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Crossover from the Hydrodynamic to the Kinetic Regime in Confined Nanoflows¹ CHARLES LISSANDRELLO, VICTOR YAKHOT, KAMIL L. EKINCI, Department of Mechanical Engineering, Boston University — We present an experimental study of a confined nanoflow. The nanoflow is generated in a simple fluid by a sphere oscillating in the proximity of a flat solid wall. Varying the oscillation frequency, the confining length scale and the fluid mean free path over a broad range provides a detailed map of the flow. We use this experimental map to construct a scaling form, which seamlessly describes the nanoflow in both the hydrodynamic and the kinetic regimes. Furthermore, our scaling form unifies previous theories based on the slip boundary condition and the effective viscosity.

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