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Explaination of nonlocal granular fluidity in terms of microscopic fluctuations QIONG ZHANG, KEN KAMRIN, Massachusetts Inst of Tech-MIT — A recently proposed granular constitutive law has shown capability to predict nonlocal granular rheology using a variable denoted granular fluidity. This work is aimed at finding the microscopic physical meaning of fluidity in terms of fluctuations such as fluctuation of normalized shear stress and fluctuation of velocity. We try to predict the fluidity as a function of the fluctuation of normalized shear stress, and also test Eyring equation and kinetic theory based on the theoretical prediction proposed in other work. We find a consistent definition for the fluidity to be proportional to the product of the velocity fluctuations and some function of packing fraction divided by the average diameter of the grains. This definition shows predictive ability in multiple geometries for which flow behavior is nonlocal. It is notable that the fluidity is well-defined as a function of kinematic state variables, as one would hope for a quantity of this nature.

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