Physics > Classical Physics

Local Runup Amplification By Resonant Wave Interactions

Themistoklis Stefanakis (CMLA), Frédéric Dias (CMLA), Denys Dutykh (LAMA)

(Submitted on 1 Jul 2011 (v1), last revised 24 Aug 2011 (this version, v2))

Until now the analysis of long wave runup on a plane beach has been focused on finding its maximum value, failing to capture the existence of resonant regimes. One-dimensional numerical simulations in the framework of the Nonlinear Shallow Water Equations (NSWE) are used to investigate the Boundary Value Problem (BVP) for plane and non-trivial beaches. Monochromatic waves, as well as virtual wave-gage recordings from real tsunami simulations, are used as forcing conditions to the BVP. Resonant phenomena between the incident wavelength and the beach slope are found to occur, which result in enhanced runup of non-leading waves. The evolution of energy reveals the existence of a quasi-periodic state for the case of sinusoidal waves, the energy level of which, as well as the time required to reach that state, depend on the incident wavelength for a given beach slope. Dispersion is found to slightly reduce the value of maximum runup, but not to change the overall picture. Runup amplification occurs for both leading elevation and depression waves.

Comments:	10 pages, 7 Figures. Accepted to Physical Review Letters. Other author's papers can be downloaded at this http URL
Subjects:	**Classical Physics (physics.class-ph)**; Pattern Formation and Solitons (nlin.PS); Atmospheric and Oceanic Physics (physics.ao-ph); Fluid Dynamics (physics.flu-dyn); Geophysics (physics.geo-ph)
Journal reference:	Physical Review Letters 107 (2011) 124502
DOI:	10.1103/PhysRevLett.107.124502
Cite as:	**arXiv:1107.0304 [physics.class-ph]**
	(or **arXiv:1107.0304v2 [physics.class-ph]** for this version)

Submission history

From: Denys Dutykh [view email]
[v1] Fri, 1 Jul 2011 19:01:58 GMT (2303kb)
[v2] Wed, 24 Aug 2011 14:17:04 GMT (2506kb)

Which authors of this paper are endorsers?