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Slow relaxations of individual colloidal spheres following the breach of a fluid interface MADHAV MANI, KITP & UCSB Physics, DAVID M. KAZ, RYAN MCGORTY, VINOTHAN N. MANOHARAN, Harvard University — Although the equilibrium state of a micron sized spherical particle at an interface is well understood, the dynamics associated with the approach to equilibrium is not. Recent high-resolution experiments from the Manoharan Lab (Ref: David M. Kaz's Talk) have shown that the dynamics are richer than expected. Subsequent to the initiation of a contact-line at a fluid interface the dynamics towards equilibrium are much slower than predicted by a hydrodynamic theory and the center of mass of the particle appears to follow a logarithmic law in time. We propose the importance of thermally agitated interactions between the contact-line and physical/chemical defects that pin the contact-line locally, thereby leading to an enhancement of the overall dissipation. We deduce that the interface must remain flat during this dynamic process and derive a force-velocity relation, which agrees with both the slow velocities and the logarithmic law. This surprisingly slow approach to equilibrium has significant consequences for processes where interactions between colloids and interfaces are present.

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