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

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Review on Propagation regimes of interfacial solitary waves in a three-layer fluid by O. E. Kurkina, A. A. Kurkin, E. A. Rouvinskaya, and T. Soomere

New observations of second mode internal waves initiated the recent studies of their properties in the framework of the Korteweg – de Vries equation for the simplest three-layer density stratification of the ocean. The present work in fact continues these studies involving the effects of cubic nonlinearity, that seems justified because of strong effective nonlinearity in such waves (wave-induced flow of second mode significantly changes with depth). The present study is very careful with the full analytical calculation of all the coefficients of the extended Korteweg – de Vries equation for both internal wave modes. This alone deserves positive decision of the question about publication

of this manuscript. Authors, however, went further, and gave the analysis of possible "kinematic" regimes of solitary waves in a three-layer flow (the problem of their generation is not considered). The novelty of this paper is also in considering the evolutionary equations for both interfaces, though it is clearly understood that in a vertical mode the displacements of both interfaces are interconnected. Firstly this part of work seemed to me absolutely redundant, but the arguments on page 22 about an unobvious choice of the nonlinear corrections to the mode while the interfaces are fully determined convinced me that the result is logical.

My main conclusion is that the present manuscript can be published and it is certainly interesting for the readers of Nonlinear Processes in Geophysics.

Some technical comments to improve the text:

1. I would recommend making the figures in color scale and of a larger size. Now it is difficult to follow the lines on them.

2. I may recommend that all analytical expressions for the coefficients will be collected and published in supplement materials to this paper (it is now usual practice for many journals) instead of information that they are available on request from Oxana Kurkina.

3. Formula (30) can be omitted because it coincides with (28).

4. On p. 12 after Eq. (26). The second-order Eq. (26), not Eq. 28.

5. In references papers Oceanology and JETP Letters are accompanied by +. Why?

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