Department of Ocean and Resources Engineering

Seminar

Numerical Modeling of the Surf-Zone Dynamics at Waimea Bay

By

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Wednesday, October 25, 2006, Holmes Hall 243
3:00-3:30 pm Coffee Hour
3:30-4:30 pm Seminar

Please join us for the coffee hour near the seminar venue a half hour before the seminar, 3:00 – 3:30 pm

Abstract

This research undertakes investigations of the surface waves and wave induced currents in Waimea Bay on the island of Oahu, Hawaii. Waimea Bay is a famous site for big-wave surfing and it is well known for its unique wave conditions in terms of extreme wave heights and the dramatic surf zone dynamics.

Due to its enclosed domain and regular bathymetry and the long period nature of the waves occurring, Waimea Bay represents a perfect field study for a state-of-the-art Boussinesq model that emphasizes a mild slope and a small h/L ratio. The numerical predictions are compared with field measurements from the bay, which provides the offshore boundary condition for the Boussinesq model, as well as provide reference points inside the computational domain used for model calibration and verification.

In this work, a state-of-the-art advanced numerical method based on the Boussinesq equations will be used. The numerical model is called Mike21 BW and has been developed by DHI Water & Environment (Denmark).

Based on comparisons with field data obtained in the period April 18-21 2006, it was found that the Boussinesq model proved to have excellent dispersion characteristics and a comparison with field data showed an acceptable agreement with deviations in integral wave height parameters of 3-20%.

It was found that the Boussinesq model had a tendency to overestimate the amount of wave reflection occurring especially from the steep cliffs and rocky outcrops along the entry of the bay but also from the beach shoreline. This was found to be primarily due to the breaker-module’s incapability to correctly predict the powerful and abrupt wave energy dissipation occurring in these regions.

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