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Dissipative neutral mass flow and quantum phase slips in one dimension ADRIAN DEL MAESTRO, Univ of Vermont — Motivated by experimental progress towards confining bosonic quantum fluids inside nanoscale constrictions, we have determined how quantum phase fluctuations of the superfluid order parameter modify neutral mass transport through a one dimensional channel open to vacuum. In the one dimensional limit, dissipation occurs in the guise of phase slips which may be nucleated due to the presence of impurity scattering, disorder, or a periodic potential. By combining equilibrium quantum Monte Carlo simulations with non-equilibrium calculations in the framework of Luttinger liquid theory, we have computed the relationship between the applied pressure and resistive mass flow for a one dimensional quantum fluid of neutral bosons. Understanding the temperature dependence of the resulting nonlinear pressure-flow behavior may be essential for the interpretation of quasi-1D superfluid flow experiments on helium-4.

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