

Numerical solution of Mild-slope equation using Virtual Element Method

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Abstract :

The mild-slope equation (MSE) describes the combined effects of diffraction and refraction for water waves propagating over bathymetry. The numerical solution of this equation is crucial in various fields, including coastal engineering, oceanography, and offshore structure design. In this talk, we will present an approach using the virtual element method (VEM) for the numerical solution of the MSE. The virtual element method offers significant advantages over traditional finite element methods, in particular for the treatment of complex geometries, irregular meshes and solution accuracy: essential for identifying eigenmodes. We will demonstrate the efficiency of our approach by validating our model using the Helmholtz equation. By comparing our numerical results with analytical solutions, we establish the accuracy and reliability of our VEM-based solver for the MSE.

Our results can contribute to coastal and ocean engineering, and also demonstrate the potential of the virtual element method for solving difficult problems in computational fluid dynamics.

Keywords: Mild-Slope Equation, Virtual Element Method, Coastal Engineering, Computational Fluid Dynamics, validation, Helmholtz equation, Finite Element Methods, Numerical Analysis, Complex Geometries, Irregular Meshes.