

Article Stress-strain behavior of sand at high strain rates (Mehdi Omidvar et al,2012)

M. Omidvar et al. / International Journal of Impact Engineering 49 (2012) 192–213

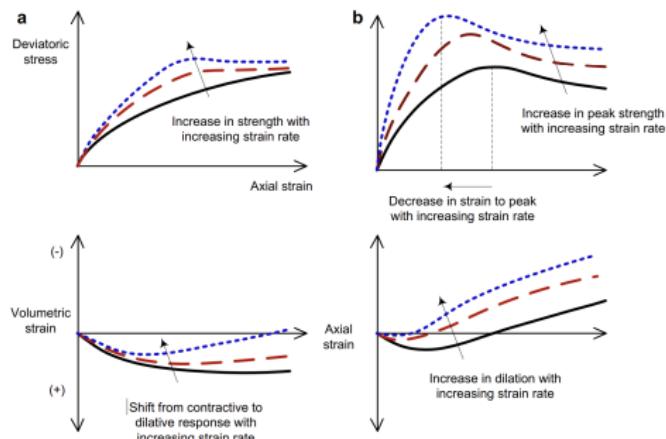


Fig. 19. Effect of increase in strain rate on stress-strain response and volumetric strains in (a) loose sand, (b) dense sand (interpreted based on data from Table 3).

"Under HSR loading, there is not enough time for strain energy accumulation, which prohibits crushing and promotes rolling-rearrangement resulting in a higher resistance to shear"

Trouver le régime de l'état critique

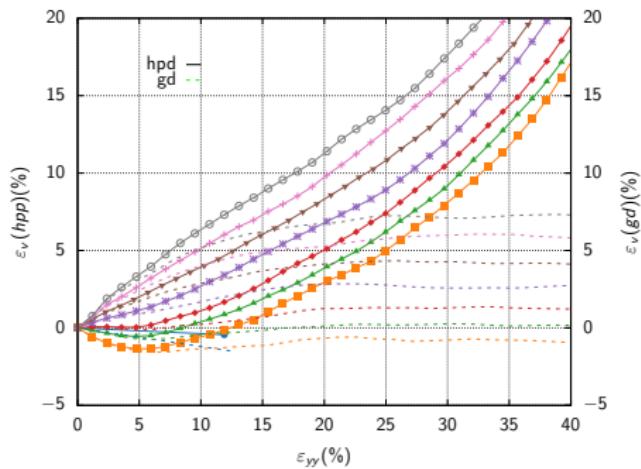


Figure 1 – Déformation Volumique

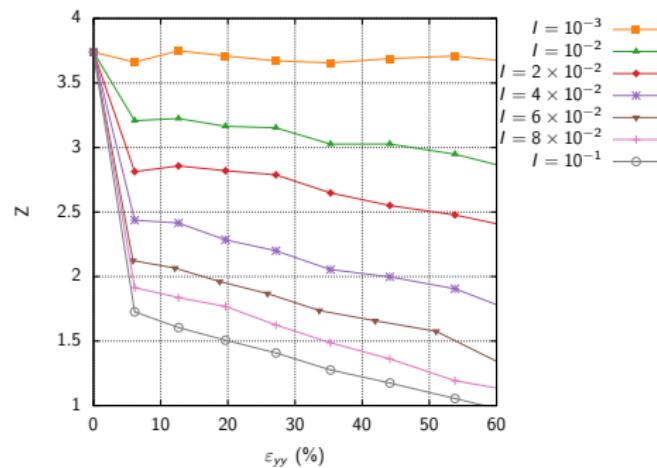


Figure 2 – Nombre de Coordination

$$\text{hpp : } \varepsilon_{yy} = \frac{\Delta h_{yy}}{h_{yy}^0}; \varepsilon_v = \varepsilon_{xx} + \varepsilon_{yy} + \varepsilon_{zz}$$

$$\text{gd : } \varepsilon_{yy} = \ln \left(\frac{h_{yy}}{h_{yy}^0} \right); \varepsilon_v = \frac{\Delta V}{V_0};$$

