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Developing a Magnetic Resonance Imaging measurement of the forces within 3D granular materials under external loads STEFAN ELRINGTON, THIBAULT BERTRAND, Yale University, MERIDETH FREY, Wesleyan University, MARK SHATTUCK, The City College of New York, COREY O'HERN, SEAN BARRETT, Yale University — Granular materials are comprised of an ensemble of discrete macroscopic grains that interact with each other via highly dissipative forces. These materials are ubiquitous in our everyday life ranging in scale from the granular media that forms the Earth's crust to that used in agricultural and pharmaceutical industries. Granular materials exhibit complex behaviors that are poorly understood and cannot be easily described by statistical mechanics. Under external loads individual grains are jammed into place by a network of force chains. These networks have been imaged in quasi two-dimensional and on the outer surface of three-dimensional granular materials. Our goal is to use magnetic resonance imaging (MRI) to detect contact forces deep within three-dimensional granular materials, using hydrogen-1 relaxation times as a reporter for changes in local stress and strain. To this end, we use a novel pulse sequence to narrow the line width of hydrogen-1 in rubber. Here we present our progress to date, and prospects for future improvements.

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