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Mean flow influence on a gravity current in a nearly horizontal confined geometry THOMAS SEON, MOHAMMAD TAGHAVI, KRISTA THIELMANN, MARK MARTINEZ, IAN FRIGAARD, University of British Columbia — We study experimentally the effect of an imposed mean flow on a buoyancy-driven exchange flow of two miscible fluids of the same viscosity in a long tube, oriented close to horizontal. Measuring the front velocity, V_f, as a function of the mean flow velocity, V_0, for different density contrasts, viscosity, and inclination angles has allowed us to identify two regimes. First, for low V_0 the flow is dominated by the buoyancy-driven flow and the dynamics are similar to the exchange flow dynamics. Secondly, for high V_0 the flow is dominated by the imposed mean flow, the front velocity varies proportionally to the mean flow velocity and the ratio V_f/V_0 does not appear to be very sensitive to the density contrast or viscosity, but does increase as the tube gets closer to vertical. In this regime we find that the flow becomes more laminar and stable, as V_0 increases. This appears counter intuitive, since more energy is being injected into the system through the mean flow.

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