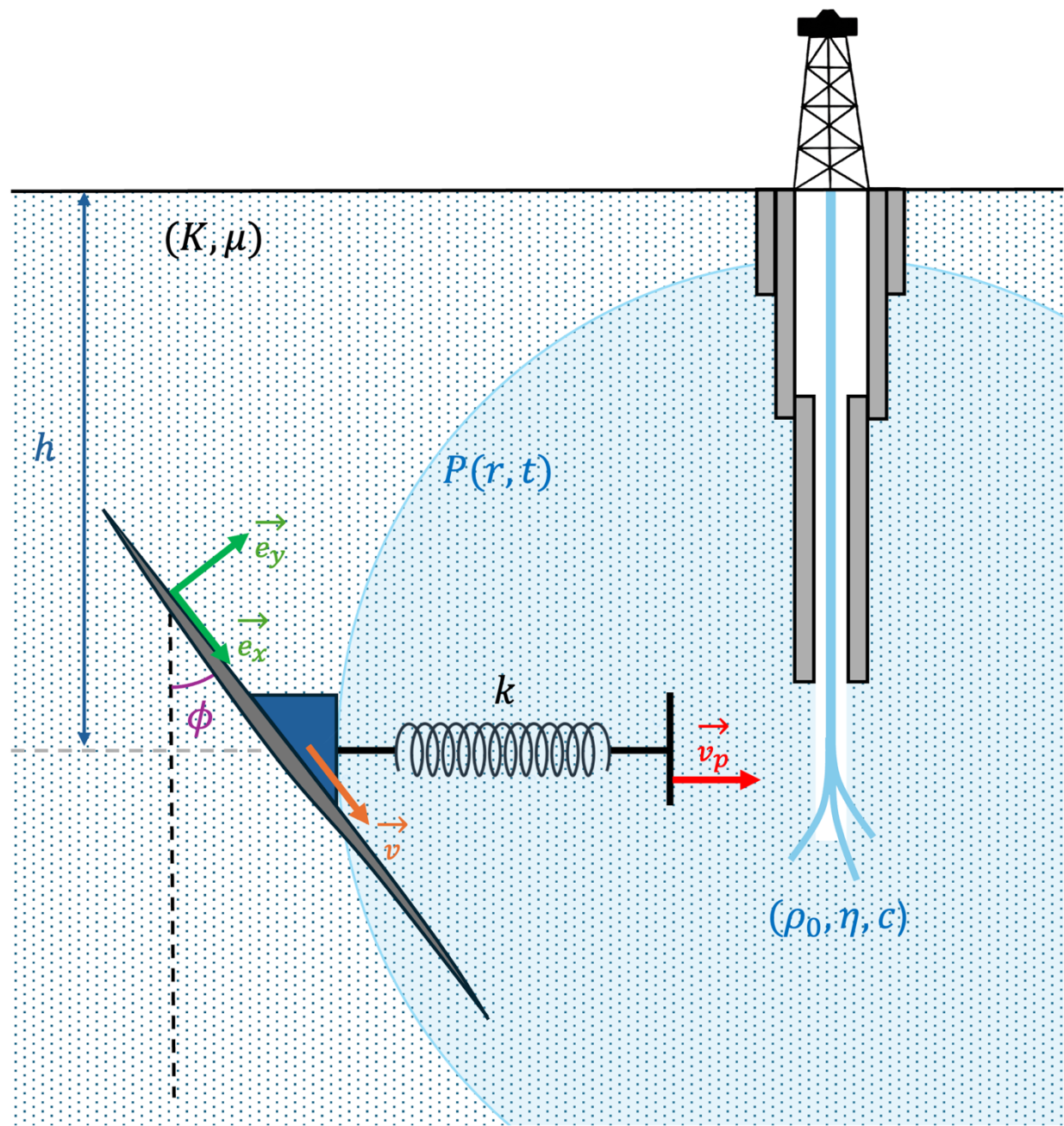


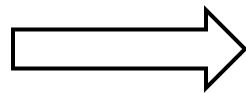
# **Modélisation physique de la réactivation de la faille**

Erhel Cayzac, Louis Cristante, Léonard Duval--Laude, Thomas Gori et Aymeric Turret



$$\frac{m}{S} \dot{v} = \eta v = -k(l^* + \sin(\phi) \delta - v_p t) \sin(\phi) - f(t) \sigma_{eff}(t)$$

$$\frac{d\bar{v}}{\bar{v}} = \frac{-\kappa(\bar{v} \sin \phi - 1) \sin \phi + \left(\bar{v} - \frac{1}{\bar{\theta}}\right) \left(\frac{\sigma(t)}{\sigma_0} - \frac{P(t)}{\sigma_0}\right) - \left(\frac{f_0}{b} + \alpha \ln \bar{v} + \ln \bar{\theta}\right) \frac{d(\sigma-P)}{dt} \frac{d_c}{v_p \sigma_0}}{\bar{\eta} \bar{v} + \alpha \left(\frac{\sigma(t)}{\sigma_0} - \frac{P(t)}{\sigma_0}\right)} d\bar{t}$$

