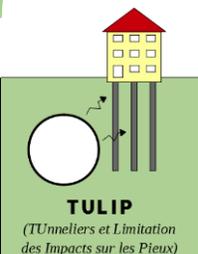


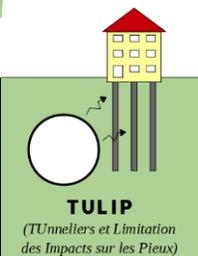
Modélisation numérique tridimensionnelle complète

Daniel DIAS
Eric ANTOINET

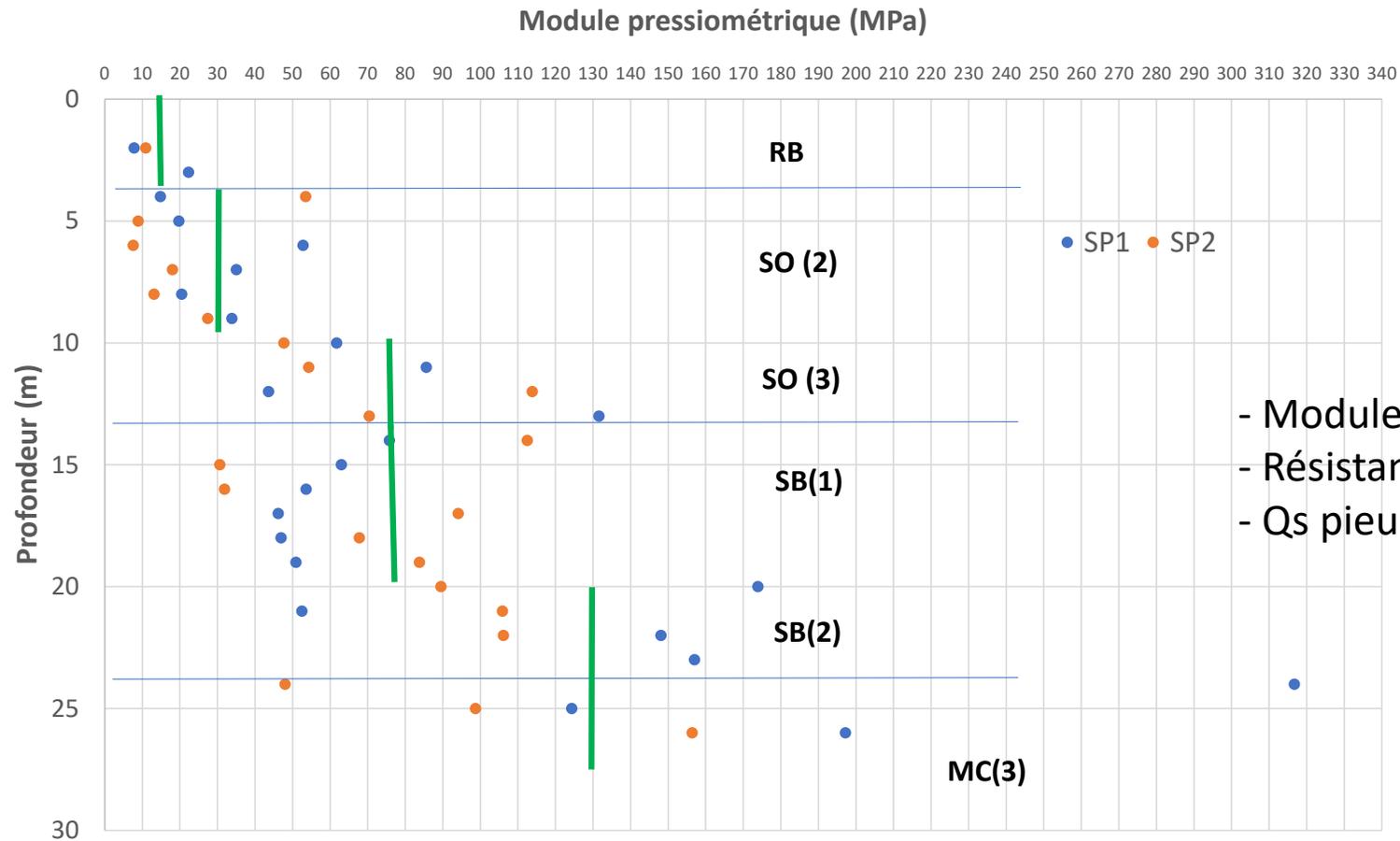


SOMMAIRE

- ❖ Modèle géotechnique
- ❖ Modèle numérique
- ❖ Résultats
- ❖ Etude paramétrique



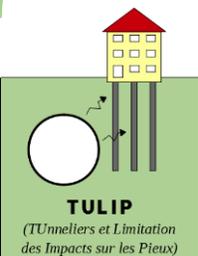
Modèle géotechnique



- Modules issus des essais pressiométriques
- Résistance au cisaillement de l'expérience L16
- Q_s pieu proches des valeurs du fascicule 62

Remarques

- $PI < 5$ MPa
- Pas d'essais cycliques



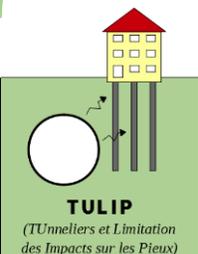
Modèle de comportement

Pieu = Elastique linéaire

Remblai = Elastique linéaire parfaitement plastique (MC)

