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 author 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 broad band field. The starting point of the paper are the author's experiments on steep broad-band waves in a large wave tank. High steepness is achieved by focusing of a wave train. The focus of the analysis is on the crest of the steepest wave where both the horizontal velocity and the vertical acceleration attain their maxima. The analysis translates dynamics of the measured elevations and their derivatives into dynamics of horizontal velocities and the Eulerian and Lagrangian vertical acceleration. The main tool of the analysis is the spatial Zakharov equation with cubic terms retained and the higher order terms neglected. The point of the analysis is to revisit the existing criteria of wave breaking by comparing them with the authors' experimental data. To this end the apparent, Eulerian and Lagrangian vertical accelerations of breaking or nearly breaking waves were computed for the parameters observed in the 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 propagation velocity of the maximal crest was found to differ significantly from both the phase and the group velocities of the peak wave. The main message of the paper is loud and clear: we all have to think hard about the applicability of the various existing criteria for wave breaking.

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

Minor comments:

(i) 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.

(ii) 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, 133Ц142. and earlier works published there.] I'd like to see this work to be mentioned and discussed, if it is relevant, or explained why it is not, otherwise.