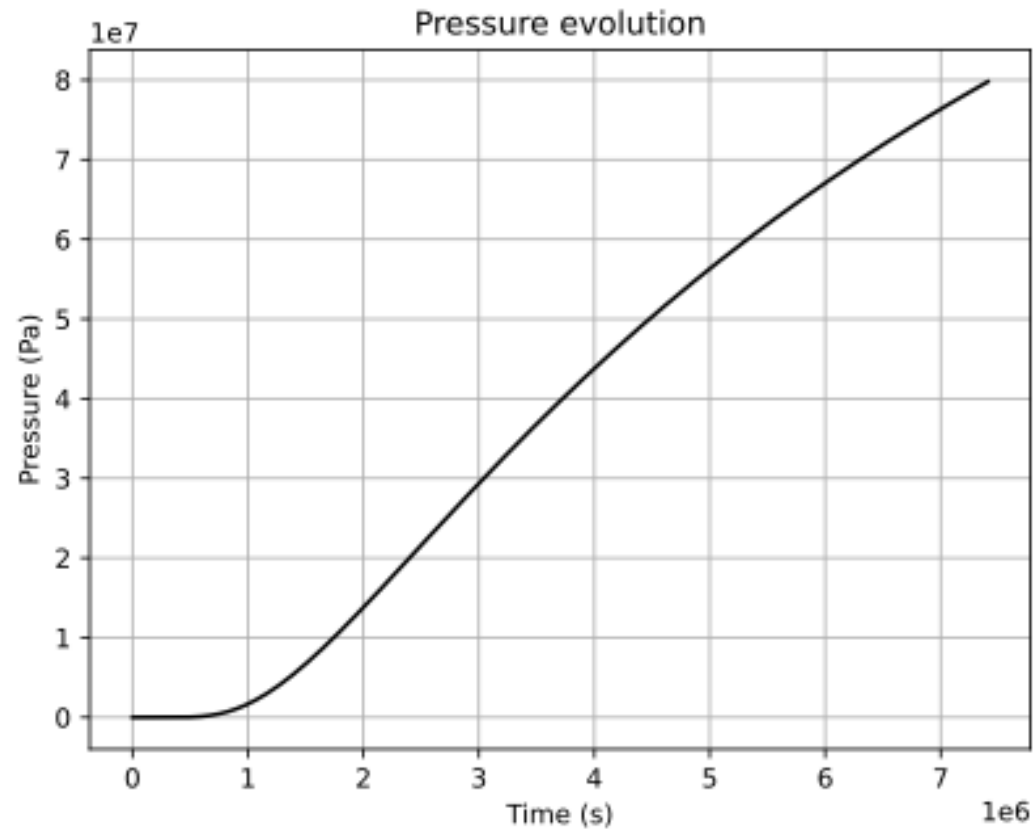


Algorithme de Runge – Kutta

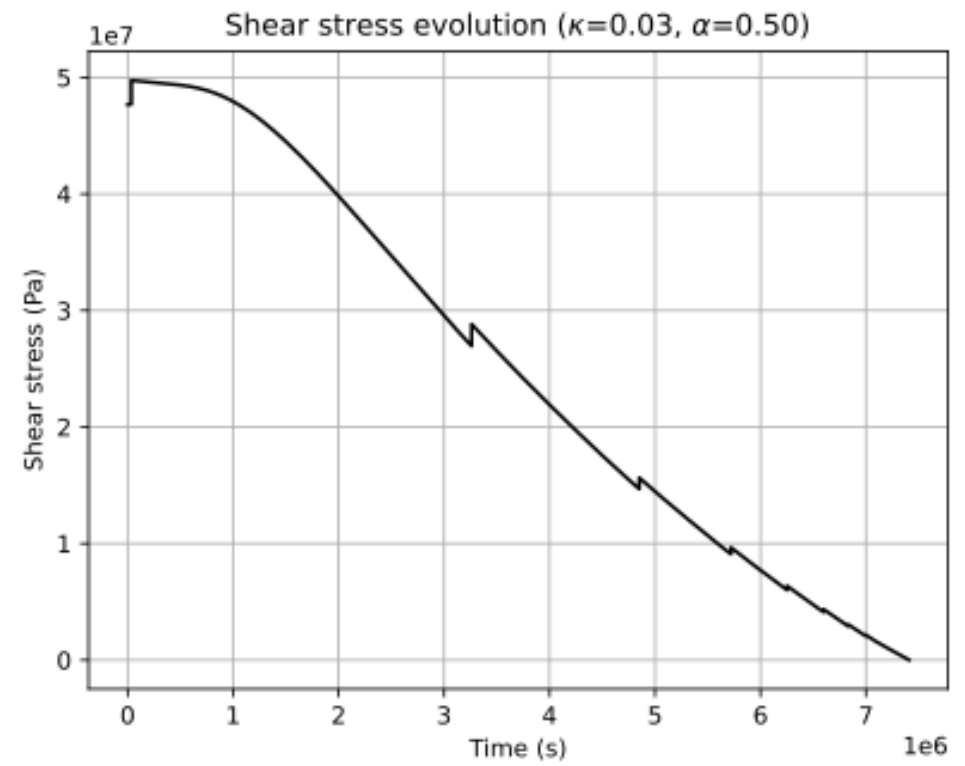
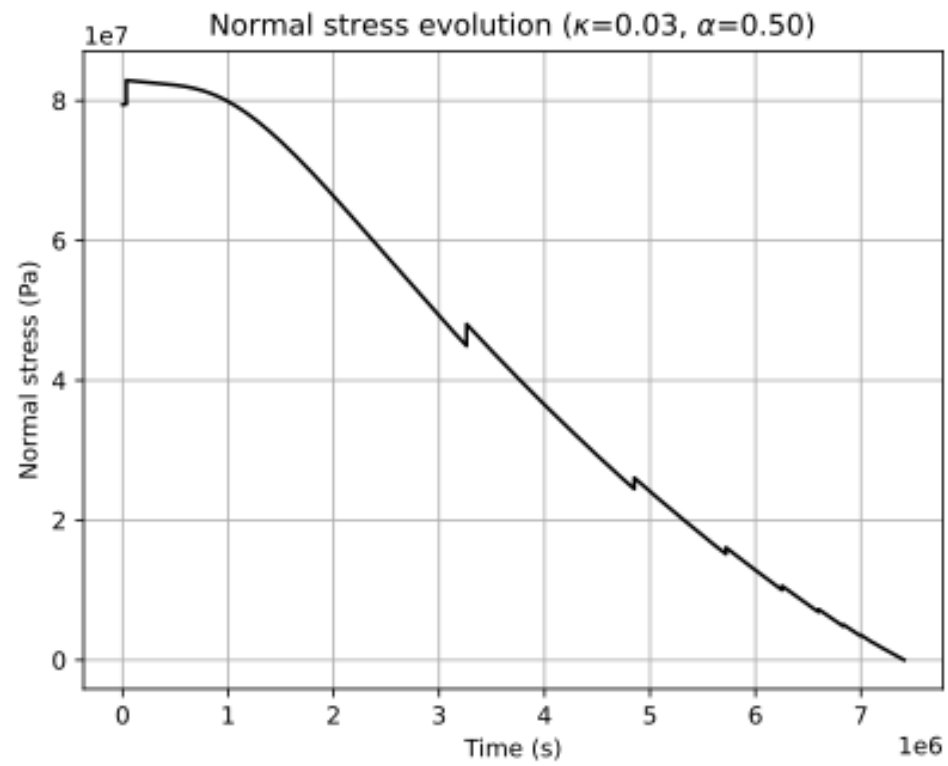
$$P(t) = \frac{q}{4\pi\rho_0 r} \frac{\eta}{K} \operatorname{erfc}\left(\frac{r}{2\sqrt{ct}}\right) = P_\infty \operatorname{erfc}\left(\sqrt{\frac{\tau}{t}}\right)$$

*Injection-induced seismicity:  
Poroelastic and earthquake  
nucleation effects, JGR*

