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The Correlated Dynamics of a Pair of Tethered Microcantilevers in a Viscous Fluid[1] BRIAN ROBBINS, MILAD RADIOM, JOHN WALZ, WILLIAM DUCKER, MARK PAUL, Virginia Tech — Understanding the dynamics of biomolecules or polymers in a fluid environment is an important challenge. One approach is to tether a molecule between the ends of two Brownian driven microcantilevers and to measure the change in their correlated dynamics. However, the cantilever dynamics is also correlated due to the motion of the intervening viscous fluid. An important question is whether the correlations due to a tethered molecule can be measured in the presence of the fluid coupling for configurations accessible to experiment. We present experimental measurements of the correlated motion of two microcantilevers in water without a tethered molecule. Using the fluctuation-dissipation theorem with deterministic finite-element simulations we compute the correlated dynamics for laboratory conditions. Our numerical results show very good agreement with experimental measurement. We next include a linear spring between the cantilever tips to model a tethered molecule and quantify the dynamics of the cantilever pair for a wide range of conditions. Our results provide physical insights into the signature of a tethered molecule and quantify the force, time, and length scales that are accessible to current technologies.

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