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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "On kinematics of very steep waves" *by* L. Shemer

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Review on the paper 'On Kinematics of very steep waves' by L. Shemer

General comments In the paper the kinematics of steep waves is investigated theoretically and experimentally for the initially Gaussian spectrum.

Specific comments The results obtained are significant only for the specifically chosen idealistic conditions while they are evidently not applicable for a real sea, where breaking is developing in a nonlinear wave field with the well-developed realistic spectrum. The author states that breaking does not happen if a wave steepness is smaller than 0.27. It is incorrect, since a rate of breaking instability development depends on time, i.e., the smaller the wave steepness, the longer the period required for onset of breaking. Breaking never occurs if the wave steepness is smaller than 0.12. Thus, either the time integration was small or the channel was short in the case under consideration. The expression 'verge of breaking' is not specified. Breaking is first connected with in-

crease of the local steepness up to infinity, followed by appearance of an over-inclined, non-single-value surface. This stage is a virtual 'verge of breaking' since the surface never returns to the local stability. All considerations based on the expansions assume that the steepness is small enough, because at a real 'verge of breaking' no expansion converges. The paper under consideration discusses some nonlinear process which actually can not be considered as breaking. This is why applicability of the results is quite unclear. It is also unclear why the author prefers using the Zakharov equation and low order expansions for 1-D modeling, while this problem can be investigated in the conformal coordinates with the highest accuracy, which allows reproducing exactly appearance of a non-single-value surface and onset of breaking. Note that a simulation in conformal coordinates is quite simple (actually, simpler than the method used) and precise. The surface integral method is also very good, though much more complicated. On our opinion considering different orders is just a tradition, because the nonlinear corrections for a case of strong nonlinearity do not have a real physical sense (as well as the Fourier components). These processes are investigated in a much broader context in the paper Chalikov, D., Babanin, A. V. 'Simulation of Wave Breaking in One-Dimensional Spectral Environment'. Journal Phys. Ocean., Vol. 42, No. 11, 1745-1761. The paper can be published after the shortcomings indicated in this review will have been regarded or rejected in a conclusive way.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 1487, 2013.