

WTNP110 - Orthotropic flow saturated 2D

Summary:

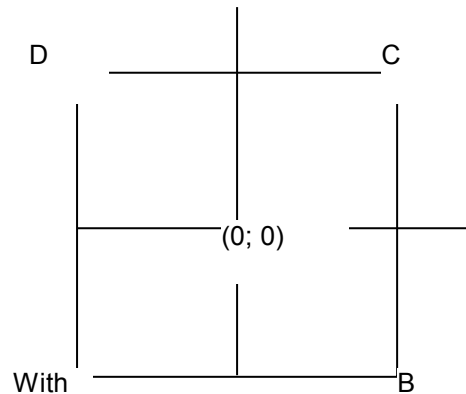
The test presented here makes it possible to check the good performance of the operators used for the resolution of the equations of a flow in orthotropic saturated medium. This test corresponds to test 1.2 of the plan of qualification of the project ALLIANCES [bib1].

The estimators of error are also validated *a posteriori* in residue developed for THM.

The reference solution is an analytical solution.

1 Problem of reference

1.1 Geometry



Coordinates of the points (m) :

<i>A</i>	-0.1	-0.1	<i>C</i>	0.1	0.1
<i>B</i>	0.1	-0.1	<i>D</i>	-0.1	0.1

1.2 Properties of material

One gives here only the properties whose solution depends, knowing that the command file contains other data of material (moduli of elasticity,...) who finally do not play any part in the solution of with the dealt problem.

Liquid water	Density ($kg.m^{-3}$)	1
	Viscosity	1
Homogenized parameters	Intrinsic permeability (component in X)	1
	Intrinsic permeability (component in Y)	3/4
	Intrinsic permeability (component in Z)	1
Initial state	Porosity	1
	Pressure of liquid	0

1.3 Boundary conditions and loadings

- On AB $P = P(X) = -45X + 30.5$
 On BC $P = P(X) = -80Y + 18$
 On CD $P = P(X) = -45X + 14.5$
 On DA $P = P(X) = -80Y + 27$

2 Reference solution

2.1 Method of calculating

The analytical solution in pressure is a polynomial of degree in x and y , speed is constant and horizontal:

$$P(x, y) = -45x - 80y + 22.3$$
$$V(x, y) = (45 K_x; 80 K_y) = (45; 60)$$

2.2 Sizes and results of reference

One gives the value of the pressure and speed in 3 points:

x	-0.05	0.00	+0.05
y	-0.05	0.00	0.05
P	28.8	22.5	16.3
V_x	45	45	45
V_y	60	60	60

2.3 Bibliographical references

[1] Project Alliances plan of qualification, note ANDRA CNT-ASCS 02-075B

3 Modeling A

3.1 Characteristics of modeling A

Modeling in plane deformations. 20×20 elements $Q8$

3.2 Sizes tested and results

Node	Type of value	Moment (s)	Reference (analytical)	Aster	Difference (%)
<i>N441</i> (0.05 ; 0.05)	<i>PREI</i>	1	16.3	16.25	0,3%
<i>N241</i> (-0.05 ; -0.05)	<i>PREI</i>	1	28.8	28.5	0.96%
<i>N341</i> (0 ; 0)	<i>PREI</i>	1	22.5	22.5	0. %

One also validates the estimators of error in time and space by tests of not-regression.

Type of value	Moment (s)	Aster	Difference (%)
ERRE_TPS_GLOB	1	1,5E-8	0%

Node	Type of value	Component	Moment (s)	Aster	Difference (%)
<i>N313</i> (-0.09 ; -0.01)	ERME_NOEU	ERHMHY_G	1	1,9E-12	0. %

4 Summary of the results

Very good agreement with the reference solution.