Geophysical Research Abstracts, Vol. 8, 05182, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05182

Solitary Wave Generation in the Strait of Luzon.

A. Warn-Varnas (1), J. Hawkins(2), G. Burgos(3), S. Chin-Bing (1), D. King(1), K. Lamb(4), and S. Piacsek(1).

(1) Naval Research Laboratory, Stennis Space Center, MS 39529, USA(varnas@nrlssc.navy.mil)

(2) Planning Systems Inc., Slidell, LA 70458.

(3) University of Puerto Rico, San Juan 00936, Puerto Rico

(4) University of Waterloo, Waterloo, Ontario, Canada N2L 3G1

A modeling study, with the 2.5 D Lamb (1994) nonhydrostatic model, of the generation of internal bores and solitary waves in the Strait of Luzon induced by tidal motion over the ridges is undertaken. The model is forced by the barotropic tidal components K1, M2, and O1. Barotropic tidal components and density distributions are extracted from data and models. As the barotropic tide moves over the Strait of Luzon sills, there an associated conversion of barotropic tidal energy into baroclinic tidal energy. Internal bores are generated and propagate towards the ASIAEX test site on the Chinese continental shelf. The nonlinear effects steepen the internal bores, frequency and amplitude dispersion set it, and disintegration into solitary waves of large amplitude occurs. Parameters variations of initial density, tidal component magnitude, tidal phases, and imposed background current (that reflects the Kuroshio influence) are considered.

Internal bore are generated at each of the two sills in the Strait of Luzon. During tidal motion over the double structured sill, Kelvin-Helmoltz type instabilities develop in the second, taller sill. The solitary waves that propagate left from the taller second sill, are modulated by the structures formed at the first sill. For one choice of parameters, at 66 hours two solitary wave train are moving to the left and other solitary waves are coming off the sills. The propagating solitary waves towards the ASIAEX test site can reach amplitudes of 120m to 250m depending on the choice of tidal magnitudes and phases. ASIAEX observations indicate amplitudes up to 150 m. Choices of tidal mag-

nitude and phase for the K1, M2, and O1 tidal components affect the resultant solitary wave train structures. Density structure and pycnocline depth affect the number and characteristics of solitary waves. A velocity component along the direction of propagation advances the internal bores and waves. An opposing velocity component retards propagation and enhances the nonlinear steepening of internal bores and hastens their disintegration into solitary waves. Along the direction of solitary wave train propagation, acoustical field studies are conducted with a parabolic equation (PE) model. Acoustical field calculations for source and receiver configurations indicate the effects of solitary waves on the acoustical field and transmission loss along the propagation path.