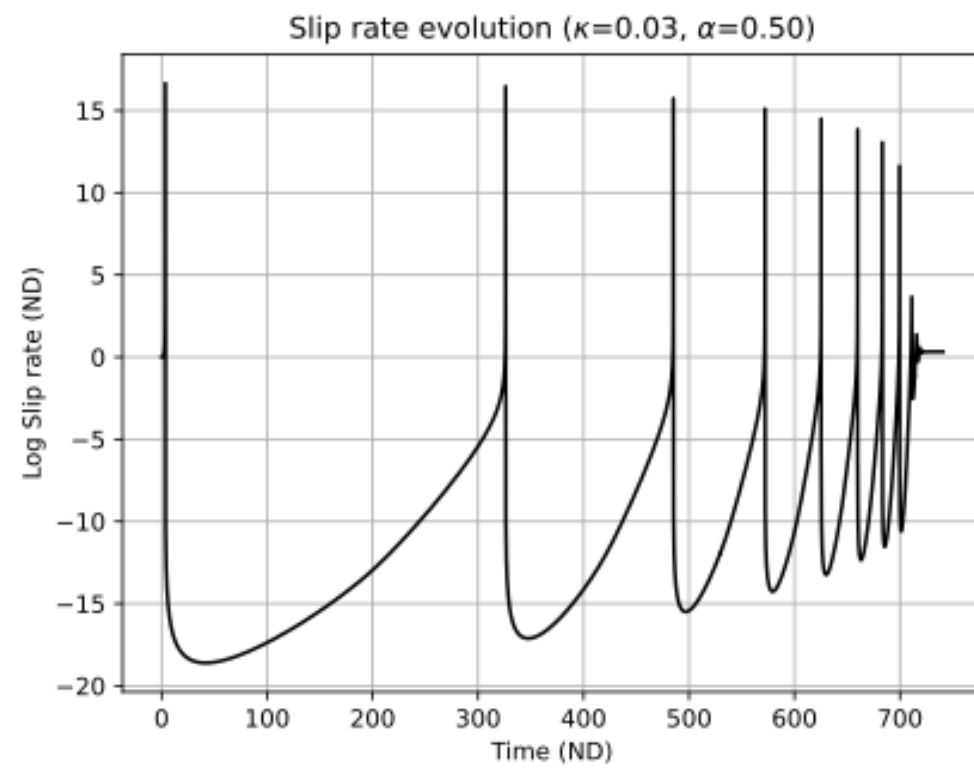
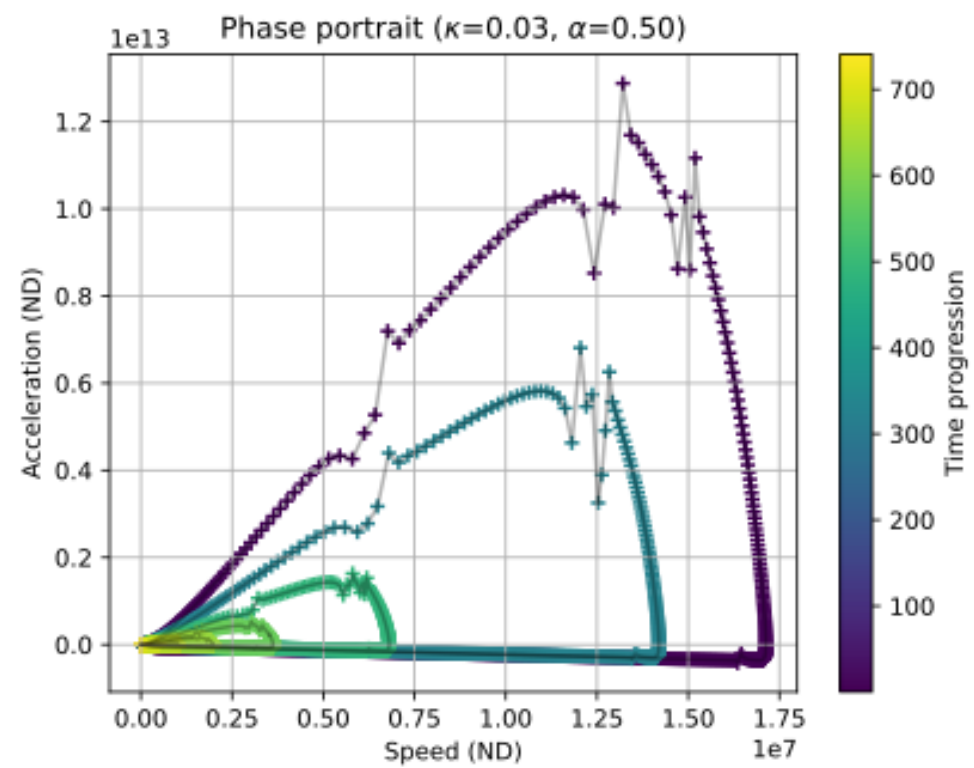
$$P_\infty = \frac{q}{4\pi\rho_0 r} \frac{\eta}{K}, \quad \tau = \frac{r^2}{4c}$$



