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High-resolution 2D and 3D numerical simulations of gravity currents AFSHIN EGHBALZADEH, JOONGCHEOL PAIK, FOTIS SOTIROPOULOS, University of Minnesota — Gravity currents are essentially horizontal motion of fluids of different density in a gravitational field and their spreading behaviors are characterized by the relative balance of buoyancy, inertial and viscous forces. High resolution numerical simulations of two- and three-dimensional (2D and 3D) gravity currents are carried out using the unsteady Reynolds-averaged Navier-Stokes (URANS) closed by the buoyancy-extended turbulence model. The governing equations are solved using second-order-accurate spatial and temporal discretization methods. Comparison with available experimental measurements confirms that high resolution URANS can capture reasonably well the rich dynamics of coherent vortical structures at the interface of the gravity current and the ambient flow, front speed of energy conserving head region and billow breakdown in wake region. Details of 2D and 3D numerical solutions of gravity currents with available experimental measurements and their flow physics will be presented at the conference.

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