Autres horizons = Plastic hardening

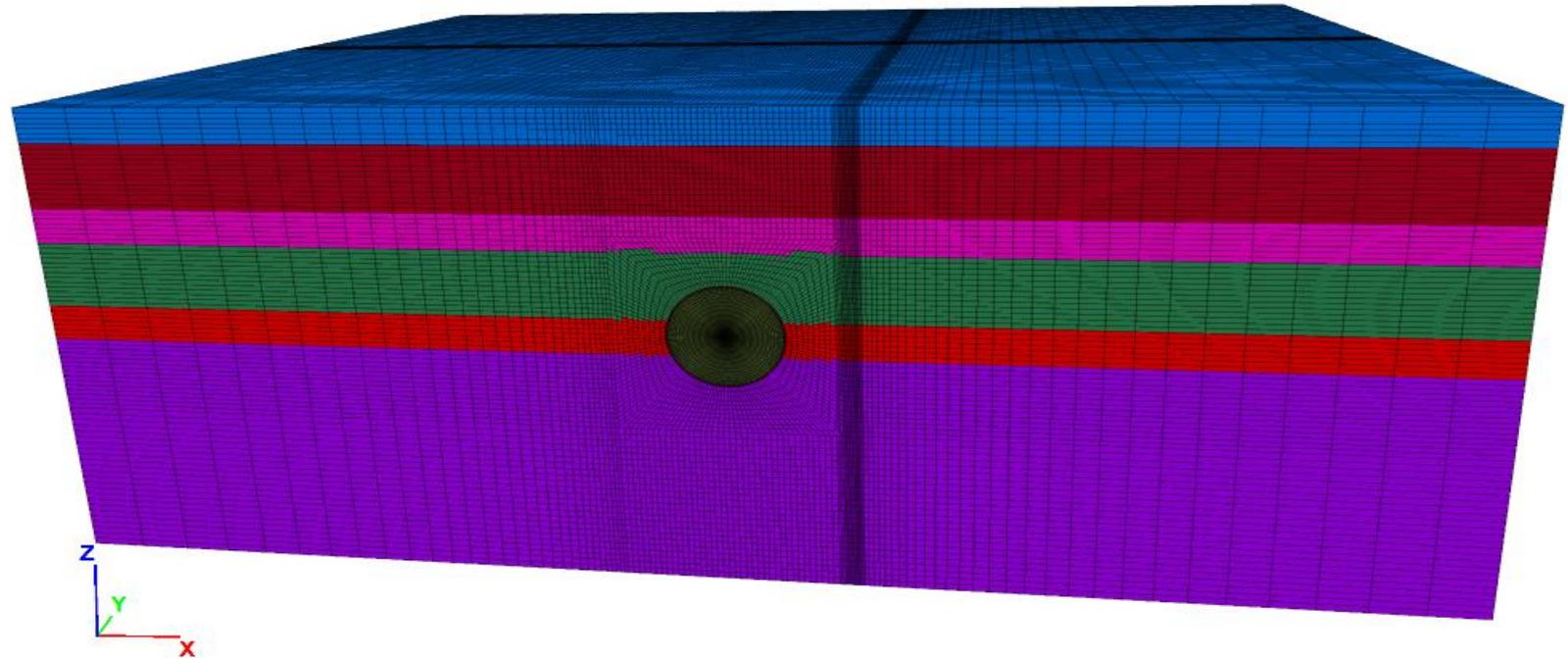
	Remblais (R)	Calcaires Saint-Ouen SO(2)	Calcaires Saint-Ouen SO(3)	Sables de Beauchamp SB(1)	Sables de Beauchamp SB(2)	Marnes et Caillasses MC(3)
Constitutive model	MC	PH	PH	PH	PH	PH
Layer head depth (m)	0	3,3	10	13,3	20	23,5
γ (kN/m ³)	19	18	18	21	21	20
EM (MPa)	15	30	75	75	130	130
E ou E50 (MPa)	30	135	337,5	225	390	585
Eur (MPa)		338	844	563	975	1463
Nu	0,30	0,30	0,30	0,37	0,37	0,30
C' (kPa)	0	20	20	10	10	25
Phi (°)	28	33	33	33	33	35
Psi (°)	0	3	3	3	3	5
qs (kPa)	35	100	120	80	80	260
K0	0,53	0,46	0,46	0,46	0,46	0,43



Modèle numérique

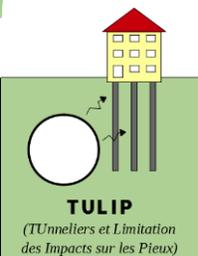
Zone Group

- Default=CSO2
- Default=CSO3
- Default=MC3
- Default=PILE
- Default=SB1
- Default=SB2
- Default=grout1
- Default=remblais
- Default=tunnel1



120m - Longueur,
100m - Profondeur,
46.5m - Hauteur

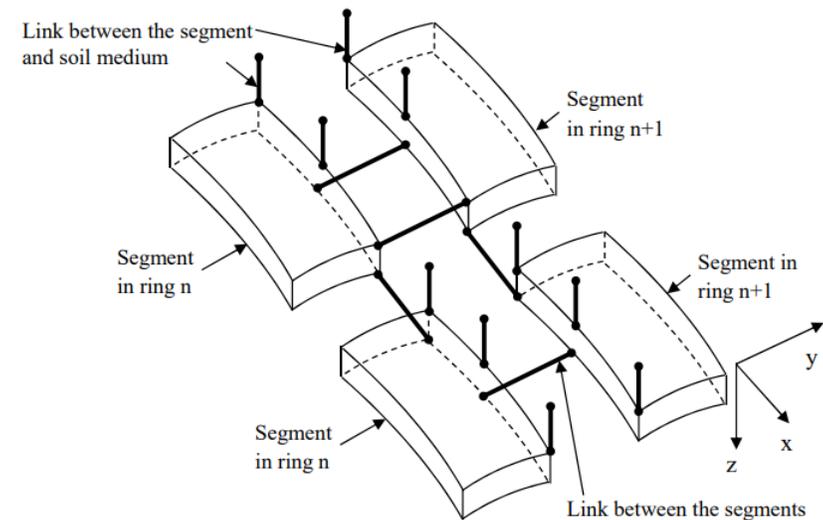
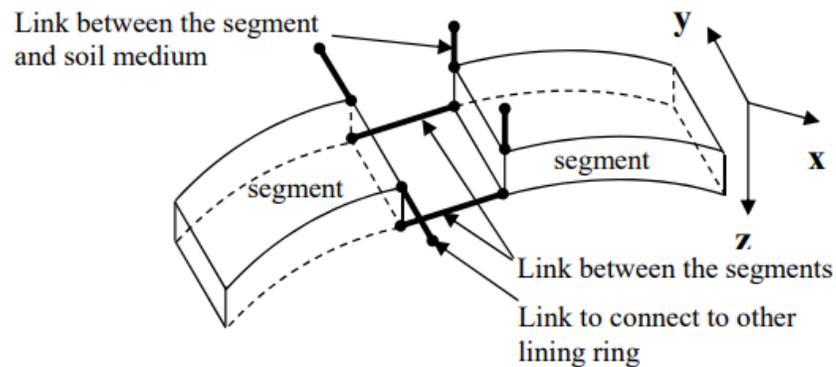
FLAC3D, Conditions drainées, 1 700 000 zones



