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The effects of the Andaman Sea bathymetry on the Sumatra 2004 Tsunami. Case Study: Khao Lak

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Abstract

Sumatra 2004 tsunami is and surely will continue to be a major source of analysis and investigations for researchers in the future.
Much work has already been done and many theories have come into the arena;
In this paper we want to analyze the modifications induced on tsunami propagation by the interactions with a variable sea depth, both on artificial and real sloping beaches, focusing on the real sea floor of the Andaman Sea, theatre of the effects of the Sumatra 2004 tsunami; particularly on the bathymetry in the Khao Lak area in Thailand.
The distribution of damages and destructions along the Andaman Sea coastline of Thailand is a good starting point for addressing the effects of local bathymetry and coastline profile in relation to risk exposure.
The mathematical and computational models which we propose in this paper are based on the solutions of the Korteweg and de Vries equation (KdV) extended to the case of variable sea depth (eKdV).
We also propose a solution obtained from the variational-iterated method for nonlinear partial differential equations.
The occurrence of phenomena such as tsunami scattering at the continental shelf, solitary wave fission along a sea floor slope, solitary wave shoaling till the eventual breaking point, are reproduced in our model for different wave periods.

An analytical explanation for the water recession phenomenon preceding a tsunami attack is found.

Keywords: Tsunami, Korteweg and de Vries equation, tsunami scattering, solitary wave fission, bathymetry, shoaling of solitary waves, water recession, Sumatra 2004 tsunami, Andaman Sea, iterative methods, tsunami risk reduction..

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