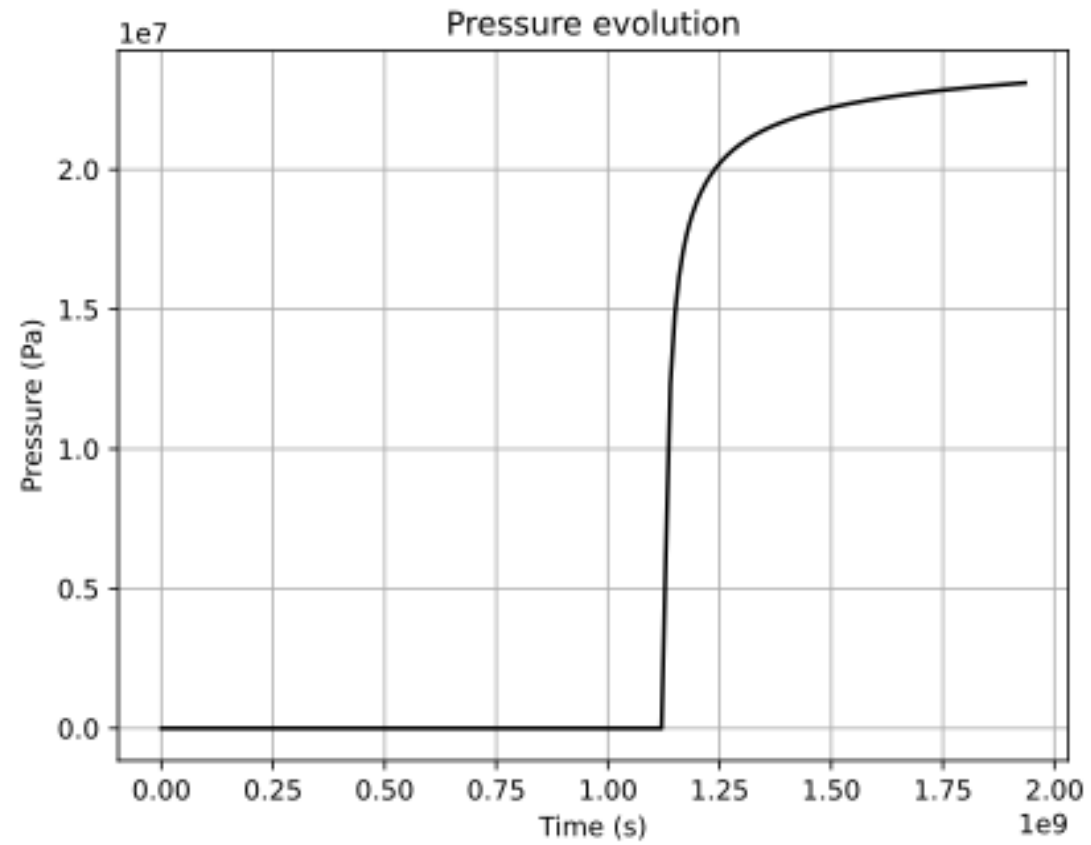
$$\left(\phi = \frac{\pi}{4}\right)$$



