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High-precision measurements of molecular slip at a solid/liquid interface JUSTIN PYE, CLAY WOOD, JUSTIN BURTON, Department of Physics, Emory University — As fluidic devices get smaller and measurements become more precise and stringent, the need to fully understand the dynamics at interfaces becomes more important. It is now clear that slip near an interface is common at the nanoscale in Newtonian liquids. In simple systems, there is a general trend to larger slip lengths for non-wetting liquid/solid combinations, but many conflicting measurements and interpretations remain. We have developed a novel differential technique using a quartz crystal microbalance (QCM) to measure slip lengths on various substrates. A drop of one liquid is grown on the QCM in the presence of a second, ambient liquid. By choosing the two liquids such that their bulk effects on the QCM frequency and dissipation are identical in the presence of no-slip, we are able to isolate anomalous boundary effects due to interfacial slip. Our data for water on gold (in undecane) are consistent with a slip length of 5nm (for water). A glass surface, wetted by both gold and undecane has also shown strongly anomalous results for the water-undecane pair. In addition to investigating other liquid pairs, future work will include extending this technique to surfaces with independently controllable chemistry and roughness, both of which are known to strongly affect interfacial hydrodynamics.

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