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A COUPLING METHOD OF FREE SURFACE FLOW USING FEM FOR BOUSSINESQ EQUATIONS AND NAVIER-STOKES EQUATIONS

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A coupling method based on an implicit mixed finite element method of two-dimensional Boussinesq equations and three-dimensional Navier-Stokes equations is proposed in this paper. A stabilized MINI element [1], bubble function element/linear element, with an implicit scheme in time is used to solve the Boussinesq equations [2] and the Navier-Stokes equations [3]. The stabilized MINI element means bubble function element stabilization method for triangular element and tetrahedral element. The estimation of gas-liquid interface for three-dimensional Navier-Stokes equations is employed an interface-capturing method based on a phase-field model (PFM) [3]. Cahn-Hilliard equation in PFM is applied to estimate the interface of gas and liquid. The stabilized MINI element is used to solve Cahn-Hilliard equation. Continuity condition satisfies for connecting the two-dimensional Boussinesq equations and three-dimensional Navier-Stokes equations [4]. A dam break problem is analyzed to verify presented coupling method as a computational example.

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