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Incident wave run-up into narrow sloping bays and estuaries

M Sinan Özeren (1), Nazmi Postacioglu (2), and Umut Canlı (2)

(1) Technical University of Istanbul, Eurasia Institute of Earth Science, Istanbul, Turkey (ozerens@itu.edu.tr), (2) Technical university of Istanbul,Department of Physics, Istanbul, Turkey

The problem is investigated using Carrier Greenspan hodograph transformations.We perform a quasi-one-dimensional solution well into the bay, far enough of the mouth of the bay. The linearized boundary conditions at the mouth of the bay lead to an integral equation for 2-D geometry. A semi analytical optimization method has been developed to solve this integral equation. When the wavelength of the incident wave is much larger than the width of the bay, the conformalmapping of the bay and the semi infinite sea onto upper complex plane provides a solution of the integral equation in closed form.

Particular emphasis is placed on the case where the frequency of the incident waves matches the real-part of the natural frequency of the oscillation of the bay. These natural frequencies are complex because of the radiation conditions imposed at the mouth of the bay. It is found that the complex part of these natural frequencies decreases with decreasing width of the bay. Thus the trapping of the waves in narrower bays leads to a strong resonance phenomenon when the frequency of the incident wave is equal to the real part of the natural frequency.