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Impact of ambient stratification on gravity currents propagating over a submerged canopy JIAN ZHOU, University of California, Berkeley, S. KARAN VENAYAGAMOORTHY, Colorado State University — The dynamics of lock-exchange gravity currents propagating over a submerged canopy in a linearly stratified environment is investigated using highly resolved three-dimensional large-eddy simulations. The canopy is composed of a bottom-mounted array of square cylinders. It is highlighted that the structure and propagation of the gravity currents show remarkable variation across the parameter space of canopy density and ambient stratification. For sparse canopies, the gravity current propagates through the canopy interior, and the reduction of front speed is less sensitive to the canopy drag under stronger ambient stratification where there is less wake-induced buoyancy loss of the current head. For denser canopies, the transition to over-flow on the canopy top and the accompanied recovery of front speed are found to occur earlier in canopy density as the ambient stratification becomes stronger, which is the outcome of three mechanisms: (i) weaker canopy drag due to the altered propagation pathway; (ii) less convective mixing of the over-head with the underlying lighter fluid; and (iii) more regain of effective horizontal buoyancy gradient as the current is lifted up. The latter two mechanisms occur due to the background stratification.

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