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Evidence for a second-order phase transition to a low-entropy glass C. PATRICK ROYALL, FRANCESCO TURCI, University of Bristol, THOMAS SPECK, Johannes Gutenberg-Universitat Mainz — The physics underlying the glass transition is a major outstanding. Central its solution is whether there is some kind of thermodynamic transition to a ideal glass, a disordered state with extremely low entropy, or whether in principle a liquid may be supercooled to arbitrary low temperature. Among the challenges that lie in tackling the glass transition are the immense timescales involved. Computer simulation, which might otherwise be able to pick up hints of a thermodynamic transition is limited by the small time-window over which a liquid can be equilibrated. Here we address this challenge using trajectory sampling in a system undergoing a first order nonequilibrium phase transition to a glassy state rich in low-energy geometric motifs. Extrapolation to equilibrium indicates that the transition would occur at a similar temperature at which the ideal glass transition is expected from extrapolation of dynamic and thermodynamic measurements. We further reweight nonequilibrium data to equilibrium leading to configurations representative of extremely low temperature, which indicate a transition to a low energy state at the ideal glass transition temperature. We thus interpret the ideal glass transition as the lower critical endpoint of this nonequilibrium transition.

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