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Level-set immersed boundary method for simulating 3D turbulent free surface flows in arbitrarily complex open channels[1] SEOKKOO KANG, FOTIS SOTIROPOULOS, University of Minnesota — A numerical method is developed for simulating three-dimensional free surface flows in open channels of arbitrarily complex bathymetry. The complex geometry is handled using the curvilinear immersed boundary (CURVIB) method of Ge and Sotiropoulos (J. of Computational Physics, 2007) and free surface deformation is modeled by employing a two-phase flow level-set approach. A new method is developed for solving the level-set equations and the reinitialization equation in the context of the CURVIB framework. The method is validated for various free-surface model problems and its capabilities are demonstrated by applying to simulate turbulent free-surface flow in an open channel with embedded complex hydraulic structures.

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