Creusement au tunnelier (creusement par phases)

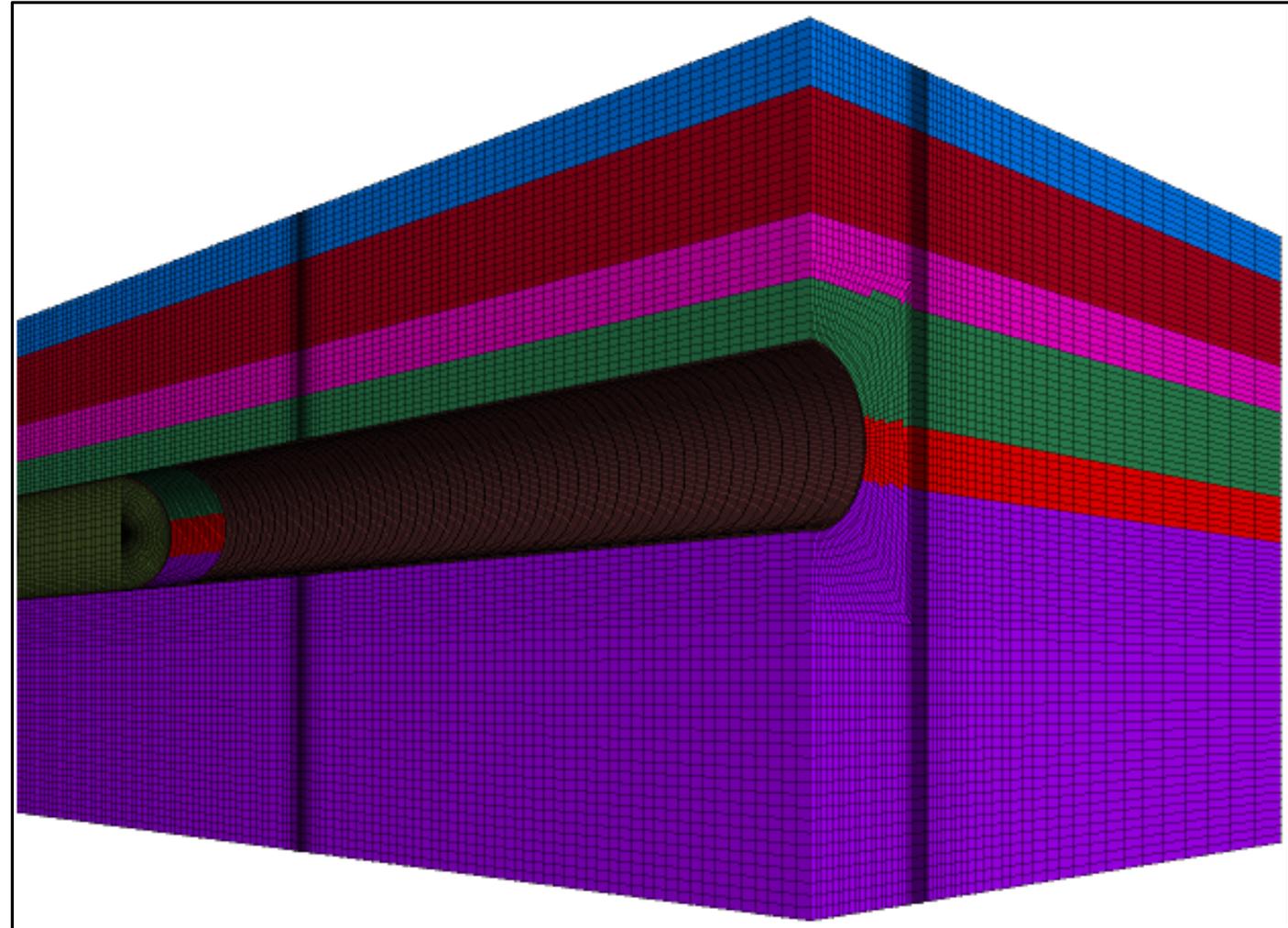
Pris en compte de :

- La pression au front de taille,
- La pression d'injection à l'arrière du bouclier,
- la longueur et le poids du bouclier,
- la différence de diamètre du bouclier entre l'avant et l'arrière
- Joints entre les voussoirs

