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Cantilever tilt compensation for variable-load atomic-force microscopy R.J. CANNARA, M.J. BRUKMAN, R.W. CARPICK, University of Wisconsin-Madison Engineering Physics — In a typical atomic-force microscope (AFM), the cantilever forms an angle with respect to the sample surface. This tilt is important for contact mode experiments, because the free end of the cantilever (constrained to move along the surface) displaces laterally as applied load varies. As a result, the AFM tip makes contact with a different point on the surface at each load. These positions lie along the surface projection of the lever's long-axis. The amount of relative tip-sample displacement is proportional to load and is shown to be substantial. Thus, care should be taken when performing load-dependent contact mode experiments, such as friction versus load or force versus separation measurements, when it is required that the tip scan the same line or remain on the same position at each load. We present a method that compensates for in-plane tip-displacement versus load, based on a simple geometric calculation that depends only on the range of vertical motion. We demonstrate the successful use of this method on surfaces with nano-scale inhomogeneities and show that the tip can remain localized over a large load range.

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