Review of “**Simulations and observation of nonlinear waves on the continental shelf: KdV solutions**” by *Kieran O’Driscoll and Murray Levine*

The use of the Korteweg-de Vries (KdV) equation, and the extended Korteweg-de Vries (eKdV) equation to model the large-amplitude internal solitary waves commonly observed in the coastal ocean is now well-established, both for a constant background, and when the bottom topography and hydrology vary in the propagation direction, see for instance the recent reviews by Grimshaw *et al* (Surveys in Geophysics, vol 28, 2007, pp 273-298, Nonlinear Processes in Geophysics, vol 17, 2010, pp 663-649) and Helfrich and Melville (Annual Reviews Fluid Mechanics, vol 38, 2006, 395-425). This paper uses these models for a two-layer fluid configuration to describe the deformation of a sinusoidal internal tide into an undular bore, for a constant background case, for a linear slope, and for the topography of a transect of the Middle Atlantic Bight. The paper concludes with a comparison of model simulations with some observational data from the same region.

Much of the material presented here in section 2 and 3 is well-known and does not need to be repeated here. For the constant-coefficient KdV model the steepening of a sinusoidal wave and formation of rank-ordered solitary waves in an undular bore is now text book material, following the seminal and landmark paper of Kruskal and Zabusky in 1965. The two-layer fluid model is widely used and understood, and since the eKdV model has a negative cubic term, its solutions are known to be generally qualitatively similar to the KdV model. Likewise, the behaviour of internal solitary waves propagating over a slope has been widely studied in both the KdV and eKdV models, with often a main focus on polarity change when the coefficient of the quadratic nonlinear term changes sign. The simulations with a linear bottom slope and with the topography of the Middle Atlantic Bight have some marginal interest in that most studies have examined the behaviour of a single solitary wave, rather than a developing wave train as here, although the outcome can be understood in terms of the known behaviour of a single solitary wave, namely adiabatic deformation and transition to an elevation solitary wave train riding on a negative pedestal when the usual transition is from a negative to positive coefficient. The most interesting and novel part of the paper is section 4 where the model simulations are compared with observational data from the Middle Atlantic Bight. Although there have been several such comparisons in the literature for other sites, this would seem to be the first for this site. In summary I would recommend that the authors prepare a heavily revised and shortened paper which focusses on the material in section 4.

Specific Comments:

(1) Further to the comments made above, in particular most of the text in section is not needed, and neither are figures 1-6.

(2) The measure χ (10a) of the relative roles of nonlinearity and dispersion is unconventional and uninformative. A better measure is simply the ratio α/β, where it should be noted that in the KdV equation (1) division by β and a rescaling of time, clearly indicates that this is the effective measure of nonlinearity *vis-a-vis* dispersion.

(3) The transition of the steepening front into a solitary wave train is best understood using the Whitham modulation theory and asymptotic solution, as developed by Gurevich and Pitaevskii. It is well known that, at least in the KdV model, the leading waves are solitary waves. The detailed discussion on this aspect is not needed here.

(4) The large-amplitude solitary wave solutions of the eKdV equation are more usually called "table-top" waves than the term "tanh" used in the text.

(5) The title should mention "internal" and should not use an acronym.