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Characterizing rare fluctuations in soft particulate flows

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Soft particulate media include a wide range of systems involving athermal dissipative particles both in non-living and biological materials. Characterization of flows of particulate media is of great practical and theoretical importance. A fascinating feature of these systems is the existence of a critical rigidity transition in the dense regime dominated by highly intermittent fluctuations that severely affects the flow properties. Here, we unveil the underlying mechanisms of rare fluctuations in soft particulate flows. We find that rare fluctuations have different origins above and below the critical jamming density and become suppressed near the jamming transition. We then conjecture a time-independent local FR, which we verify numerically, and that gives rise to an effective temperature. We discuss similarities and differences between our proposed effective temperature with the conventional kinetic temperature in the system by means of a universal scaling collapse.

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