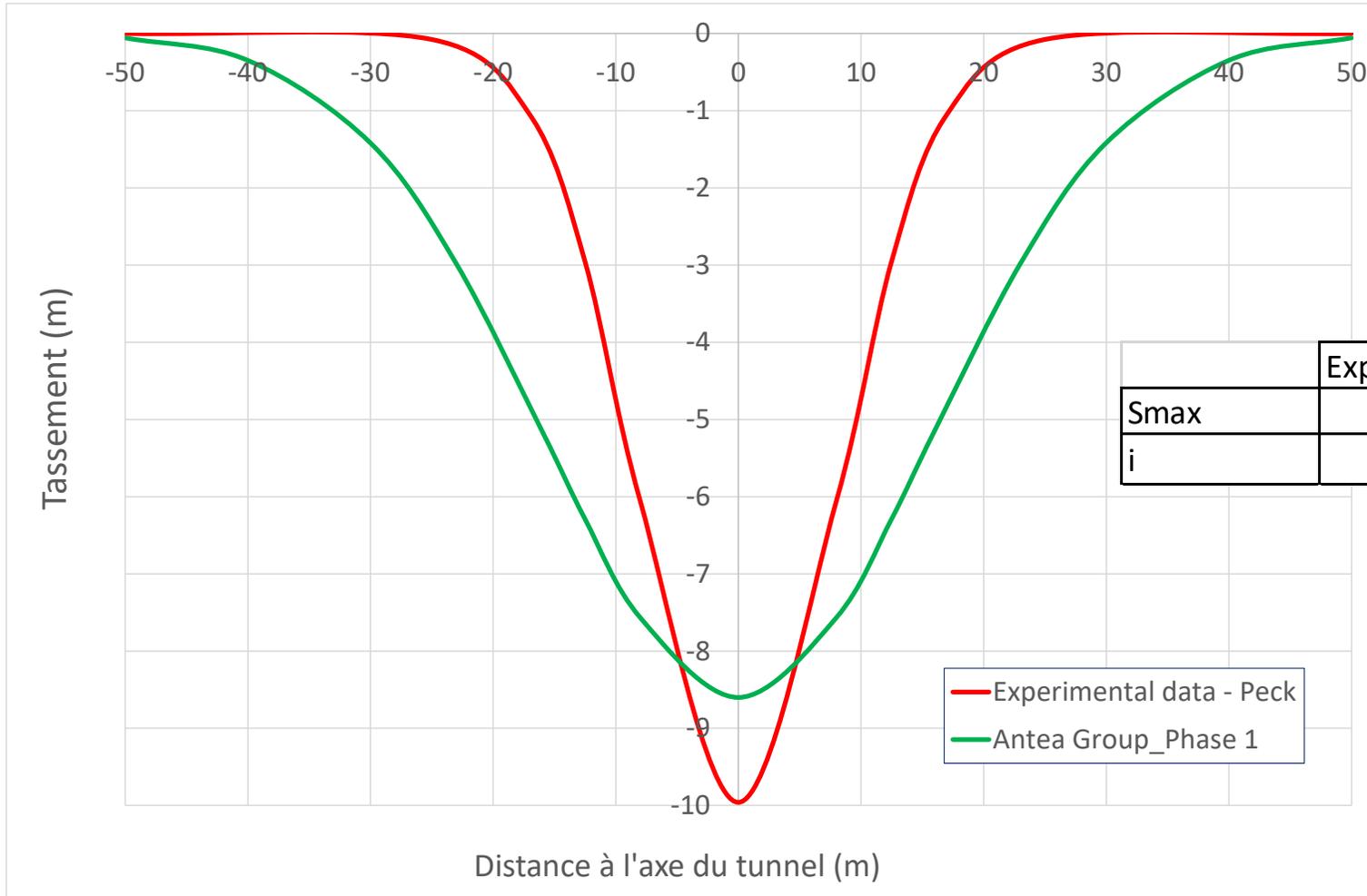


Creusement au tunnelier (creusement par phases)

Zone Group	
	Default=CS02
	Default=CS03
	Default=MC3
	Default=PILE
	Default=SB1
	Default=SB2
	Default=grout1
	Default=remblais
	Default=tunnel1



