



Experimental Study of Solitary Waves Run-up on Rough Slopes

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Long waves close to the shore caused damage were a crucial issue for coastal engineering community. There is a classic issue of long-wave run-up on smooth beaches, which has been extensively studied in literature, using different research methodologies, but in reality, coastal beaches should have surface roughness instead of being hydraulically smooth. Run-up of roughness effect is rarely discussed.

In this study, new experiment has been carried out in a laboratory tank (21m x 0.7m x 0.5m) to investigate the physical process of long-wave on a 1:20 slope. Long-wave is with infinite wavelength and wave period. Solitary-wave is employed to represent the characteristic. There are four slopes including smooth, sandpaper, marble, and carpet, the water depths are 16cm (on marble slope), 15cm, 14cm, 12cm and 10cm. The nonlinearity (H/h_0) are from 0.04 to 0.451.

Firstly, the run-up of long-wave was observed on different slopes. From the comparison in terms of maximum run-up height (R) with different wave-height-to-water-depth ratios were generally categorized into two groups, marble and carpet slopes led to the similar run-up trend. The run up values were by using image processing method to compare average interval 0.05cm and the point at the maximum run-up to find out the sidewall effect. Also using run-up values describe the roughness effect of the run-up reduction. Secondly, the effect of slope roughness was limited on the free surface elevations. The last result, through using a state-of-the-art measuring technique Bubble Image Velocimetry, which features non-intrusive and image-based measurement, the wave kinematics in the highly aerated region with different roughness slopes due to solitary-wave shoaling, breaking and uprush can be quantitated. In order to observe more detail, the high speed camera is used capture the run-up and rundown process.

This study can give a reference to the long-wave run-up at the shoreline. It is hoped that more run-up studies will be conducted to increase the roughness to closer the real coastal slope.