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Growing length scale for dynamical heterogeneity in an air-driven granular system near jamming AARON KEYS, SHARON GLOTZER, Deparment of Chemical Engineering, University of Michigan, ADAM ABATE, DOUGLAS DURIAN, Department of Physics, University of Pennsylvania — Anomalous behaviour known as "spatially heterogeneous dynamics" (SHD) has been observed in supercooled liquids, dense colloids, and, more recently, in confined granular packings. Dynamics in these systems may be governed by proximity to a generic "jamming transition," beyond which rearrangements cease and the viscosity diverges. However, the universality of this jamming hypothesis has not yet been tested in terms of variation in the hallmark dynamical heterogeneities as a function of control parameter. Here, we report measurement of SHD in systems of air-driven granular beads, as a simultaneous function of both density and effective temperature. On approach to jamming, the dynamics are found to become progressively slower and more heterogeneous. The measured dynamical time and length scales appear to diverge, and can be modeled both by mode-coupling theory and by the Vogel Tammann-Fulcher (VFT) equation, in quantitative analogy with glass-forming liquids. The Vogel temperature arising from the VFT fit, which corresponds to an ideal glass transition temperature in liquids, coincides with point-J, the volume fraction corresponding to a random close-packed structure. Our findings provide a significant step forward in the quest for a unified theory of "jamming" in disparate systems.

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