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Granular Rheology with Sliding, Rolling and Twisting Friction ANDREW SANTOS, Sandia National Laboratories, ISHAN SRIVASTAVA, Lawrence Berkeley National Laboratory, LEONARDO SILBERT, Central New Mexico Community College, JEREMY LECHMAN, GARY GREST, Sandia National Laboratories — Intuition tells us that a rolling or spinning sphere on a table will eventually stop due to the presence of friction. Nonetheless, rolling and twisting friction are often neglected in particle-based flow simulations. Rolling and twisting friction are important in granular rheology, where the flow field induces rotations. Granular rheology is simulated using particle-based, discrete element simulations with sliding, rolling and twisting friction in bulk-like stress-controlled shear flows. Normal stress difference, stress ratios and inertial numbers are used to characterize the rheology for different friction states. The increase in critical shear stress to flow, for bulk-like rheology, due to rolling and twisting friction is measured. Fabric tensors are used to characterize the structure of the flowing states. Beyond the contact, normal and tangential fabric tensors, the two rotational fabric tensors, from rolling and twisting friction, are also calculated.

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