

# ***active comment on “On kinematics of very steep waves” by L. Shemer***

**Anonymous Referee #2**

Submitted and published: 19 June 2013

Title

Referee's report on manuscript NHESS-2013-147

*“On kinematics of very steep waves”*

by L. Shemer

This is a good paper particularly appropriate for the discussion type journal. The paper revisits one of the most fundamental questions concerned with water wave breaking: the criterion of wave breaking when the wave field under consideration is a random field. The starting point of the paper are the author's experiments on steep random waves in a large wave tank. High steepness is achieved by focusing of a

... kinematics of the measured elements and then compares the experimental horizontal velocities and the Eulerian and Lagrangian vertical acceleration. The goal of the analysis is the spatial Zakharov equation with cubic terms retained and higher order terms neglected. The point of the analysis is to revisit the criteria of wave breaking by comparing them with the authors' experimental results. To this end the apparent, Eulerian and Lagrangian vertical accelerations of  $g$  or nearly breaking waves were computed for the parameters observed in experiments. Contrary to the common beliefs the modulus of Lagrangian vertical acceleration proved to be well below  $g$ , less than  $g/2$ . The velocity at the crest was found to be noticeably smaller than the crest velocity. The crest velocity, that is the phase velocity of the maximal crest was found to differ significantly from both the group and the group velocities of the peak wave. The main message of the paper is clear: we all have to think hard about the applicability of the various existing criteria for wave breaking.

The paper is well done and well written. I recommend the paper for publication in NHESS after a very minor revision.

## **Comments:**

The findings of the work will be also of interest for remote sensing since the velocity of the breaker is of special significance for remote sensing. I'd like to see this point a bit more elaborated. It is not clear at present how the group and phase velocities were defined.

The choice of the truncated Zakharov as the main tool of analysis requires a justification (apart from just a convenience for the author). Of course, as a bonus it provides a particular insight about contribution of different orders of the expansion. However, it is not clear to what extent the employed weakly nonlinear expansion captures strongly nonlinear dynamics of breaking or nearly breaking waves. On the hand there exist exact relations for velocities in terms of elevation and its derivatives [See P. D. Sclavonous (2005) *Nonlinear particle kinematics of ocean waves*, J. Fluid Mech. (2005), 540, 133–142. and earlier works published before]. I'd like to see this work to be mentioned and discussed, if it is relevant, or