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Flushing of a dense pollutant from a square 2D street canyon
NIGEL KAYE, ZAHRA BARATIAN, Clemson University — Experimental results are presented the rate of flushing of a dense pollutant from a square street canyon. Both finite and continuous release source conditions are considered. For Richardson numbers Ri greater than 1 a clear two-layer stratification is observed, whereas for small Ri the canyon remains well mixed. For the finite release experiments, the initial rate of removal of pollutant is well described with an exponential decay function with the non-dimensional decay rate k being a function of Ri. Steady-state measurements from continuous release experiments for $Ri > 1$ showed that the rate of entrainment across the density interface (directly analogous to the exponential decay rate) is almost exactly the same function of Ri, provided the Richardson number is based on the buoyancy of the lower layer and the canyon height. An energy argument can be used to relate $k(Ri)$ to the mixing efficiency of the turbulent shear flow. Our results indicate that there is a peak in the mixing efficiency at $Ri = 1$ above which the mixing efficiency decreases with increasing Ri and a two-layer stratification is observed.

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