



Modifications of solitary waves in non homogeneous medium: Modeling and Simulation

Massimiliano Cannalire

Faculty of Science, Chulalongkorn University. Bangkok 10330, Thailand (tsunami_study@techemail.com)

European Geosciences Union General Assembly 2010

Vienna, Austria, 02 - 07 May 2010

Session: NH5.2. Extreme Sea Waves

“Modifications of solitary waves in non homogeneous medium:
Modeling and Simulation”

Massimiliano Cannalire

Tsunami_Study@Techemail.com

Faculty of Science, Chulalongkorn University. Bangkok 10330, Thailand.(*)(*)

Abstract

Analyzing the propagation of solitary waves in non homogeneous medium allows to discover salient features of such fascinating physical and mathematical entities.

In the realm of the propagation of long sea wave and their foremost representatives, tsunamis, it is interesting to devise a framework in which we can point out when the effects of a non homogeneous medium enter into play and how they affect the wave propagation. The modifications induced on a solitary wave in the transition between the oceanic propagation and a shallower water propagation determine the future dynamics of the wave near shore. Particularly, the possibility that a tsunami wave could be partially reflected at the continental shelf and even closer to the shore, has great implications for tsunami risk mitigation.

In this paper, we analyze the propagation of solitary waves over artificial bathymetries and study the induced modification and changes in the wave propagation.

Bearing in mind applications to the study of tsunamis generated by submarine tectonic events, we simulate the wave propagation, in the realm of Boussinesq-Korteweg de Vries equations, for different wave parameters and sea bed characteristics.

Keywords: Solitary wave, Korteweg and de Vries equation, bathymetry, tsunami propagation, simulation of wave propagation.

(*) Not currently at Chulalongkorn University

(**) With the kind endorsement of the Crisis Unit. Italian Ministry of Foreign Affairs.