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Analysis of Slip Boundary Condition in Single and Multi-Phase Flows[1] JOSEPH THALAKKOTTOR, KAMRAN MOHSENI, University of Florida — Over the past two decades several studies have been conducted to understand the molecular mechanism of slip in fluids at the boundary and to better understand the contact point singularity in two phase flow. Although for single phase flows, researchers have looked into the effects of unsteady flow in gases; in liquids, most of the study has been limited to steady flows. In this paper we use molecular dynamic simulations to study slip in an unsteady flow. An unsteady slip model is established, the non-dimensionalizing of which leads to a universal curve for boundary slip. The universal curve gives the slip length for a given shear rate and gradient of shear rate, for steady and unsteady flow. We also identify a non-dimensional number which is defined as the ratio of phase speed to local speed of sound that explains the mechanism responsible for the transition of slip boundary condition from finite to perfect slip. The slip boundary condition is further studied for steady and unsteady multi-phase flows. Emphasis is placed on observing the slip at the wall at the fluid-fluid interface. We establish a universal curve for slip boundary condition for multi-phase flow, for steady and unsteady flows.

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