Abstract Submitted
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The dynamics of bottom-boundary gravity currents propagating over a submerged array of cylinders[1] JIAN ZHOU, Colorado State University, TIM WILLIAMS, MEGAN BALL, University of Canterbury, CLAUDIA CENEDESE, Woods Hole Oceanographic Institution, SUBHAS VENAYAGAMOORTHY, Colorado State University, ROGER NOKES, University of Canterbury — The structure and propagation of lock-exchange bottom-boundary gravity currents (BBGC) in a rectangular horizontal channel containing a submerged array of cylindrical obstacles are investigated using experiments and large eddy simulations. Excellent agreement on the front velocity between the experimental and numerical results is found. A broad-range three-dimensional parametric study is performed in which the solid volume fraction ϕ of the array is varied continuously from 0 (flat-bed case) to 1(solid-slab case), and the submergence ratio is varied from 1 (emergent) to 10 (deeply submerged). Both in-line and staggered cylinder arrangements are considered. The various flow regimes arising from the current-array interaction and their mutual transitions are investigated in detail in terms of front velocity, density, vorticity, turbulent mixing and global energy budget. Our analysis provides a new framework for predicting the front velocity of BBGCs propagating over a submerged array of cylinders under the influence of array inhomogeneity.

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