The eigenfunction matching method for water wave scattering by variable structures and bottoms

Chia-Cheng Tsai

Bachelor Degree Program in Ocean Engineering and Technology and Center of Excellence for Ocean Engineering, National Taiwan Ocean University, Keelung 202301, Taiwan

Abstract

In this talk, I will introduce my recent studies on the eigenfunction matching method (EMM) for solving problems of water wave scattering. These include problems of viscous or inviscid waves scattering and/or breaking by arbitrary bottoms, tension-leg, and/or surface-piercing structures. The Bragg reflections of oblique water waves by series of periodic surface-piercing structures and bottoms are also reported. By the assumption of small wave amplitude, the linear wave theory is employed in the EMM formulations. In the solution procedure, the tension-leg or surface-piercing structures and bottoms are sliced into a number of shelves separated by abrupt steps. On each shelf, the solution is composed of eigenfunctions with unknown coefficients that represent the wave amplitudes. By the conservations of mass and momentum, a system of linear equations is obtained and then solved by a sparse-matrix solver. The proposed EMM is validated by several examples in the literatures. Numerical results indicate that the EMM are accurate up to four decimal places.