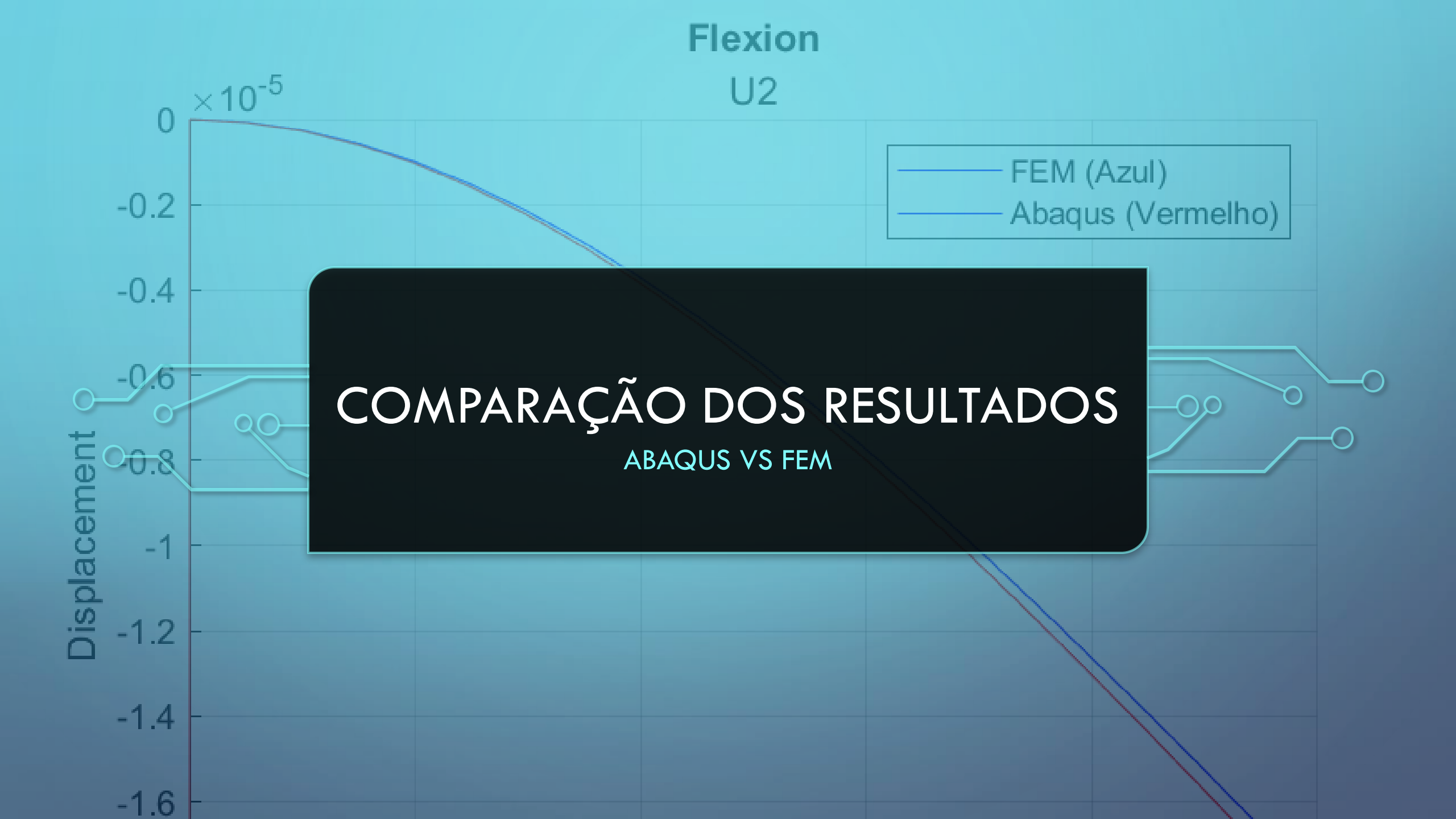
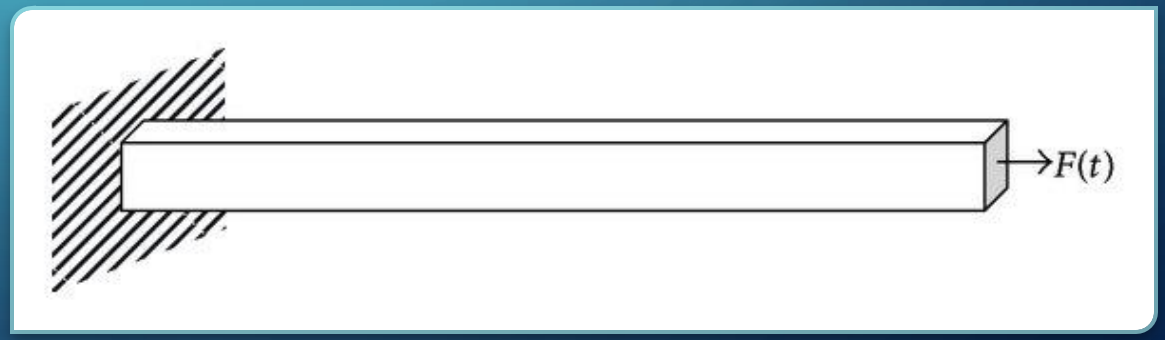