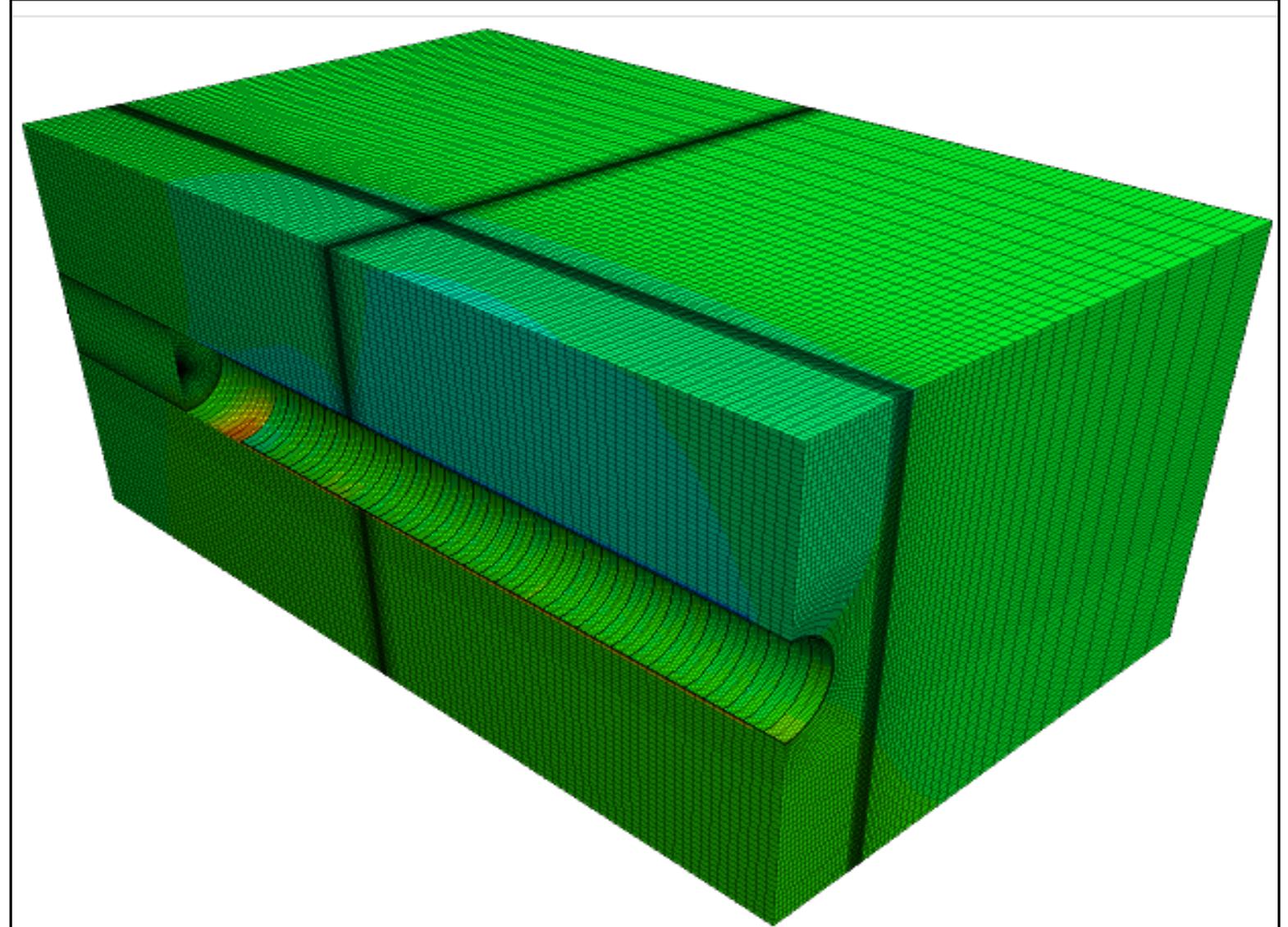
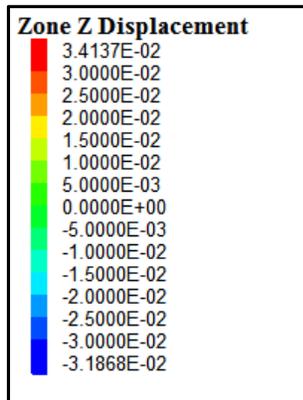
Résultats / Phase 1



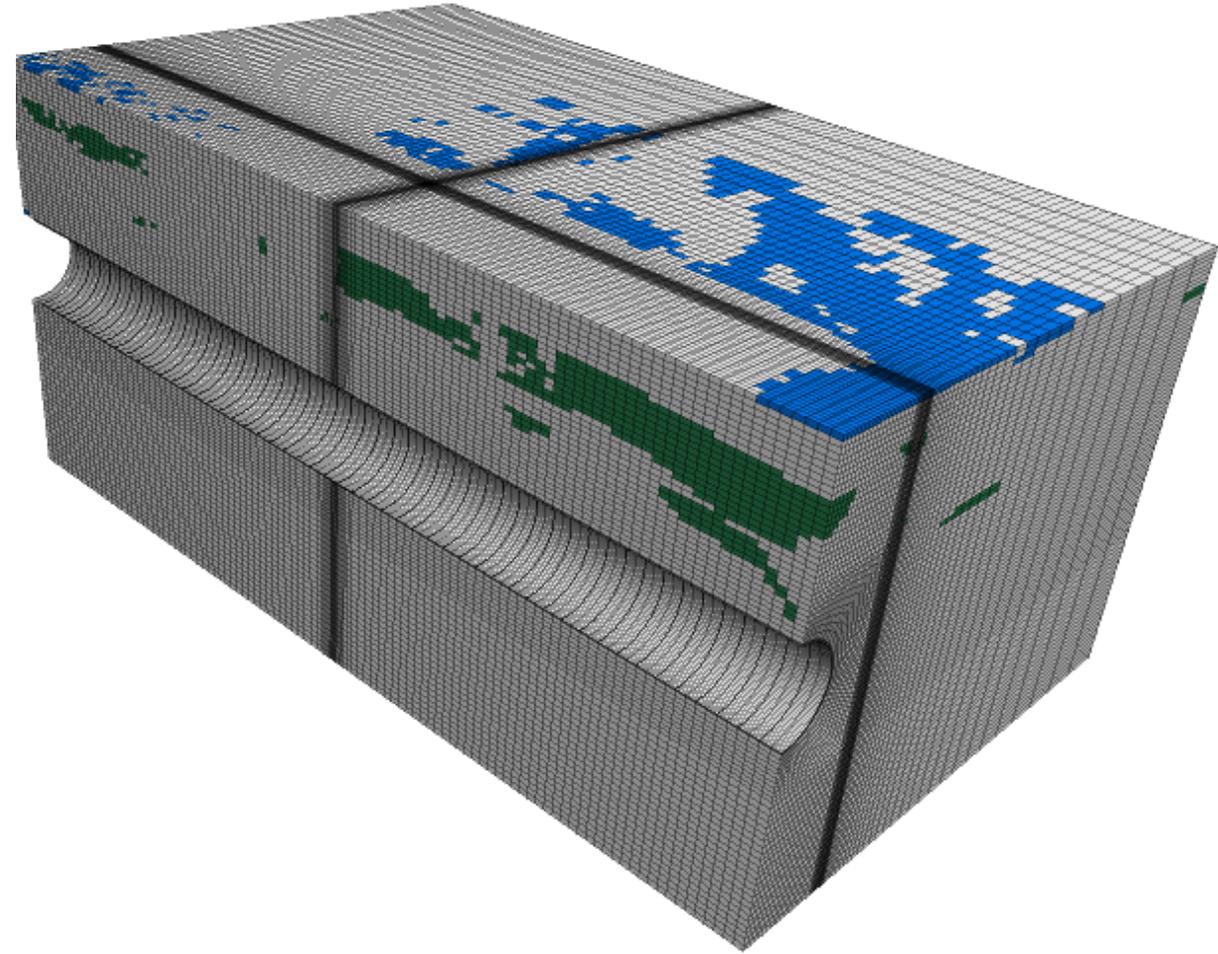
	Expérimental	Antea Group_Phase 1	Différence
Smax	9,96	8,6	-15,81%
i	8,02	15,8	49,26%

