Numerical Simulation and Experimental Study on Tsunami Propagation and Run-up and the Influence of Submerged Breakwater on Run-up

Honarmand, Masih[1]; Shanehsazzadeh, Ahmad[2*];
Zandi, Sayed Mahdi[3]; Vahida, Arman[4]

1- MSc. in Water and Hydraulic Structures, Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran. Email: honarmand.masih@yahoo.com

2- Assistant Professor, Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran. Email: a.shanehsazzadeh@eng.ui.ac.ir

3- Assistant Professor, Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran. Email: s.m.zandi@eng.ui.ac.ir

4- MSc. in Water and Hydraulic Structures, Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran. Email: armanvahida@yahoo.com

Abstract

Tsunami threatens the lives and property of millions of people who are living in coastal areas. The southern coasts of Iran are also exposed to tsunami waves due to Makran subduction zone. Therefore, understanding the propagation and run-up of tsunami waves through numerical simulation and experimental studies is vital. In this research, applying OpenFOAM computational fluid dynamics open source Software, propagation and run-up of tsunami waves in different conditions were estimated and the results of numerical simulations were compared with experimental data. Solitary waves were considered as the model for tsunami waves. Initially, the propagation of non-breaking and then the breaking solitary wave as two-dimensional numerical simulation were investigated. The effect of submerged obstacle on the decreasing run-up was studied numerically and experimentally. Results showed that the submerged obstacle could reduce the tsunami run up to 19.7 percent. The results showed that OpenFOAM software was able to precisely model the propagation phenomena and predict the wave run-up with acceptable level of accuracy in numerous wave conditions.

Keywords: *Tsunami, Solitary wave, Wave run-up, Wave propagation, Submerged breakwater, OpenFOAM.*