The effect of geometry on ice-shelf ocean cavity ventilation: a laboratory experiment

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A laboratory experiment is constructed to simulate the density driven circulation under an idealized Antarctic ice shelf and to investigate the flux of dense and fresh water in and out of the ice shelf cavity. Our results confirm that the ice front can act as a dynamic barrier that partially inhibits fluid from entering or exiting the ice shelf cavity, apart from in two wall-trapped boundary currents. This barrier results in a density jump across the ice front and in the creation of a zonal current which runs parallel to the ice front. However despite the barrier imposed by the ice front, there is still a significant amount of exchange of water in and out of the cavity. This exchange takes place through two dense and fresh gravity plumes which are constrained to flow along the sides of the domain by the Coriolis force. The flux through the gravity plumes and strength of the dynamic barrier are shown to be sensitive to changes in the ice shelf geometry and changes in the buoyancy fluxes which drive the flow