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The interplay between apparent viscosity, wettability, and slip in nanoconfined water ELISA RIEDO, DEBORAH ORTIZ, HSIANG-CHIH CHIU, SUENNE KIM, Georgia Tech, RIEDO TEAM — Understanding and manipulating fluids at the nanoscale is a matter of growing scientific and technological interest. Here we show that the viscous shear forces in nanoconfined water can be orders of magnitudes larger than in bulk water if the confining surfaces are hydrophilic, whereas they greatly decrease when the surfaces are increasingly hydrophobic. This decrease of viscous forces is quantitatively explained with a simple model that includes the slip velocity at the water surface interface. The same effect is observed in the energy dissipated by a tip vibrating in water perpendicularly to a surface. Comparison of the experimental data with the model shows that interfacial viscous forces and compressive dissipation in nanoconfined water can decrease up to two orders of magnitude due to slippage. These results offer a new understanding of interfacial fluids, which can be used to control flow at the nanoscale. NATURE COMMUNICATIONS (2013) |DOI: 10.1038/ncomms3482

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