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A Nodal DG-FEM Method for Solving High Order Boussinesq-type Equations

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Abstract:
The possibility of applying the Discontinuous Galerkin finite element method for the next generation of Boussinesq-type models has been investigated. These numerical methods have reached a level of maturity that can potentially turn them into an attractive alternative to existing Boussinesq-type models, which traditionally have been based on finite difference methods in structured domains. In particular, the aim is to take advantage of the geometrical flexibility of a finite element framework to enable the solution of wave problems in increasingly complex environments. A nodal discontinuous Galerkin finite element method (DG-FEM) is used for the spatial discretization to solve the derived set of high-order Boussinesq-type equations [1] in complex and curvilinear geometries, and thereby amend the application range of previous numerical models of these types. The high-order Boussinesq-type formulations allow for the accurate description of fully nonlinear and dispersive water waves in both shallow and deep waters. To investigate and demonstrate the current applicability and limitations of the numerical model both linear and nonlinear test cases have been considered where water waves interact with bottom-mounted fully reflecting structures.

Speaker's Bio:
He is a PostDoc at Department of Mechanical Engineering, Coastal, Maritime and Structural Engineering Section. Main research is in the field of computational fluid dynamics. Current focus is on development, analysis and application of state-of-the-art high-order accurate numerical models for the prediction and study of fully nonlinear water waves.