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The Role of Free Surfaces on Plastic Deformation of Colloidal Micropillars[1] DANIEL STRICKLAND, ALEXANDER KLEBNIKOV, University of Pennsylvania, Department of Materials Science and Engineering, JYO LYN HOR, DAEYEON LEE, University of Pennsylvania, Department of Chemical and Biomolecular Engineering, DANIEL GIANOLA, University of Pennsylvania, Department of Materials Science and Engineering — The effect of free surfaces on the strength and deformation behavior of amorphous solids remains an area of intensive research in materials science. We present experiments on the evolution of particle-level strain in amorphous colloidal micropillars compressed uniaxially. The unique micropillar geometry allows us to study the effect of free surfaces, which are believed to be fertile sites for STZ activity, on deformation behavior. The micropillars, which are composed of fluorescent 3 um PMMA particles, are suspended in a fluid so that we can use laser scanning confocal microscopy to image through the micropillar at each increment of macroscopic strain. By employing particle-identification and tracking algorithms, we are able to track the positions of more than 100,000 individual particles during the duration of a compression experiment. Particle-level position information allows us to quantify the spatiotemporal evolution of microscopic strain with macroscopic strain and explore differences in deformation behavior between bulk and surface regions.

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