12th International Conference on Hydroscience & Engineering
Hydro-Science & Engineering for Environmental Resilience
November 6-10, 2016, Tainan, Taiwan.

Non-hydrostatic Modeling of Leading Elevation and Depression Waves on a Plane Beach

Y.-T. Wu[1], H.-H. Hwung[2]
1. International Wave Dynamics Research Center, National Cheng-Kung University
2. Department of Hydraulic and Ocean Engineering, National Cheng-Kung University
Tainan, Taiwan

ABSTRACT

The 2004 India Ocean tsunami and the 2011 Tohoku earthquake and tsunami brought tremendous disasters to the coastal areas as well as the local residents. According to the field observation and the nearshore buoy recording, the leading wave of tsunami approaching the shoreline may have various forms and may not be only consisted of a single crest. Incident tsunamis behaves either as leading depression or elevation waves generally depending on the source of seafloor rupture. Such evidence further shows the use of a solitary wave to represent leading wave of tsunamis is insufficient in some aspect. However, the methodology on how to generate an idealized N-wave either as leading depression or elevation in a wave flume is still complicated. Motivated by understanding the wave hydrodynamics of tsunamis, several high-quality experiments of long-wave evolution and run-up have been carried out in a supertank (300m × 5.0m × 5.2m) of Tainan Hydraulics Laboratory at National Cheng-Kung University, Taiwan. Experimentally, a leading elevation wave train was generated using a ramp trajectory to force the wave paddle moving forward to the full stroke of the wavemaker whereas a leading depression wave train was to force the wave paddle moving backward instead. Detailed evolution of free surface, flow velocity in the surf zone and run-up on a 1/40 slope were synchronously measured and systematically discussed. This unique dataset are used to compare with the model results obtained from a non-hydrostatic wave model. It is expected to have more understanding on the wave hydrodynamics due to N-wave on a mild slope by means of large-scale physical modeling and high-resolution numerical simulation.