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Large Eddy Simulation study of the development of finite-channel lock-release currents at high Grashof numbers SENG-KEAT OOI, GEORGE CONSTANTINESCU, LARRY WEBER, Department Civil and Environmental Engineering, The University of Iowa — Lock-exchange gravity current flows produced by the instantaneous release of a heavy fluid are investigated using 3-D well resolved Large Eddy Simulation simulations at Grashof numbers up to $8*10^9$. It is found the 3-D simulations correctly predict a constant front velocity over the initial slumping phase and a front speed decrease proportional to $t^{-1/3}$ (the time t is measured from the release) over the inviscid phase, in agreement with theory. The evolution of the current in the simulations is found to be similar to that observed experimentally by Hacker et al. (1996). The effect of the dynamic LES model on the solutions is discussed. The energy budget of the current is discussed and the contribution of the turbulent dissipation to the total dissipation is analyzed. The limitations of less expensive 2D simulations are discussed; in particular their failure to correctly predict the spatio-temporal distributions of the bed shear stresses which is important in determining the amount of sediment the gravity current can entrain in the case in advances of a loose bed.

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