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**Characterization of local shear zones that govern the deformation of colloidal glasses** KATHARINE JENSEN, Department of Physics, Harvard University, Cambridge, MA, NOBUTOMO NAKAMURA, Department of Mechanical Science and Bioengineering, Osaka University, Osaka, Japan, DAVID WEITZ, Department of Physics and School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, FRANS SPAEPEN, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA — Colloidal glass provides a unique experimental system with which to study the structure, defects, and dynamics of a generic amorphous material. We report experiments on 1.55-$\mu$m-diameter, hard-sphere silica colloidal glasses under conditions of uniform shear. We use confocal microscopy to follow the 3D, real-time trajectories of roughly 100,000 particles during homogeneous deformation and explore the roles of both glass density and applied strain rate. In this way, we probe the elastic, anelastic, and plastic response of the system, with particular focus on identifying specific mechanisms of deformation. In plastic deformation, we directly observe "shear defects" or "shear transformation zones" (STZs) as clusters of particles that behave as Eshelby inclusions, undergoing highly localized plastic strain. These clusters can be identified as regions that are best fits to the Eshelby strain field throughout the sample. We correlate the development of these regions with local density-related properties, including the Voronoi volume and the free volume of both individual particles and connected clusters of particles.

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