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Capillary condensation and Ice formation at room temperature in nano-friction experiments[1] K.B. JINESH, J.W.M. FRENKEN, Leiden University — We report several direct observations of manifestations of capillary condensation in atomic-scale friction experiments. We have used a dedicated high-resolution friction force microscope to investigate the forces between a tungsten tip and a graphite surface under ambient conditions at a range of relative humidities. The velocity dependence of the friction shows a variety of new effects. We observe high friction and pronounced stick-slip instabilities with periods differing from those on graphite at very low scan velocities and moderate humidities. On the other hand, we see smooth sliding with strongly velocity dependent friction at higher humidities. We show that all aspects of the observed behavior can be interpreted in terms of capillary condensation of water, melting-freezing transitions and visco-elastic effects.

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