a.

b. Quasi-static | Inertial & Collisional

fabric-dominated | I - dominated

$$I = \frac{\dot{\gamma} \cdot d_p}{\sqrt{P/\rho}}$$

$$\mu(I) = \mu_s + \frac{(\mu_2 - \mu_s)}{I + I_0}$$

oscillatory shear

Temporal Governing Equation?

Quasi-static regime

Evolution equation for fabric

$$\mathring{\boldsymbol{A}} = c_1 \boldsymbol{S} + c_2 |\boldsymbol{D}| \boldsymbol{A} + c_3 (\boldsymbol{A} : \boldsymbol{S}) \boldsymbol{A}$$

$$\frac{dA_{xz}}{dt} = \frac{1}{2}(A_{zz} - A_{xx} + c_1)\frac{d\gamma}{dt} + \frac{\sqrt{2}}{2}c_2 A_{xz}\left|\frac{d\gamma}{dt}\right| + c_3 A_{xz}^2 \frac{d\gamma}{dt}$$

$$\frac{dA_{xz}}{dt} \approx \xi_1 \frac{d\gamma}{dt} + \xi_2 A_{xz}\left|\frac{d\gamma}{dt}\right| + \xi_3 A_{xz}^2 \frac{d\gamma}{dt}$$

Discovered governing equation

$$\frac{d\mu}{dt} = C_1 \frac{d\gamma}{dt} + C_2 \mu \left|\frac{d\gamma}{dt}\right| + C_3 \mu^2 \frac{d\gamma}{dt}$$

c.

d.