

Abstract Submitted
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Frequency dependence of Brownian driving force exciting microcantilevers in fluids MATT CLARK, MARK PAUL, Virginia Tech, JOHN SADER, University of Melbourne, JASON CLEVELAND, Asylum Research — The spectral density of the Brownian force acting on an oscillating infinite cylinder in a viscous fluid is expected to be frequency dependent from theoretical considerations. Using analytics, numerics, and experimental measurements we explore the frequency dependent nature of the Brownian force, for a micron scale rectangular and V-shaped cantilever in fluid. Surprisingly, measurements using a V-shaped atomic force microscope cantilever indicate an almost constant frequency dependence of the Brownian driving force. The origin of this unexpected behavior is explored using three-dimensional finite element simulations of the fluid-structure interaction that includes the precise cantilever geometry, where we find that it is necessary to include contributions from multiple bending modes.

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