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Particle Rearrangements in a Granular material subject to Thermal Cycling STEVEN SLOTTERBACK, LEONARD GOFF, MASAHIRO TOIYA, WOLFGANG LOSERT, University of Maryland — Repeated heating and cooling, or thermal cycling, is known to cause compaction in granular assemblies. However, the microscopic mechanism for this process is not known. Our goal is to investigate how individual grains rearrange during the compaction process. Observation of the interior of a granular pile is made possible by the use of transparent grains immersed in index-matching fluid. A new laser sheet scanning approach allows us to extract 3D positions of individual grains. We cycle the temperature of a pile of glass beads in a plastic container with a ΔT of 40 $^\circ$ C. We track the motion of individual particles through a sequence of thermal cycles using 3D particle tracking software. Overall, we observe notable compaction that is qualitatively consistent with results found by Chen et al. [1] for the same beads and container, but with index-matching fluid. When studying individual particle tracks, we find that some particles undergo sudden hopping, similar to the hopping observed under vertical tapping [2]. We will also present further analysis of particle rearrangements.
[1] Chen, et al. , Nature 442, 257(2006).
[2] P. Ribiere et al. Phys. Rev Lett, 95, 268001 (2005)

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