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Molecular dynamics simulations of oscillatory Couette flows with slip boundary conditions NIKOLAI PRIEZJEV, Michigan State University — The effect of interfacial slip on steady-state and time-periodic flows of monatomic liquids is investigated using non-equilibrium molecular dynamics simulations. The simulations were performed in a wide range of oscillation frequencies; namely, when the Stokes boundary layer thickness is smaller than the channel width at the highest frequency, and, on the other hand, at lower frequencies that correspond to quasi-steady flows. It was found that the velocity profiles computed in MD simulations are well described by the continuum solution with the slip length as a fitting parameter that depends on the local shear rate. Interestingly, the shear rate dependence of the slip length obtained in steady-state shear flows is reproduced in oscillatory flows when the slip length is measured as a function of the absolute value of the local shear rate. Finally, for both types of flows, the friction coefficient at the liquid-solid interface correlates well with the structure factor and the contact density of the first fluid layer. Financial support from the National Science Foundation (CBET-1033662) is gratefully acknowledged.

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