— Experimental data - Peck
— Antea Group_Phase 1

Résultats / Phase 1



Résultats / Phase 1



Zone State By Average

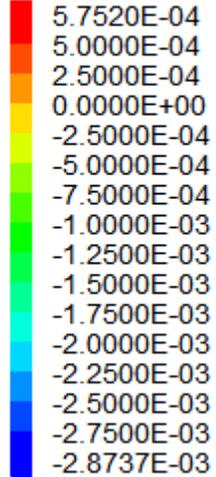
None
shear-n shear-p
shear-n shear-p volume-p
shear-n tension-n shear-p tension-p volume-p
shear-p
shear-p tension-p
shear-p tension-p volume-p
shear-p volume-p
tension-p volume-p
volume-n volume-p
volume-p

Résultats / Phase 1

Zone X Displacement

Scale (100,100,100)

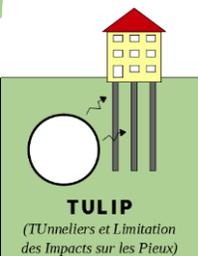
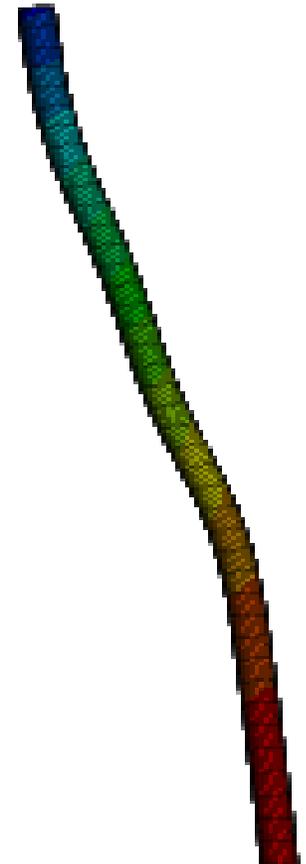
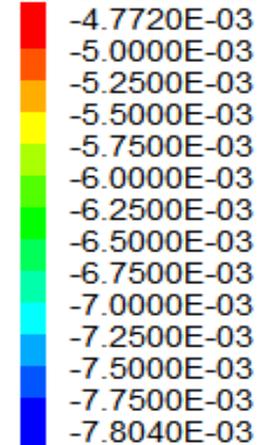
Deformed Factor: 1000



Zone Z Displacement

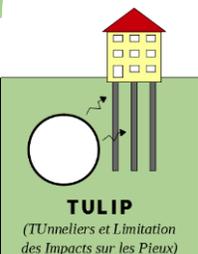
Scale (100,100,100)

Deformed Factor: 1000

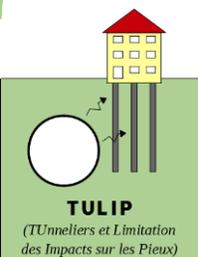
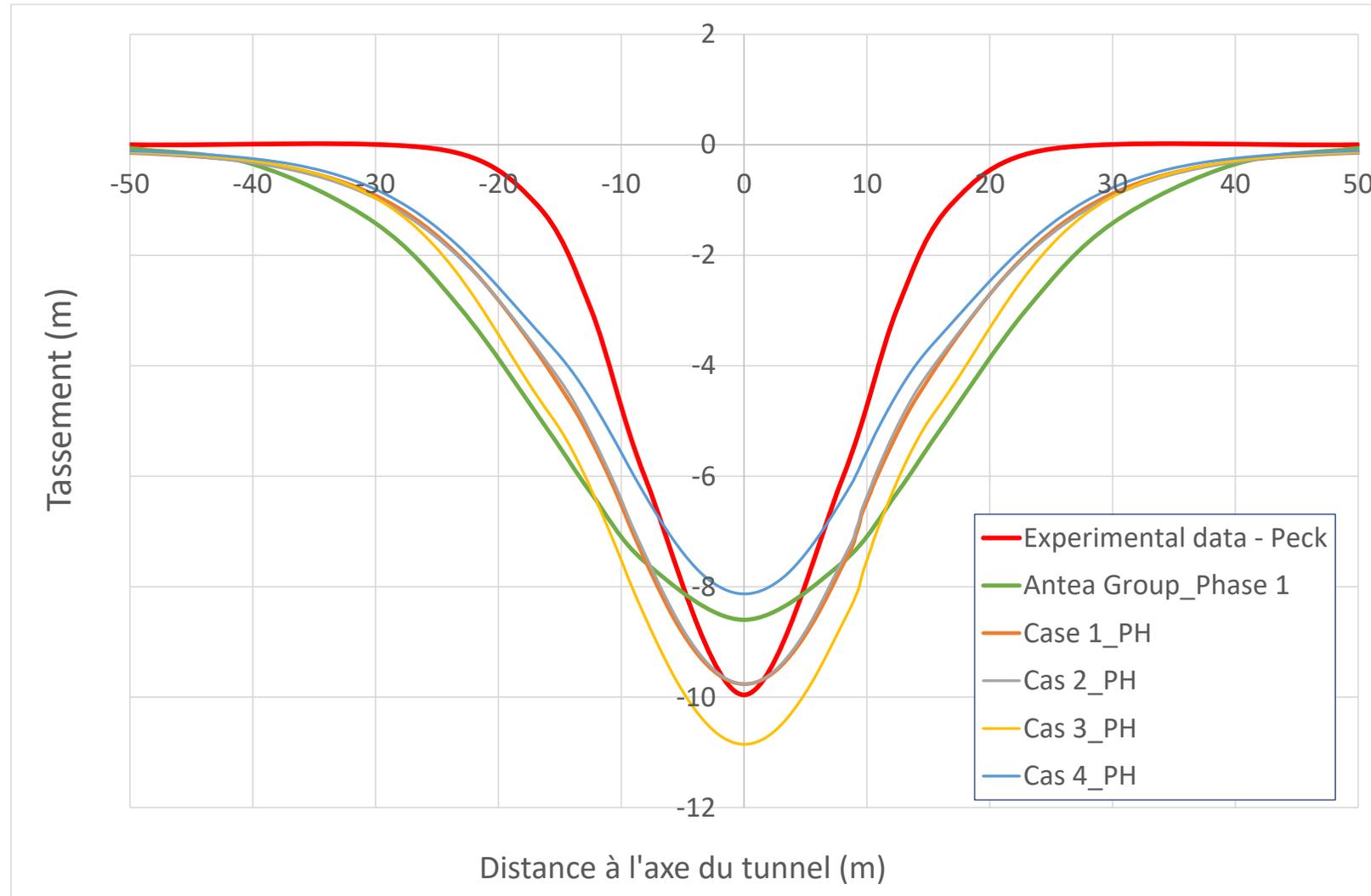


