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The Stochastic Dynamics of an Array of Atomic Force Microscope Cantilevers in a Viscous Fluid MATTHEW CLARK, Virginia Tech, MARK PAUL, Virginia Tech — The hydrodynamic coupling between micron scale atomic force microscope cantilevers in a viscous fluid is studied. Using the fluctuation-dissipation theorem, the stochastic dynamics of the cantilevers are quantified from deterministic calculations. Numerical simulations of individual cantilevers immersed in fluid are used to verify the approach. A simple harmonic oscillator model is shown to be reasonable for the description of the dynamics of a single cantilever. The fluid induced correlations in an array of cantilevers are then explored and quantified. Absolute predictions of the cross-correlations in the equilibrium fluctuations of cantilever displacement are presented. This is used to yield limits of the force and time scales of operation for a correlation detection method using multiple atomic force microscope cantilevers.

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