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Scale effects in single-asperity friction[1] MARK O. ROBBINS, TRISTAN SHARP, VINCENT LIGNERES, Johns Hopkins University, LARS PASTEWKA, Fraunhofer Institute for Mechanics of Materials IWM — Simulations are used to examine the static friction in model single-asperity contacts between a sphere and a flat elastic substrate. The two surfaces have the same crystalline structure. The radius R of the sphere and a of the contact are varied from nanometers to micrometers. For small contacts the atoms move coherently and the coefficient of friction μ is independent of load. As contact size increases, μ begins to drop. Results from a wide range of systems can be collapsed when μ is plotted against a^2/Ra_0 where a_0 nearest-neighbor spacing. The results are compared to Cattaneo-Mindlin continuum theory and dislocation-based models of contact-size effects from Hurtado and Kim and Gao.

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