

## The Transitional nature of $\nu=0.58$

The following are stress histories for the dimensionless normal stress  $\tau_{yy}/\rho d^2 \dot{\gamma}^2$  at the transitional solid fraction  $\nu=0.58$ . Note that for small  $k/\rho d^3 \dot{\gamma}^2$  one sees the slowly undulating stresses as the shear flow causes force chains to form and collapse. Larger  $k/\rho d^3 \dot{\gamma}^2$  exhibit the spikes characteristic of collisional behavior. But notice large peaks appear even at the largest value,  $k/\rho d^3 \dot{\gamma}^2 = 10^{13}$  reflecting the sporadic formations of force chains. These sporadic force chain formations make these flows a combination of elastic and collisional behavior.

