

Interactive comment on “Phase-dependent dynamics of breather collisions in the compact Zakharov equation for envelope” by Dmitry Kachulin and Andrey Gelash

Anonymous Referee #1

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The authors continue the work on soliton collisions of the compact Zakharov equation along the research line of Dyachenko et al.

They presented an analysis of soliton interactions studying phase shifts, energy losses/gains. The authors are not aware of past work on the compact Zakharov equation that provided new insights and highlights of this special equation.

The dynamics of the compact Zakharov equation is far richer than the NLS in terms of structures and dynamics in state space. In this regard, authors are unaware of previous work by Fedele & Dutykh (JFM, 2012), who revealed that existence of peakons of the compact Zakharov equation (cDZ) which bifurcate from smooth solitons. More-

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over, the cDZ solitons loose energy after several collisions indicating some robustness properties of the cDZ.

Moreover, Fedele (JFM, 2014) was the first to derive a modified NLS equation from the compact Zakharov equation, showing that the dynamics is that of an NLS for small wave steepness and it becomes of KdV type at higher steepness, suggesting a trend to wave breaking.

The authors have the great opportunity to study the richer structure of the compact Zakharov equation, beyond typical studies on NLS-type soliton collisions.

The dynamics of the compact Zakharov equation is far richer than the NLS and a much better approximation than the NLS to describe gravity water waves. It is about time to go beyond the NLS and explore the hidden richness of the cDZ dynamics

The authors have done a great job in studying the properties of cDZ soliton collisions as Dyachenko et al. have done previously.

I would like to see a major revised version of this work, where the authors take a steep further and go beyond typical NLS studies.

I suggest the authors to enrich their work by

1) analyzing the breaking of cDZ solitons and their bifurcation to peakons. 2) how peakons relate to the inelastic collisions of cDZ solitons ? Do solitons bifurcate to peakons before becoming inelastic ? 3) Why does it take several collisions before solitons radiate energy ?

REFERENCES

Fedele F. 2014 On certain properties of the compact Zakharov equation. J. Fluid Mech. 748, 692–711.

Fedele F. & Dutykh D. 2012 Special solutions to a compact equation for deep-water gravity waves. J. Fluid Mech. 712, 646–660.

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