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Stick-Slip Dynamics Using Velcro as Model System LISA MARIANI, CARA ESPOSITO, PAUL ANGIOLILLO, Saint Joseph's University — Described by Galileo and further developed phenomenologically by Amontons and Coulomb, friction remains to be poorly understood especially with respect to its transition from the static to the kinetic regimes. In particular, the dynamics and control thereof of systems exhibiting stick-slip motion continues to be an area of fascination. The dry sliding behavior of the hook-and-loop system evinced by common Velcro captures many of the hallmarks of stick-slip motion typically manifested in systems at very small and very large length scales in addition to satisfying some of the classical laws as put forth by Amontons and Coulomb. Specifically, the kinetic frictional force is independent of driving velocity over nearly three orders of magnitude. In stark contrast to classical behavior, both the maximum static and the kinetic frictional forces reveal a linear dependence on the "area of contact" or more appropriately, hook number. Moreover, the frictional force (static and kinetic) exhibits a power law dependence on load with an exponent of approximately 0.25 similar to behavior seen in AFM, the implication being non-constant coefficients of static and kinetic friction. Statistical analysis shows that the fluctuations of stick-slip events follow a power law behavior with an exponent of approximately 0.5. Interestingly, this relatively simple system demonstrates evidence of precursor events prior to the onset of motion and may provide insight to the nucleation and transition from static to kinetic friction.

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