Author Reply_2

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Title: Laboratory and numerical experiments on stem waves due to monochromatic waves along a vertical wall
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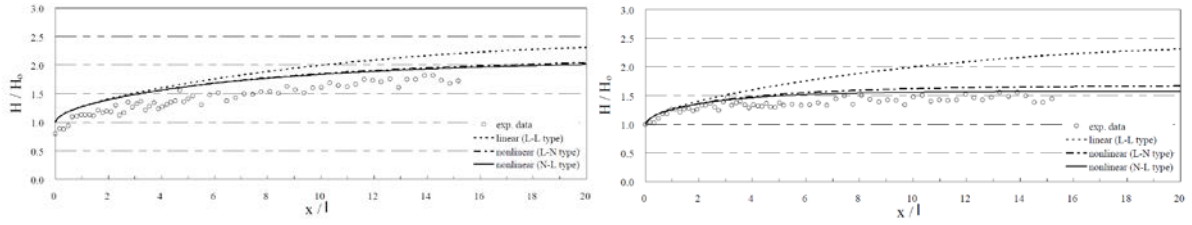
Summary of responses:

We appreciate the referee's interest and criticisms on our manuscript entitled “Laboratory and numerical experiments on stem waves due to monochromatic waves along a vertical wall”. We hope that the revision we made could have reflected the referee's comments.

The three papers mentioned by the referee show similar results to the present manuscript, but experimental conditions and numerical results are different. Their hydraulic experiments demonstrated stem waves for some cases with a relatively large incident wave. However, the stem waves were not clearly developed because of both the narrowness of wave basin and the reflected waves from the beach as shown in Figure 1. Only four cases of incident wave conditions were tested in their experiment. Thus, the experimental data were not sufficient to investigate the properties of stem waves. Moreover, the numerical results for the cases of large angle of incidence were not highly accurate because of the small-angle parabolic model employed for their numerical simulations. In addition, the previous papers did not analyze the effect of nonlinearity of incident waves on the development of stem waves.



(a) $\beta = 10°$ for CASE 1 (b) $\beta = 10°$ for CASE 2

Figure 1. Relative wave height along the front wall of CASE 1 and CASE 2 (Lee and Kim, 2007)

Thus, the present authors decide to conduct precisely-controlled and comprehensive hydraulic experiments to investigate the stem waves. In the present experiments the gravel beach is carefully designed to reduce the reflected waves at less than 3% for all the incident waves considered. To overcome the narrowness of the basin the water depth is reduced to 0.25 m to secure the length of vertical wall at least 40 wavelengths for the case of T = 0.7 s and 20 wavelengths for the case of T = 1.1 s. To obtain data for various wave conditions including nonlinearity and angle of incidence total of 24 cases are considered. The large-angle parabolic model is employed to get more accurate solutions for the waves with large angle of incidence. Based on the observation of the experimental data we

propose a mechanism for the generation of stem waves in a different point of view.

Corresponding to the referee's comment we added the following description in the manuscript.

Response	**Page Reference (Origin)**	**Page Referred**
We add in text. "Lee et al. (2003), Lee and Yoon (2006) and Lee and Kim (2007) performed laboratory experiments to investigate stem waves for sinusoidal waves, and compared the measured waves with the numerical results obtained using a nonlinear parabolic approximation equation model. Their hydraulic experiments demonstrated stem waves for some cases with a relatively large incident wave. However, the stem waves were not clearly developed because of both the narrowness of wave basin and the reflected waves from the beach. Only four cases of incident wave conditions were tested in their experiment. Thus, the experimental data were not sufficient to investigate the properties of stem waves. Moreover, the numerical results for the cases of large angle of incidence were not highly accurate because of the small-angle parabolic model employed for their numerical simulations."		P2 L25-32