



Resonant excitation of coastal waves

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By using the analytically treatable Ball's (1967) profile of the shelf in the framework of the rotating shallow water model and relaxing the condition of normal incidence adopted in earlier literature on the subject (Miles, 1990), we provide a full analysis of resonances of free (Poincaré) waves and trapped coastal waves (shelf waves, edge waves and Kelvin waves).

We show that the resonances of one free wave with two coastal waves are ubiquitous, and thus lead to a universal mechanism of resonant excitation of coastal waves and related energy transfer from the open ocean to the coastal regions. We derive the nonlinear modulation equations for coupled amplitudes of thus excited waves and show that they lead to nontrivial spatio-temporal organisation in the coastal zone.