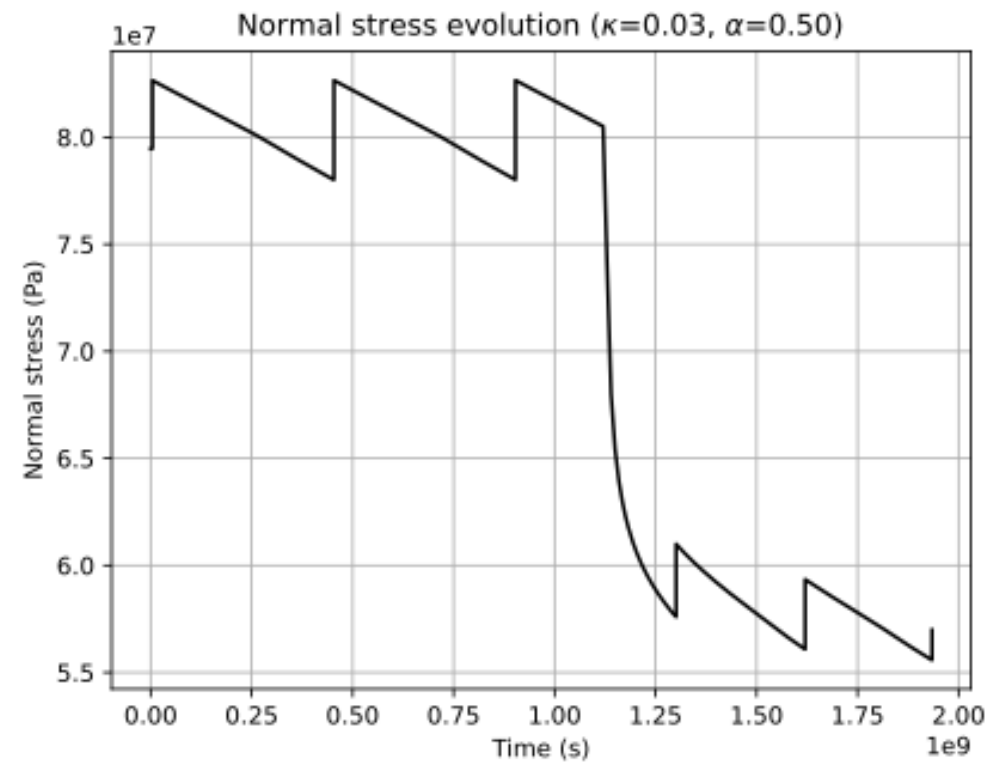
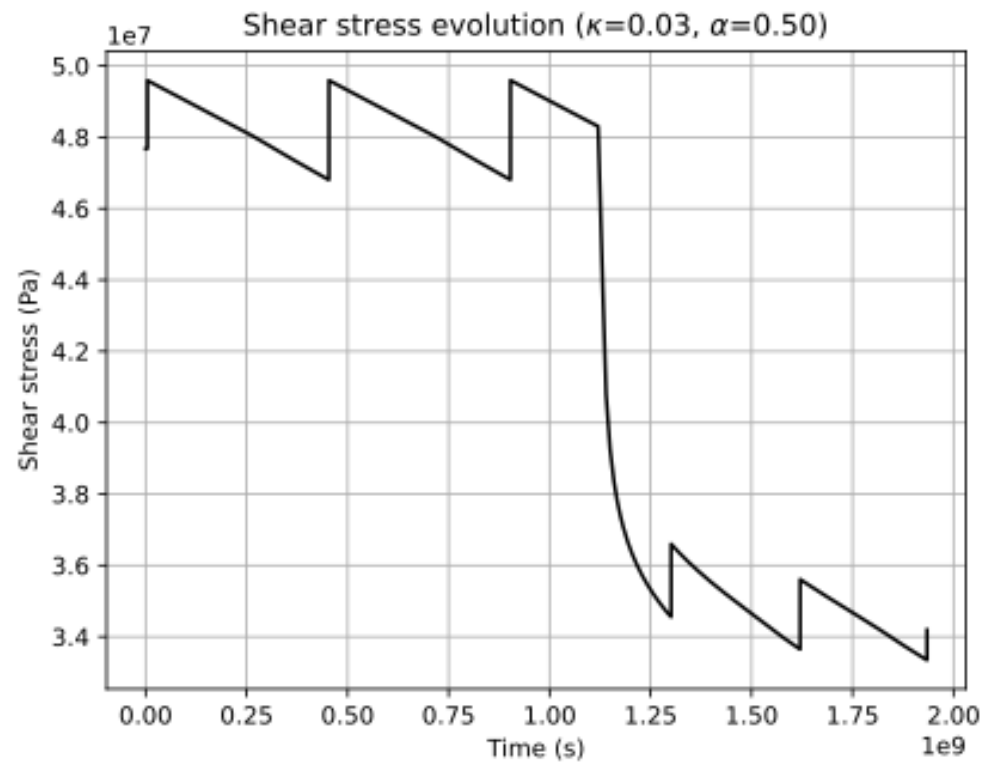
$$\left(\phi = \frac{\pi}{4}\right)$$