Etude paramétrique

Cas de calcul	Conicité du bouclier (cm)	E50 Horizons 2-5	K0 Horizons
Phase 1	3,5	100%	100%
Cas 1_PH	3,5	120%	120%
Cas 2_PH	3,5	100%	140%
Cas 3_PH	2,5	80%	100%
Cas 4_PH	2	110%	100%
Cas 1_PHSS	3,5	120%	120%

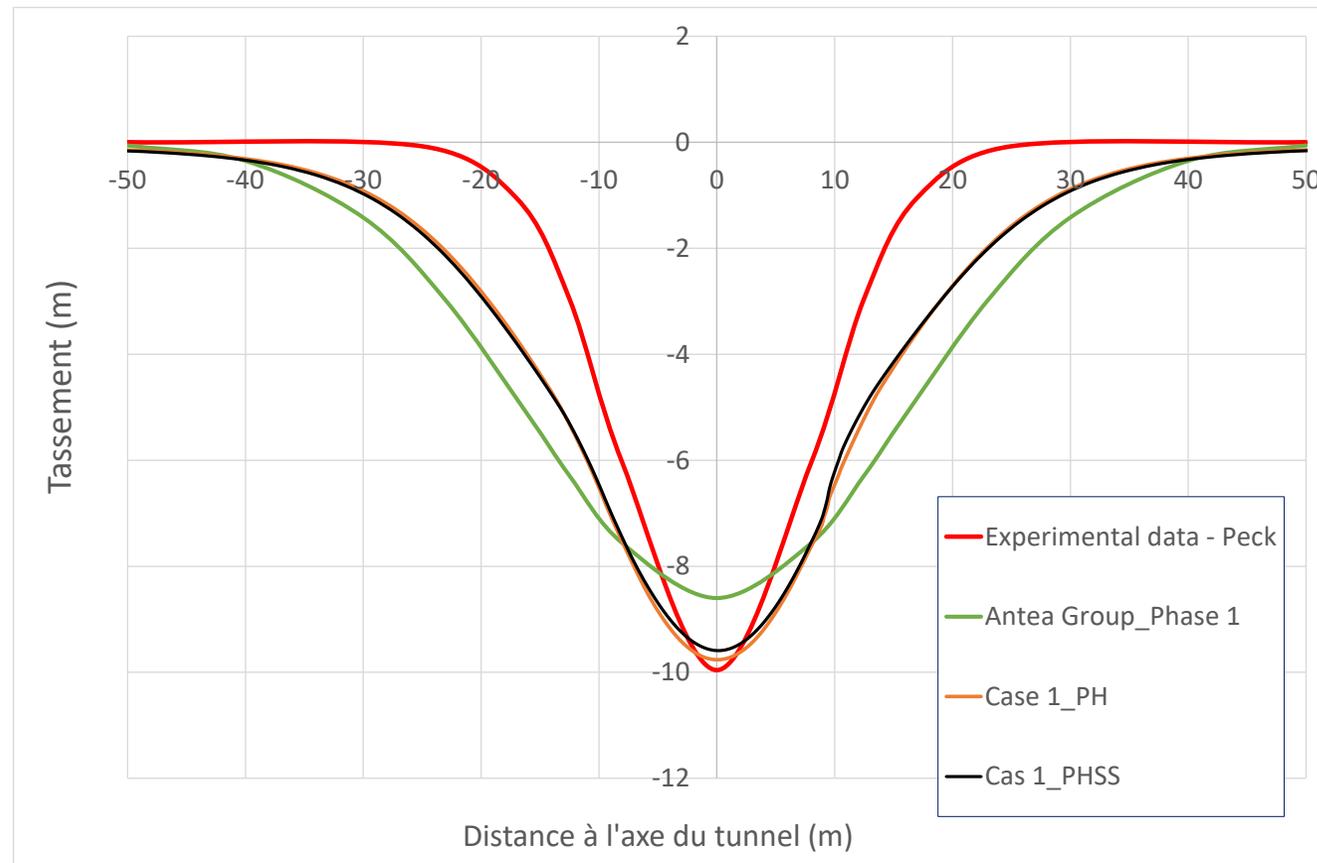


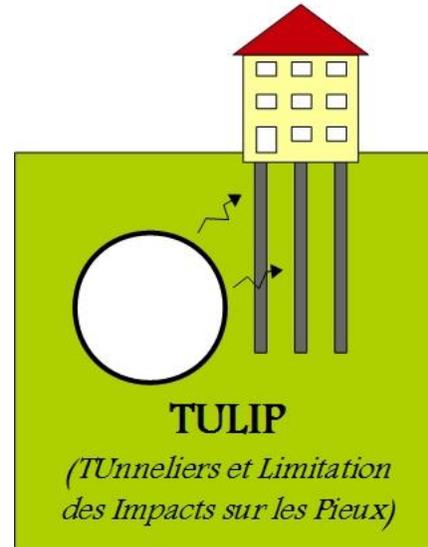
Etude paramétrique



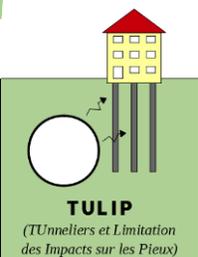
Influence du modèle de comportement

	Remblais (R)	Calcaires Saint-Ouen SO(2)	Calcaires Saint-Ouen SO(3)	Sables de Beauchamp SB(1)	Sables de Beauchamp SB(2)	Marnes et Caillasses MC(3)
E (MPa)	30	135	337,5	225	390	585
stiffness-0-reference (Mpa)	175	540	900	725	1000	1500