Trouver le régime de l'état critique

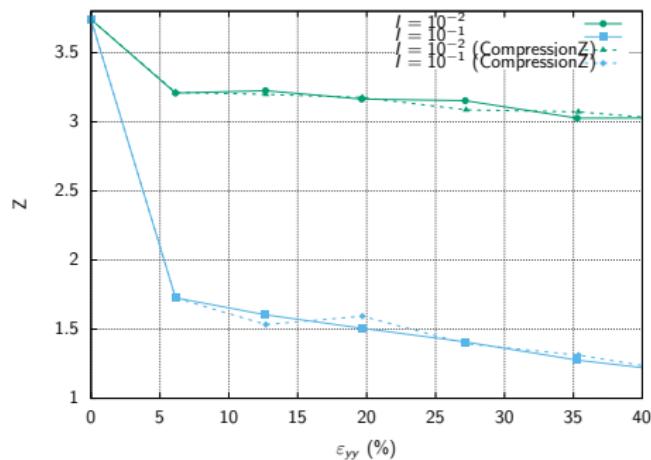


Figure 3 – Nombre de Coordination

échantillon aléatoire par compression dans l'axe Z

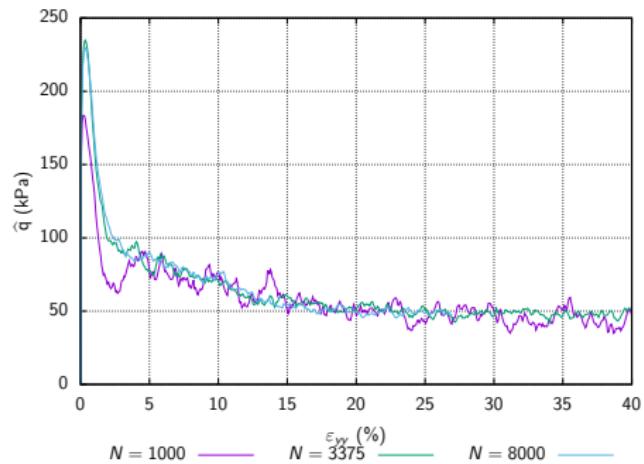


Figure 4 – Nombre de Particules

État Rankine

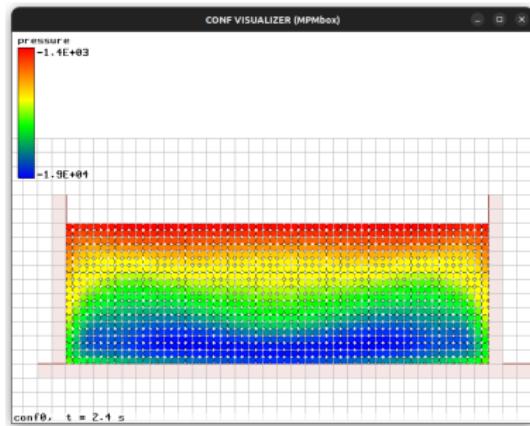


Figure 5 – Pression en bas

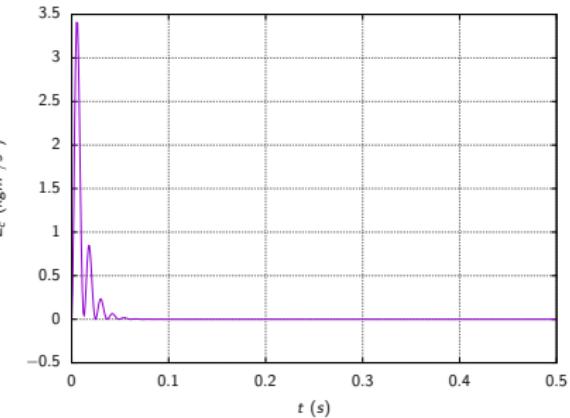


Figure 6 – Énergie cinétique

État Rankine

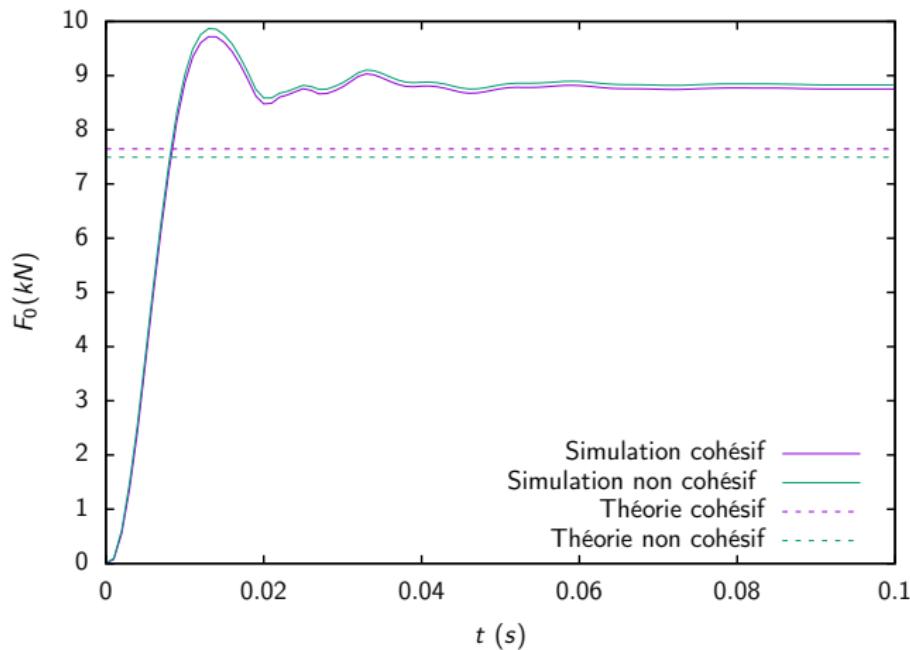


Figure 7 – Non cohésif

Paramètres principaux

Symbol	Paramètre	Valeur
L	Longueur	3 m
H	Hauteur	1 m
ρ	Densité	2700 kg/m ³
E	Module de Young	1×10^9 Pa
ν	Coefficient de Poisson	0.2
φ	Angle de frottement	25°
ψ	Angle de dilatance	≈ 0°
v	Vélocité de déplacement	0.005 m/s
c	Cohésion	0 & 100 Pa

Table 1 – Paramètres du modèle Mohr-Coulomb

État Rankine - Théorie

