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Estimation of mixing in a lock-exchange flow using molecular tagging velocimetry and thermometry TANMAY AGRAWAL, JIMMY PHILIP, JOE KLEWICKI, The University of Melbourne — Gravity currents produced by a lock-exchange experiment are studied using the single-component version of molecular tagging velocimetry (MTV) in conjunction with its thermal counterpart, molecular tagging thermometry (MTT). The experiments are conducted in a Perspex tank of 2.0 m x 0.2 m x 0.2 m where the lock is located mid-way. Therefore, the current is studied only during the slumping phase and there are no transitions associated with the end-wall reflection. For these experiments, the initial density difference is created by introducing a thermal inhomogeneity on either side of the lock as compared to the general experimental practice of dissolving a salt on one side. The flow is first visualized by mixing a dye on the heavier side to establish the experimental parameters. Subsequently, MTV/MTT images are acquired that contain approximately 1000 data points distributed across the interface of hot and cold fluid. This high-resolution velocity and temperature data is then used to quantify the mixing being taken place at the interface. Specifically, background potential energy of the flow is evaluated over time to estimate the extent of irreversible mixing while an equivalent Thorpe scale is calculated to estimate the size of overturning eddies.

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