

Review

on the revised manuscript by D. Kachulin and A. Gelash

“On the phase dependence of the soliton collisions in the Dyachenko-Zakharov envelope equation” submitted for publication in journal “Nonlinear Processes in Geophysics”.

The paper has been improved significantly; my comments have been taken into account. Unfortunately, I am not fully convinced by the authors’ reply on the difference between solitons and breathers in their terminology, but leave this issue at the authors’ discretion.

I still have a few more critical remarks which should be taken into account before the text may be published.

1) Page 1, lines 22 and below. The paragraph is not logical. In the discussion of the NLS and Dysthe equations it is crucial to emphasize that the integrable NLS equation possesses the mathematically strict soliton solution (i.e., with elastic collisions). While other nonintegrable equations may still have exact stationary solitary solutions (~“solitons”), which do not interact elastically.

The first sentence (“A term soliton was originally coined for a special solution of the NLS...”) is not at the right place and should be shifted to the end of the paragraph, or may be to one of the subsequent paragraphs. The term ‘soliton’ was first attributed to the solutions of the KdV equation, hence the sentence sounds confusing.

2) Page 2, line 7: “The DZ equation is formulated for the wave train itself” – As I may understand, in this sentence and above the authors wish to oppose the NLS and Dysthe equations for the *modulation* or *envelope* against the DZ equation for the surface displacement and surface velocity potential. In the present form it is not clear. I suggest the following redaction:

“Both the NLS and the Dysthe equations are formulated to describe the evolution of the envelope function. They require that the steepness of the wave train is small and it is modulated weakly, i.e., there are sufficiently many carrier wave lengths in the characteristic scale of the modulation. In terms of the Fourier transform of the surface elevation this is equivalent to having a sufficiently narrow band concentrated in the vicinity the carrier wave number. The DZ equation is written in terms of the surface displacement and the surface velocity potential, and is free from the assumptions of the weak nonlinearity and narrow bandness (Dyachenko and Zakharov (2011, 2012)).”

3) Page 9, line 14: You may note that when the solitons are steep, the maximum amplification increases by about 20%, and at the same time the minimum amplification decreases significantly. So that if the phases of two steep colliding solitons are chosen properly, the wave field may increase very little: $A \approx 0.6$ (see the solid curve in Fig. 4, and also Fig. 6; $A = 0.5$ for non-colliding solitons).

4) Page 14, lines 5-6: The sentence “All results presented here for solitons of the DZe equation are valid also for breathers of the DZ equation since these two models are physically identical” is very important as it describes the applicability limits of the study, but it is unclear. What does ‘physically identical’ mean? Are solutions of the DZ equation necessarily solutions of the DZe model? Is the opposite statement correct? The new title of the manuscript mentions the DZe model, not the DZ equation as before...

5) Page 15, line 22: “...by the absence of exact N-soliton solution formulas, and also the inelasticity of the interaction...” – inelasticity of the interaction guarantees the absence of the exact N-soliton solution. Thus, the two listed reasons are not of a similar weight.

There are also some drawbacks of the technical matter:

6. page 1, line 17: the name Schrödinger should be corrected.
7. page 2, line 5: “...on the characteristic **wave** length scale of the envelope modulation.” should be replaced by “...on the characteristic length scale of the envelope modulation.”
8. page 2, line 6: double use of “the” before “Fourier spectrum”
9. page 2, lines 31-32: “...including mKdV equation for **shallow water** waves...” should be replaced by “...including mKdV equation for **long** waves...”, as the mKdV equation is a **long-wave** model, but generally speaking it does not describe **shallow water waves**.
10. page 5, line 16-17: It is better to make the sentence “The amplitude of the DZe soliton C_0 is not an independent parameter of the solution.” more precise as following, “The amplitude of the DZe soliton C_0 is not a free parameter of the solution when k_0 and V are fixed.”
11. page 5, line 4: To change “ δx is $1.55\lambda_0$ ” to “ $\delta x = 1.55\lambda_0$ ”
12. page 5, line 10: To change “For this case...” to “For the case of the NLS equation...”
13. page 14, line 1: To change “explain by the mention above” by “explain by the mentioned above”