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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Propagation regimes of interfacial solitary waves in a three-layer fluid" *by* O. E. Kurkina et al.

Anonymous Referee #2

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The refereed paper is devoted to the problem of description of internal interfacial waves in shallow three-layer fluid within the framework of Bossinesq approximation which presumes small density difference between the neighbouring layers. Such approximation is relevant to oceanic situations, and three-layer models are widely used to approximate real oceanic stratification. Weakly nonlinear evolution equations are derived in the paper for perturbations propagating on the interfaces in the form of two modes, slow and fast. The overall quality of the paper is good, the analysis is accurate, and the paper is appropriate for publication in NPG. There are, however, some issues which should be addressed before the paper is accepted for publication.

1) I don't think that the words "Propagation regimes . . ." correctly reflect the paper content. The paper is devoted rather to the derivation of the model equations and analysis

of soliton structures than to the discussion of possible regimes of wave propagation. Perhaps, the title "Soliton structures in three-layer fluid" is more relevant to the paper content?

2) The authors write in the Abstract that they consider immiscible fluid layers. But they do not include surface tension between the layers into consideration. Therefore their results pertain in fact to miscible fluid layers.

3) It can be mentioned that some coefficients at the nonlinear terms may vanish not only in a three-layer fluid, but even in a two-layer fluid with the surface tension between the layers too. The authors can refer to the papers:

1. Giniyatullin A.R., Kurkin A.A., Kurkina O.E., Stepanyants Y.A. Generalised Korteweg–de Vries equation for internal waves in two-layer fluid. Fundamental and Applied Hydrophysics, 2014, v. 7, n. 4 (in Russian).

2. Kurkina O., Singh N., Stepanyants Y. Structure of internal solitary waves in two-layer fluid at near-critical situation. Comm. Nonlin. Sci. Num. Simulation, 2015, v. 22, n. 5, 1235–1242.

4) I am suggesting to present all coefficients of the derived equations explicitly in the Appendix.

5) In the first sentence of Sect. 5 it is claimed that Eqs. (29) are integrable by means of the inverse scattering method only for ONE specific set of coefficients. It is not true, there are two sets of coefficients when the fifth-order KdV equation is integrable – the Sawada–Kotera equation and Kaup–Kupershmidt equation, see: http://mathworld.wolfram.com/Sawada-KoteraEquation.html http://en.wikipedia.org/wiki/Kaup%E2%80%93Kupershmidt_equation.

6) As for the technical corrections, I would advise authors to enlarge sizes of Figs. 3, 7 and 9; they are poorly visible in the current format.

7) I am also suggesting the authors to check once again the English – there are missed

articles in several cases and some other botches.

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