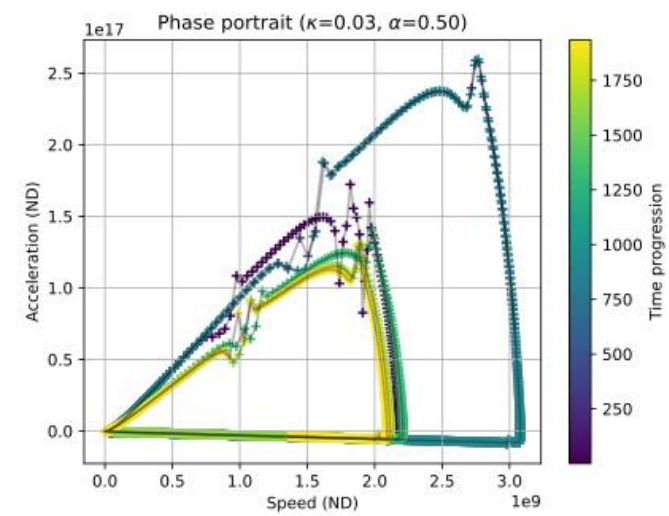
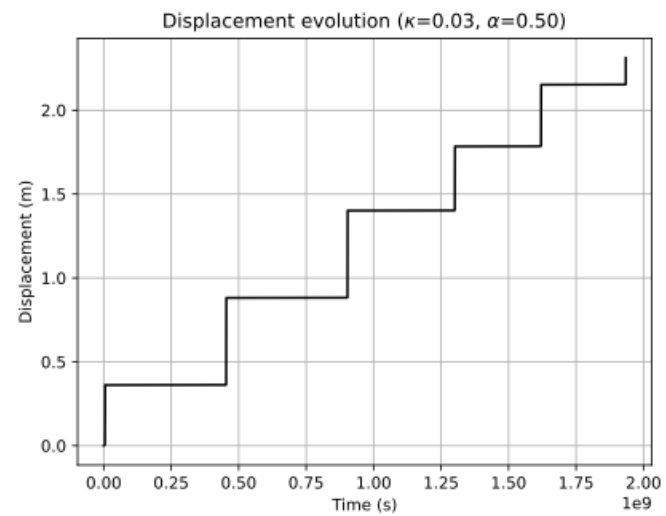
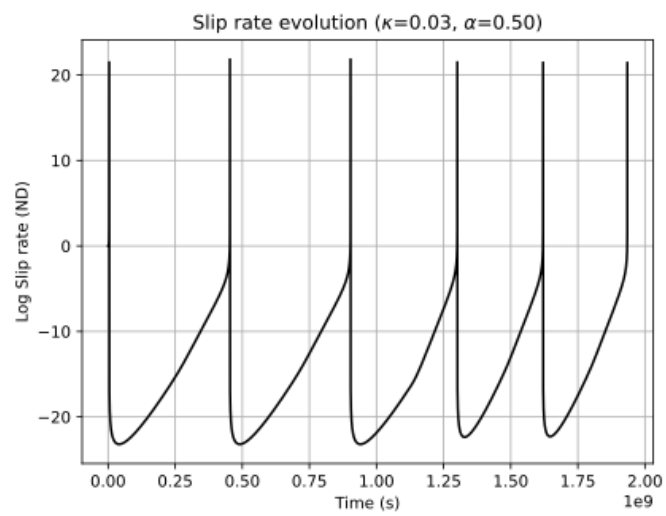
## Ajout d'un délai



