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Numerical Simulation of Large-scale Experiments at THL on Solitary Wave Evolution and Run-up

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It is of great importance to understand the evolution and shoreline motion of long-wave on coastal beaches so as to have sufficient knowledge applied to inundation mapping and tsunami forecasting. Experimentally, reliable measurements are to convincingly provide direct observation through naturally non-linear fluid system, which are useful and desirable for numerical model validation. Due to the limited length of laboratory-scale wave flume, some natural features of coastal environment in terms of mild slope and turbulent flow cannot be properly reproduced in laboratory-scale experiments. This fact implies the necessity of large-scale physical modeling tests. In the past ten years, detailed measurements on the evolution and run-up of breaking solitary waves on different gradients of sloping beaches have been carried out in a supertank (300m × 5.0m × 5.2m) at Tainan Hydraulics Laboratory (THL), National Cheng-Kung University, Taiwan. Artificial beaches built by smooth layers of concrete with different slope gradients, i.e., 1/20, 1/40, 1/60, 1/100 and composite geometry, have been constructed to investigate the slope effects on wave hydrodynamics. The purpose of this study is to validate an open-source non-hydrostatic model SWASH by using those of existing measured data conducted in a supertank of THL. After calibrating the Manning friction coefficient of the slope surface, model-data comparisons in terms of free surface elevations and run-up motions will be detailed. Finally, this model will then be used to study the effects of submerged obstacles into the implication of long-wave run-up mitigation and some preliminary results will be demonstrated through this presentation.

Biography

Yun-Ta Wu has completed his PhD program at the age of 29 years from Department of Hydraulic and Ocean Engineering, National Cheng-Kung University and visiting scholar program in 2014 at Zachry Department of Civil Engineering, Texas A&M University. Currently, he is a postdoctoral fellow at International Wave Dynamics Research Center, National Cheng-Kung University. His research interests are in the area of fluid mechanics with applications to coastal and ocean engineering.

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