Abstract Submitted
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Unusual ultra-low frequency fluctuations in freestanding graphene[1] STEVEN BARBER, PENG XU, University of Arkansas, MEHDI NEEK-AMAL, Universiteit Antwerpen, MATTHEW ACKERMAN, JAMES SCHOELZ, PAUL THIBADO, University of Arkansas, ALI SADEGHI, Universitat Basel, FRANCOIS PEETERS, Universiteit Antwerpen — Intrinsic ripples in freestanding graphene have been difficult to study with common experimental methods. In notable breakthroughs, ripple geometry was recently imaged using scanning electron microscopy as well as scanning tunneling microscopy (STM), but these measurements are thus far limited to static configurations. Thermally-activated flexural phonon modes could generate dynamic changes in curvature which would be of great interest to observe. Here, we present how to track the vertical movement of a one-square-angstrom region of suspended graphene using STM. This allows a direct measurement of the out-of-plane trajectory at one point in space over long periods of time. Based on these data, we present a model from elasticity theory to explain the very-low frequency oscillations that are observed. Unexpectedly, we sometimes detect a sudden colossal jump, which we interpret as due to mirror buckling. This innovative technique provides a much needed atomic-scale probe for the time-dependent behaviors of intrinsic ripples in freestanding graphene, and it represents a fundamental advance in the use of STM.

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