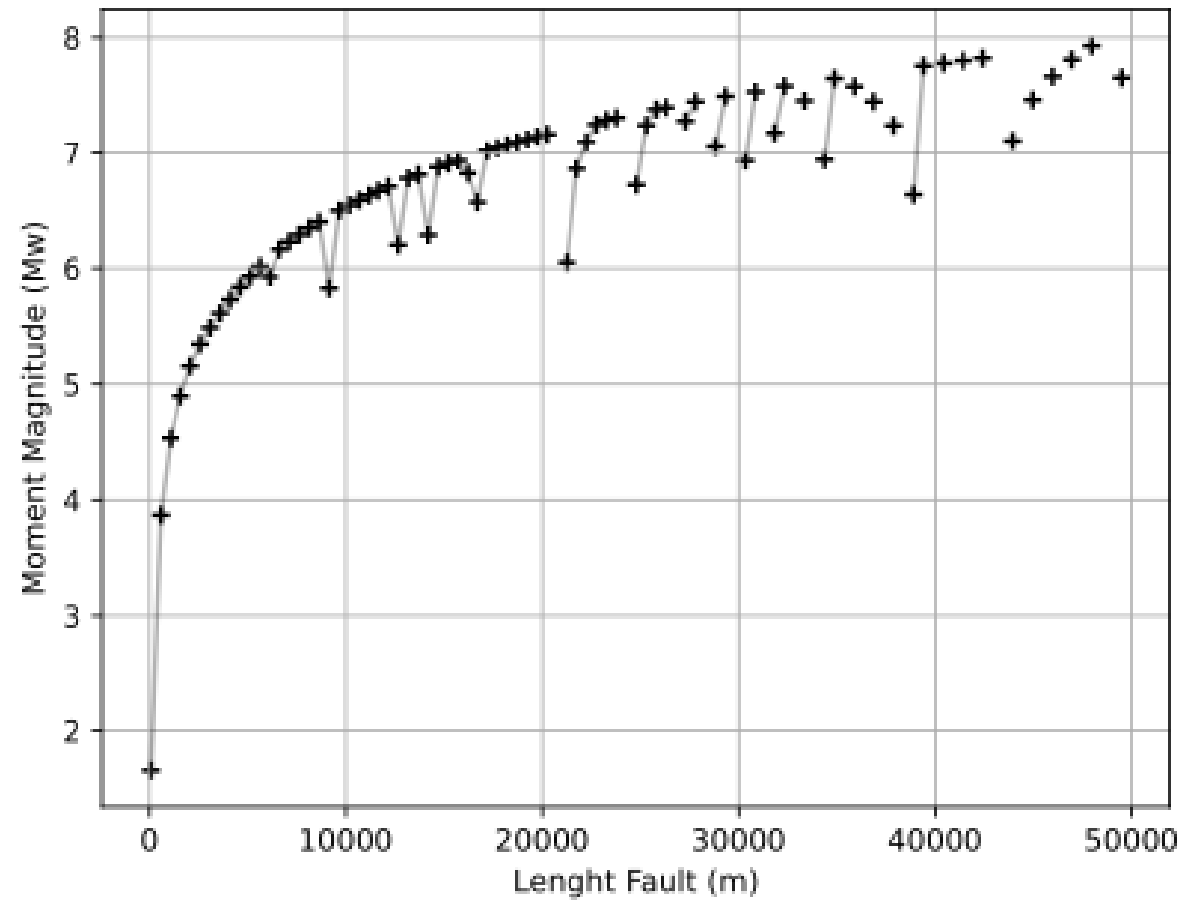
$$\left(\phi = \frac{\pi}{4}\right)$$

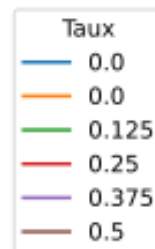
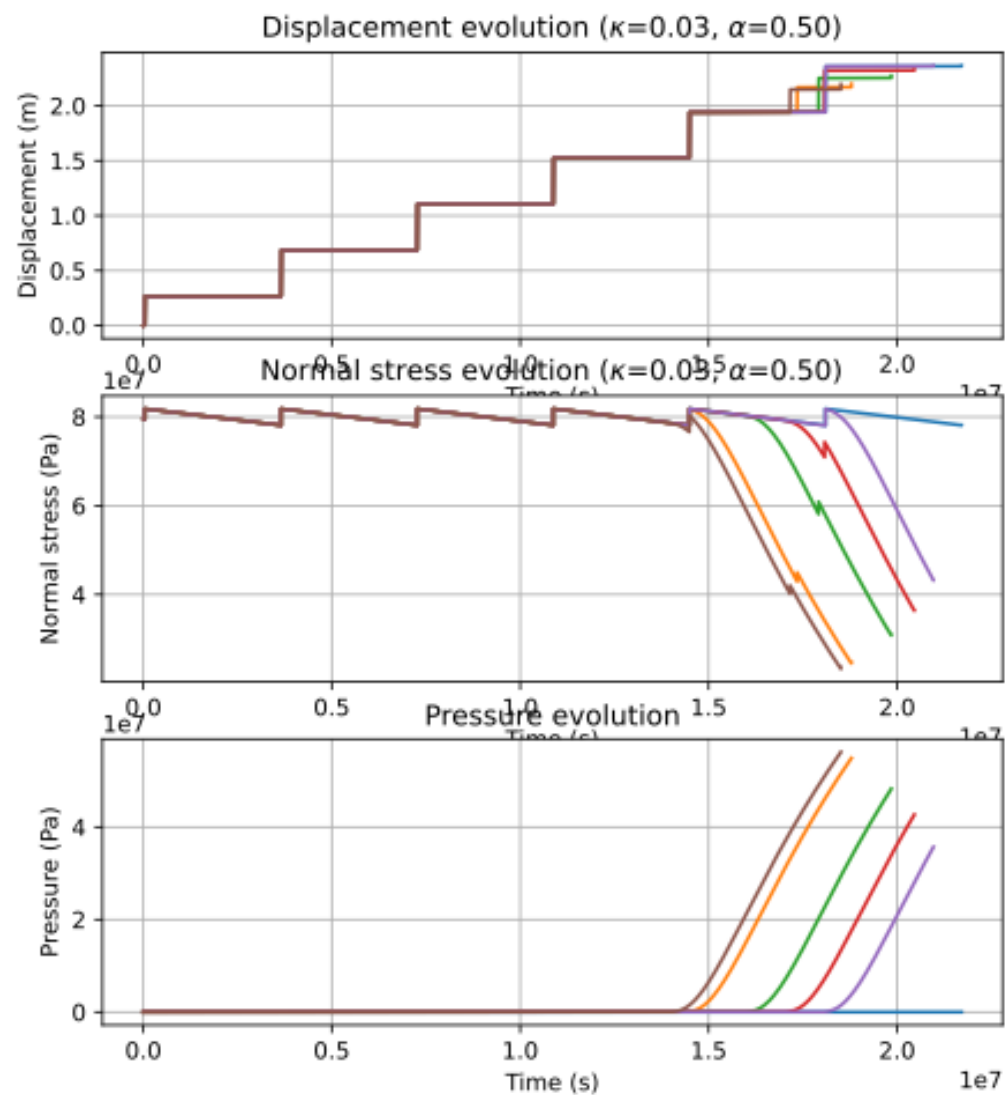
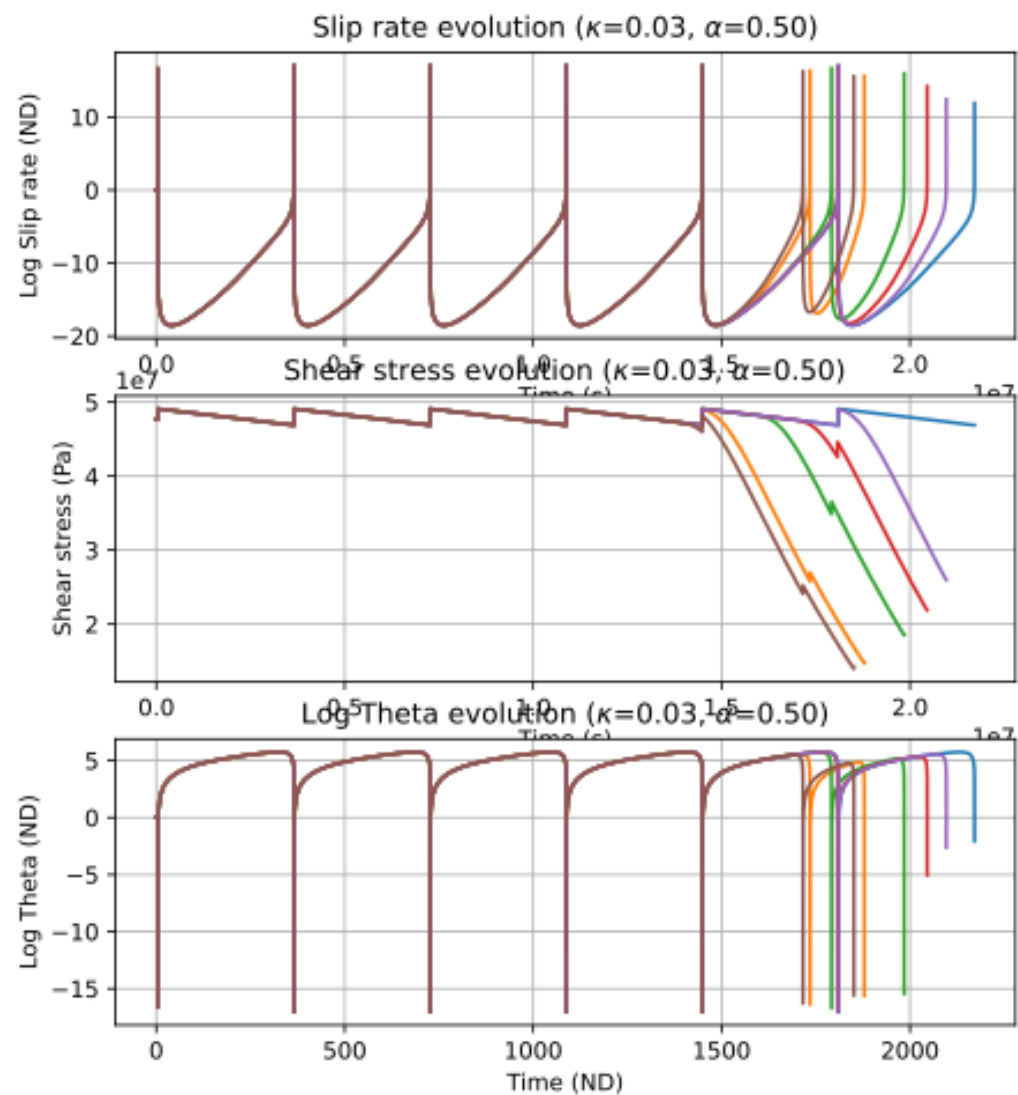






Moment Magnitude vs Lenght Fault





## Prise en compte de la poro-élasticité

$$\eta \frac{dv}{dt} = -k(v \sin(\phi) - v_p) \sin(\phi) - \left( \frac{df}{dt} (\sigma(t) + \sigma_{pe}^{(y)}(t) - P(t)) + \frac{d(\sigma + \sigma_{pe}^{(y)} - P)}{dt} f(t) \right) + \frac{d\sigma_{pe}^{(x)}}{dt}$$

