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The stochastic dynamics of a triangular atomic force microscope near a solid boundary MATT CLARK, MARK PAUL, Virginia Tech — The stochastic dynamics of an atomic force microscope (AFM) cantilever with a complex planform and in a finite-sized fluid filled container is of direct relevance to industry and the development of new technologies. We study the Brownian driven dynamics of an industrially available AFM cantilever with triangular planform immersed in water at room temperature. The stochastic dynamics are determined using a thermodynamic approach based upon the fluctuation-dissipation theorem that requires only deterministic calculations. Using this approach with finite element simulations of the complete fluid-solid interaction problem we quantify the equilibrium fluctuations in cantilever tip displacement and in tip angle. We use our results to explore the increased fluid dissipation that arises as the cantilever is brought near a solid boundary, and the corresponding reduction in quality factor and resonant frequency of the cantilever. Approximations based on long-thin cantilevers predict higher dissipation than found in our approach, suggesting that care be used when applying the theory to cantilevers with complex planform.

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