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Nonlinear Processes in Geophysics
Discussions

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

Anonymous Referee #2

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On the manuscript "Kinematic parameters of internal waves of the second mode in the South China Sea" by O. Kurkina et al. This is one more work in the long series of publications of the group including the authors regarding different variants of the Gardner equation (GE) in application to the oceanic internal waves. It is devoted to calculation and mapping of GE parameters for South China sea for which, indeed, many observations of nonlinear (often strongly nonlinear) internal waves (IWs) have been published. The authors concentrate on the second IW mode which was observed albeit much less regularly than the first mode. It contains numerous details and maps of the second-mode wave structure the GE coefficients. The paper has a heuristic and perhaps some practical interest. It is written in a good English and potentially can be published. However, some serious questions should be addressed first. 1. The authors briefly discuss

applicability of the weakly nonlinear model. But it is not very convincing. If nonlinear corrections to phase velocity reach 50%, it may change the result significantly. I do not understand the 20% estimate for both amplitudes and velocities of solitons: usually one of them is taken empirically and the second is calculated based on that. Also how nonlinear corrections to the mode stricture affect the GE parameters? 2. Even more important is that after all the calculations no single comparison with the observed internal waves is given. What kind of nonlinear waves was observed at the second mode? Is there anything more specific in the literature than just box 2 in Fig. 1? If so it would add a justification for the detailed mapping, and vice versa. 3. For the deep parts of the SCS: what should be the wavelength of the IW to fit the long-wave approximation? Are the observed waves long enough for that? 4. Sorry if I missed that but what stratifications were used for calculation and mapping? It is mentioned about two pycnoclines but only a simple model is shown in Figure 3 (so only the total depth was varied according to the bathymetry?) 5. If alpha1 is mostly negative, and alpha2 is also negative, what kind of solitons can exist in this area? There is no flat-top solitons in this case. 6. The paper text is short but it is overloaded by figures. In my opinion, figures like 6-10 which show intermediate values are not necessary.

Minor notes: "solitary wave that interact elastically" -so it is a priori weak, integrable nonlinearity in a 100 m wave? How do you know? "highly energetic [?] internal waves of higher modes" -What do you mean by that? "The coefficients at the quadratic and cubic terms of Gardner equation for internal waves of the second mode are practically independent of water depth."- How can? Probably you mean the case of a deep lower layer? "are qualitative similar" -better "qualitatively" (this is about the only typo I noticed). Why "Vaisala" rather than "Brunt-Vaisala?"

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