

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

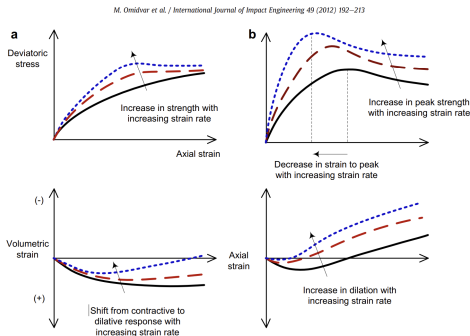


Fig. 19. Effect of increase in strain rate on stress-strain response and volumetric strains in (a) loose sand, (b) dense sand [interpreted based on data from Table 3].

"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

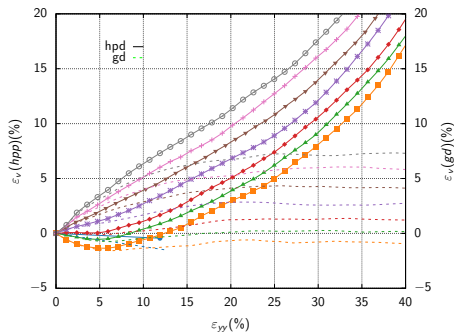


Figure 1 – Déformation Volumique

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

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

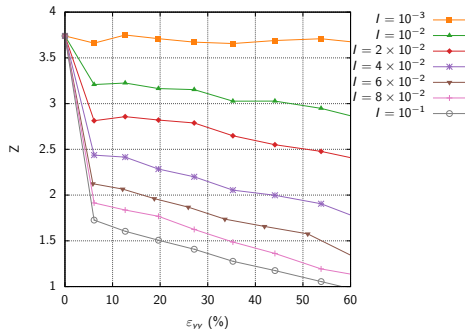


Figure 2 – Nombre de Coordination

$$Z = \frac{2N_{\text{contact}}}{N_{\text{particule}}}; I = \frac{v}{H_0} \sqrt{\frac{m}{Pa}}$$

Trouver le régime de l'état critique

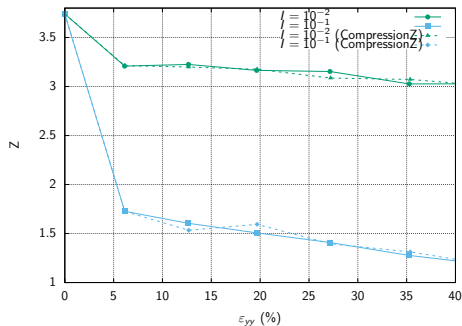


Figure 3 – Nombre de Coordination

échantillon aléatoire par compression
dans l'axe Z

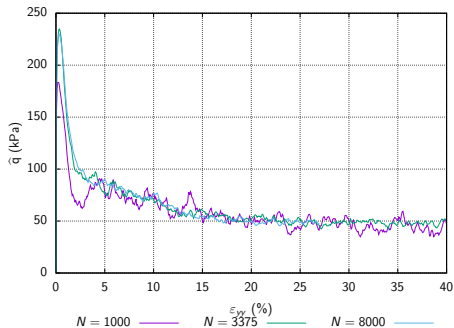


Figure 4 – Nombre de Particules

État Rankine

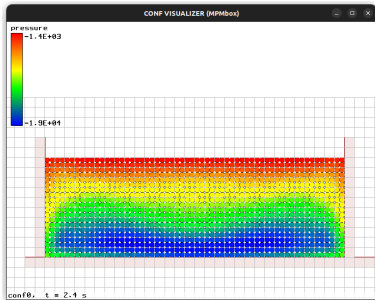


Figure 5 – Pression en bas

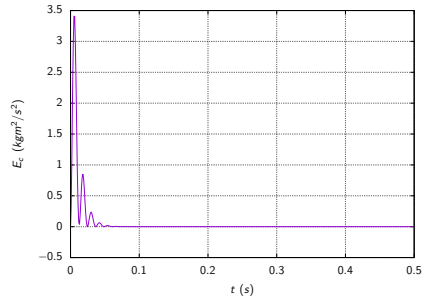


Figure 6 – Énergie cinétique

État Rankine

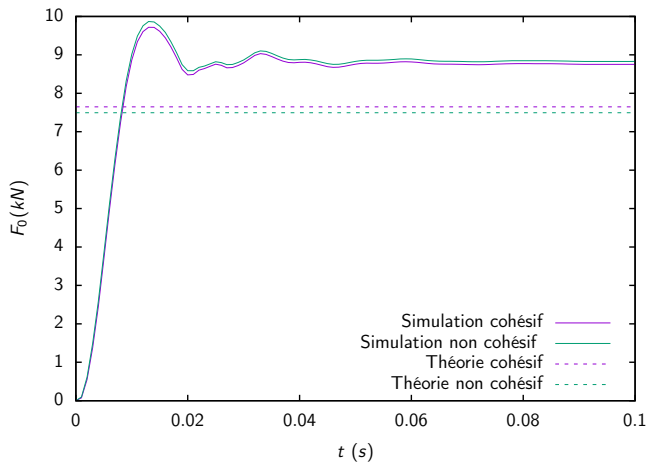


Figure 7 – Non cohésif

Paramètres principaux

Symbole	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	$\approx 0^\circ$
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 horizontale :

- 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) appliqué sur le mur :

Sans cohésif :

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

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

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

Cohésif :

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

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

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

État Rankine - Pression Active

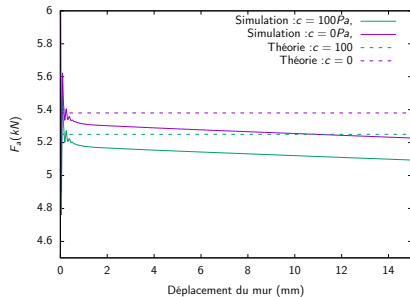


Figure 8 – Pression active
 $v = 0.005 = \text{const}$

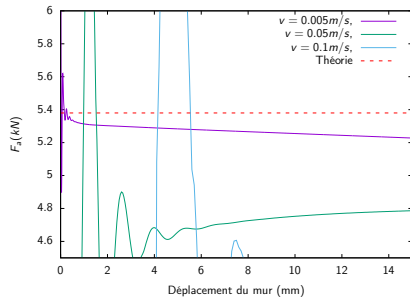


Figure 9 – Pression active $c = 0 = \text{const}$

État Rankine - Pression Passive

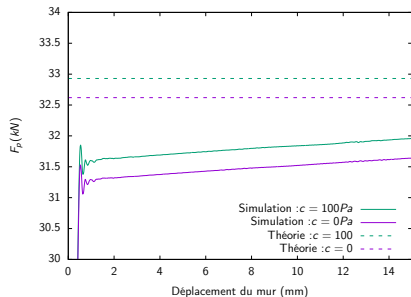


Figure 10 – Pression passive
 $v = -0.005 = \text{const}$

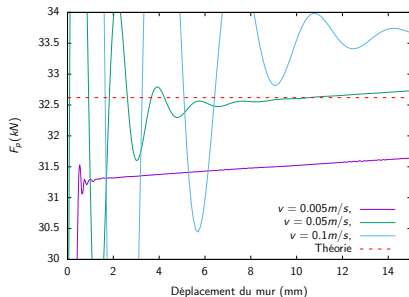


Figure 11 – Pression passive
 $c = 0 = \text{const}$