strain-70	9,50E-05	9,00E-05	9,00E-05	1,10E-04	1,10E-04	1,30E-04





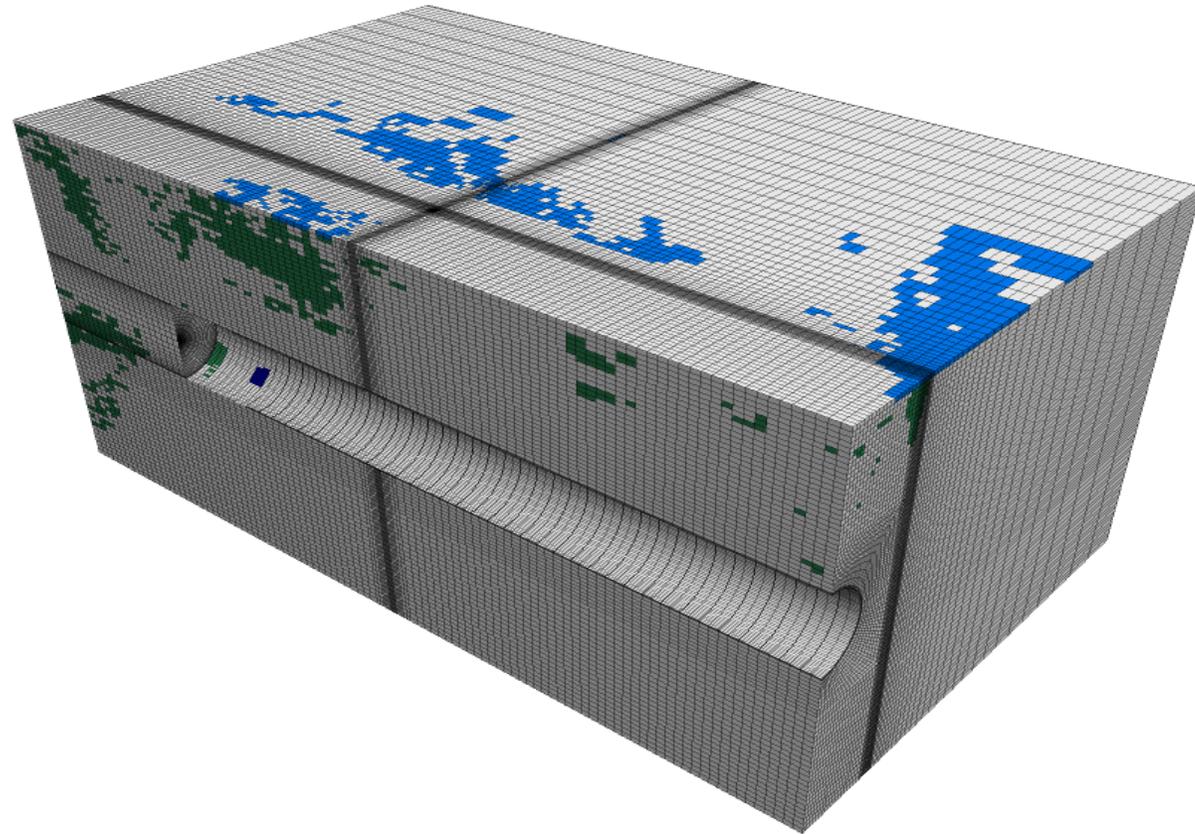
**Merci de votre
attention**



Résultats / Cas 1

Zone State By Average

None
shear-n shear-p
shear-n shear-p tension-p
shear-n shear-p tension-p volume-p
shear-n shear-p volume-p
shear-p
shear-p tension-p
shear-p tension-p volume-n volume-p
shear-p tension-p volume-p
shear-p volume-n volume-p
shear-p volume-p
tension-n shear-p tension-p volume-p
tension-p volume-p
volume-n volume-p
volume-p

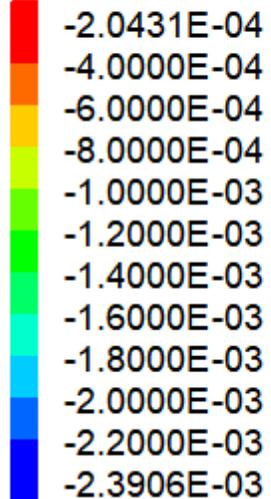


Résultats / Cas 1

Zone X Displacement

Scale (100,100,100)

Deformed Factor: 1000



Zone Z Displacement

Scale (100,100,100)

Deformed Factor: 1000

