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Flushing of a dense fluid from an urban canyon part 2: Transient flows ZAHRA BARATIAN, NIGEL KAYE, Clemson University — We consider the wind driven flushing of a finite volume of dense fluid from a canyon. Unlike the case of a continuous release of dense fluid into the canyon, no steady state flow is established. Instead the total buoyancy in the canyon decreases monotonically with time until it is completely flushed. The time taken to flush an initially full canyon depends on the initial flow Richardson number. Two flow phenomena were observed. For high Richardson numbers a two layer stratification is maintained for much of the flushing process. Dense fluid is skimmed off the top of the dense layer. However, the buoyancy of the layer also slowly decreases over time indicating that fresh ambient fluid is mixed down into the dense layer. The two layer transient flushing is modeled using an entrainment coefficient for mixing across the interface and a skimming coefficient to describe change in interface height over time. Both these coefficients were derived from steady-state constant buoyancy flux experiments. For lower Richardson numbers the fluid in the cavity is relatively well mixed and the buoyancy decays approximately exponentially over time consistent with previous observations of flushing of a non-buoyant fluid from a canyon. The exponential decay rate decreases with increasing Richardson number.

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