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Role of inertia in the rheology of amorphous sys- tems: a finite element based elasto plastic model KAMRAN KARIMI, JEAN-LOUIS BARRAT, Joseph Fourier University — A simple Finite Element analysis with varying damping strength is used to model the athermal shear rheology of densely packed glassy systems at a continuum level. We focus on the influence of dissipation mechanism on bulk rheological properties. Our numerical studies, done over a wide range of damping coefficients, identify two well-separated rheological regimes along with a cross-over region controlled by a critical damping. In the overdamped limit, inertial effects are negligible and the rheological response is well described by the commonly observed Herschel-Bulkley equation. In stark contrast, inertial vibrations in the underdamped regime prompt a significant drop in the mean-stress level, leading to a non-monotonic constitutive relation. The observed negative slope in the flow curve, which is a signature of mechanical instability and thus permanent shear-banding, arises from the sole influence of inertia, in qualitative agreement with the recent molecular dynamics study of Nicolas *et al.* (*arXiv preprint arXiv:1508.06067*, 2015).

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