calculation and analysis of the wave speed of long internal waves of the second mode, and the respective coefficients of the weakly nonlinear model (Gardner equation) for the conditions of the South China Sea. The calculations use the GDEM database. As a result of this study, the authors have described important key trends in the behaviour of these parameters, which they have summarised at the end of section 4. A useful comparison has been made with the relevant coefficients for the waves of the first mode, and the authors have included a helpful discussion on their choice of the representative depth. Overall, I find that this is a useful study. However, I have some queries, and I hope that the authors will be able to address these queries in the revised version of the paper.

C1

Specific comments:

1. In the Introduction it is stated that "These powerful disturbances are usually excited by interactions of barotropic tidal waves with the Kuroshio Current..." (Minor comment: 'excited' is probably better replaced with 'affected'). This statement seems to be in a direct contradiction with "The field of large-scale currents was ignored" on p. 7. Indeed, the modal equations on p. 4 and 5, and the coefficients of the Gardner equation on p.5 are calculated under the assumption that there is no background shear flow. However, the presence of the flow will change the very parameters calculated and analysed in the paper. Thus, the authors are asked to justify ignoring the currents.

2. In the discussion of the applicability of the Gardner equation for long internal waves in the South China Sea (section 3.3) the authors provide estimates for the terms in the bracket of the Gardner equation (1). This discussion seems to be incomplete. It would be useful to add estimates (or at least a discussion) for (a) the nonlinear and dispersive terms in (1), (b) the fifth and nonlinear dispersive terms which appear in the derivation of the higher-order KdV equation, but are neglected in this study. The authors are asked to clarify these points.

3. On p. 3 it is stated that "This feature makes it possible to use these models to isolate and identify principally new features of the dynamics of internal waves even if some details of the system are not reproduced..." The authors are asked to expand this discussion and briefly describe the main advantages and disadvantages of using the weakly nonlinear models of this type, rather than just referring to the literature.

4. On p. 10 it is stated that "Gardner equation is not applicable in locations where the coefficients at the quadratic term vanishes and one has to employ a modified KdV equation..." This is not clear to me. Gardner equation becomes the mKdV in this case, so, what is meant here?

Technical corrections:

C2

1. A footnote with the web link to GDEM database would be useful to readers.
2. p. 1, "...solitons (solitary waves that interact elastically)" The comment in the bracket is not relevant in the context of this study, remove.
3. p. 5, "... are invariant with respect to the particular choice of  $z^*$ ..." is better replaced with "... do not depend on the particular choice of  $z^*$ ..."
4. Figure 4, caption is unclear. Please, check.
5. The list of references is too long for the size of the paper.

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