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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Variational modelling of extreme waves through oblique interaction of solitary waves" *by* F. Gidel and O. Bokhove

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Thank you for commenting our article. Below is the answer point by point to your comments and suggestions:

"This paper is about the reflection of obliquely incident solitary waves on vertical walls. This is a well studied problem and it is known that at small angles a Mach stem is observed which can lead to large amplitudes (up to 4 times the incident wave). The main goal of the paper is to devise a finite element numerical scheme that can be used to solve the Benney-Luke equation - an equation which encompasses previous studies using the KP equation."
Thank you for this summary. We agree.

"The paper is well written but probably spends too many pages re-deriving BL and KP (albeit using variational methods)."
Given that we require the variational formulation for our numerical techniques we feel our presentation is presently of the correct length to accommodate understanding of our work by the readership. Our variational approach is helpful therein.

"The name Benney-Luke was unfortunately seldom used in the literature (to my knowledge it reappears in Milewski Keller 1996 and Pego Quintero 1999) and, although I am not aware of any, I wonder if are any studies of Mach reflection using "three-dimensional Boussineq" (which is essentially what Benney-Luke is) models in the literature."
Thank you for this remark; now included the reference to Milewski and Keller (1996).

"I would note that recently Kodama and Yeh have claimed that the KP order is insufficient to capture the large amplitude Mach stem and that better results are obtained using higher order corrections to KP. These would be out of the range of the present BL equation. However, given how BL performs here one may wonder whether this claim is correct. "
As we derive our initial BL condition from the KP equation, we actually include a higher order correction to our interaction parameter in Equ. (39), following the remark from Yeh et al (2010). This leads to a much better agreement between our numerical results and the theoretical expectations, which confirms their claim. Is this something different from what you mean in your comment? If so, can you please clarify what you mean by "higher order correction to KP"? Thank you.

"Note that the "extreme wave" claim for such cross wave constructions in shallow water is not new (see Peterson et al). "
Indeed, and they also explained in which conditions these waves may occur in real conditions, which may complete our note about 'green water'. Thank you for this

remark; we have added a reference to this paper.

"I also believe the title is a bit too broad. It should probably mention the oblique reflection of a solitary wave with a wall. (perhaps keep the same title and add ": application to Mach reflection.") "
We have extended the title.

"I am happy to recommend this paper for publication. Incidentally I do not find the way the actual waves are presented (Figures 9 10) particularly informative - a larger version of the top view (i.e. the bottom right panel) only would be better. "
Thank you for this suggestion. We have extended and improved these figures. They now contain a larger version of the top view of the numerical results, as well as a scheme of the expected behaviour of the stem and reflected waves for comparison. We also increased the size of the side view in order to highlight the difference between the stem and incident waves' amplitudes. We have removed the front view, which indeed did not bring any complementary information. You can find these new figures in the attached supplement.

Thank you for all these suggestions. An updated version of the article is available in the attached supplement.
Best regards,
Floriane Gidel and Onno Bokhove

Please also note the supplement to this comment:
http://www.nonlin-processes-geophys-discuss.net/npg-2016-58/npg-2016-58-AC2-supplement.pdf

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