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The power laws of nanoscale forces in ambient conditions MATTEO CHIESA, SERGIO SANTOS, CHIA-YUN LAI, Laboratory for Energy and NanoScience, Masdar Institute — Power laws are ubiquitous in the physical sciences and indispensable to qualitatively and quantitatively describe physical phenomena. A nanoscale force law that accurately describes the phenomena observed in ambient conditions at several nm or fractions of a nm above a surface however is still lacking. Here we report a power law derived from experimental data and describing the interaction between an atomic force microscope AFM tip modelled as a sphere and a surface in ambient conditions. By employing a graphite surface as a model system the resulting effective power is found to be a function of the tip radius and the distance. The data suggest a nano to mesoscale transition in the power law that results in relative agreement with the distance-dependencies predicted by the Hamaker and Lifshitz theories for van der Waals forces for the larger tip radii only

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