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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Laboratory and numerical experiments on stem waves due to monochromatic waves along a vertical wall" *by* Sung Bum Yoon et al.

Anonymous Referee #1

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Stem waves are an interesting topic and research on this field may help coastal engineers in properly design vertical defense structures. Experimental data are compared with numerical results and analytical solutions, with interesting findings on influence of wave nonlinearity on stem wave generation. The manuscript is fairly well written and merits to be presented to the scientific community, though some moderate additions and amendments are required.

Major points

In the results which illustrate the comparison between experiments, numerical simulations and analytical solutions, stem waves should be better highlighted. In particular, looking at the plane behavior of the waves depicted by Figs. 2 and 3, it would be interesting to present 3-dimensional results in addition to the existing 2-dimensional plots (Figs. 4 to 21). Since experimental measures were only collected along the x axis and at two specific y alignments, they do not cover the whole domain. However, numerical results from the REF/DIF model may be used to illustrate what happens in the whole domain for cases which clearly show existence of stem waves, e.g. using color maps to represent normalized wave heights H/H_0 in the x/L-y/L domain. Such 3d results may also be used to explain the wave reflection induced by the stem boundary. To this aim, the sentence at P11 L24-25 must be expanded.

With the purpose to properly identify stem waves in Figs. 4 to 21, these should be better highlighted, e.g. adding a further/overlapping colored line between the wall and the first nodal line. Such improvement will clarify the stem wave description (e.g., P8 L26-31).

Photo 2 suggests a "beehive" wave pattern. This is typical of the cross-sea, generated by two or more waves which interact as a consequence of, e.g., reflection, refraction. The authors are required to comment on that point referring to studies on propagation of plane waves (e.g., Le Mehauté, 1976; Mei, 1983) and cross-sea (Postacchini et al., 2014).

In the experiment description, the displacement of the measuring points should be clarified. In particular, two incident wave measuring points are illustrated in Fig.3, while three measuring points are recalled at P6 L18-19. Clarifications are needed about all used measuring/checking points (notice that five points are represented in Fig.3).

Specific points

- P1 L20-21: the last sentence of the abstract is awkward/unclear and should be rephrased.
- P2 L31-32: it should be "... the effects of both nonlinearity and angle of incidence. In the final section...".
- P3 L8-9: when talking of "recent version of REF/DIF", a significantly recent reference should be included (not only those of 1986 and 1994); otherwise, "latest version" is more appropriate.
- P5 L13-14: "each with dimensions of 0.5m ... in height and driven by".
- P5 L27 and P6 L2: "numeric number" should be replaced with "number" or "numeric digit".
- P6 L1-2: " 'shorter' or 'longer' waves in terms of period, respectively... or 'large' waves in terms of incident wave height, respectively".
- P7 L21: "of the incident wave is three times larger than the MSS-series waves".
- P7 L27: remove "downwave".
- P7 L31: "in good agreement"; check use of "agreement" throughout the text.
- P7 L32-33: "the measured data, probably because of nonlinear interactions between incident".
- P8 L7: "to reach a constant value".
- P8 L19-21: "The amplitude of the MLS incident waves is chosen to provide the same steepness, ... , as the MSS waves. Hence, the wave patterns observed in the MSS-series (Fig.4) are similar to the results of the MLS-series".

- P10 L24-26 – P11 L1-4: if β is the slope ratio, $\beta\epsilon$ should be the slope of the stem boundary; if so, this must be clarified in the text.
- P11 L1 and L4: the wall angle is θ_0, please amend.
- P11 L22 and Fig.23b: the term "l" must be added to Fig.23b.
- P12 L12: "The key results derived from this study are here illustrated".
- P12 L17: "agree".
- Fig.4 to 21: the y-axis label should be "H/H_0".

References

Le Méhauté, B. (1976). An introduction to hydrodynamics and water waves. Springer-Verlag.

Mei, C.C. (1983). The applied dynamics of ocean surface waves. Wiley-Interscience.

Postacchini, M., Brocchini, M., Soldini, L. (2014). Vorticity generation due to cross-sea. Journal of Fluid Mechanics, 744, 286-309.

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