Coefficient K : la relation entre la contrainte verticale et horizontal :

- Poussée active : $K_a = \frac{1 - \sin(\varphi)}{1 + \sin(\varphi)} = 0.406$
- Poussée passive : $K_p = 1/K_a = 2.464$
- État au repos : $K_0 = 1 - \sin(\varphi) = 0.577$

La somme de pression $F(kN)$ appliquée sur le mur :

Sans cohésif :

$$F_a = \frac{1}{2} \gamma H^2 K_a = 5.376861$$

$$F_a = \frac{1}{2} \gamma H^2 K_p = 32.619458$$

$$F_0 = \frac{1}{2} \gamma H^2 K_0 = 7.647$$

Cohésif :

$$F_a = \frac{1}{2} \gamma H^2 K_a - 2cH\sqrt{K_a} = 5.249425$$

$$F_p = \frac{1}{2} \gamma H^2 K_p + 2cH\sqrt{K_p} = 32.93334$$

$$F_0 = \frac{1}{2} \gamma H^2 K_0 + 2cH\sqrt{K_0} = 7.495$$

État Rankine

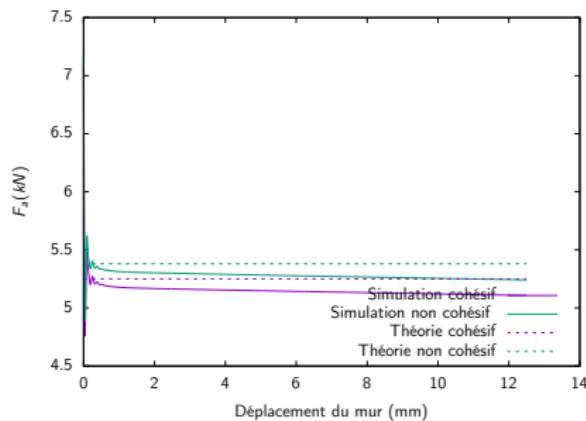


Figure 8 – Pression actif

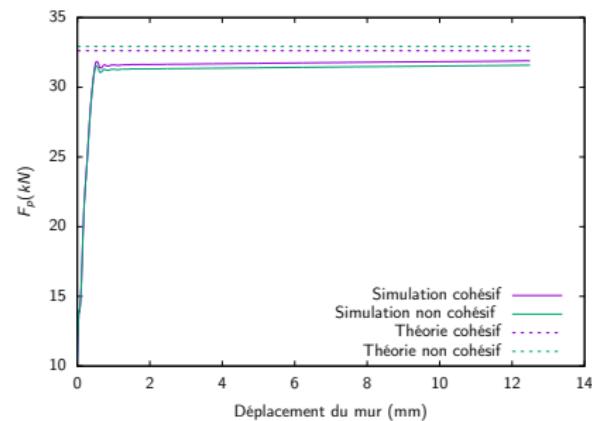


Figure 9 – Pression passif