COMPARAÇÃO DOS RESULTADOS

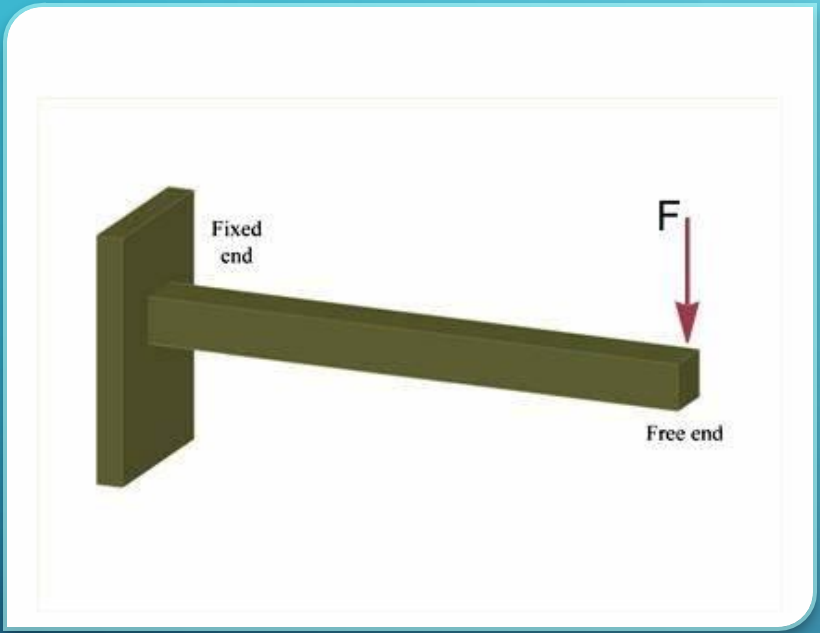
ABAQUS VS FEM

DEFINIÇÃO DO PROBLEMA - TRAÇÃO

- Comprimento: 10 m
- Largura: 1 m
- Altura: 1 m
- Malha:
  - Comprimento: 20 el
  - Largura: 4 el
  - Altura: 4 el
- Carga 1000 N destribuida igualmente em cada nó da face em que a força é exercida (cada um dos 25 nós recebe 40 N).



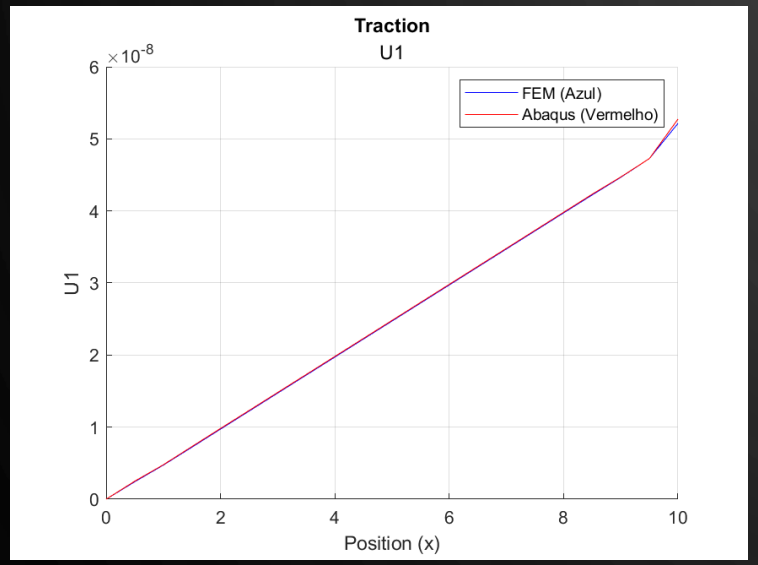
DEFINIÇÃO DO PROBLEMA - FLEXÃO

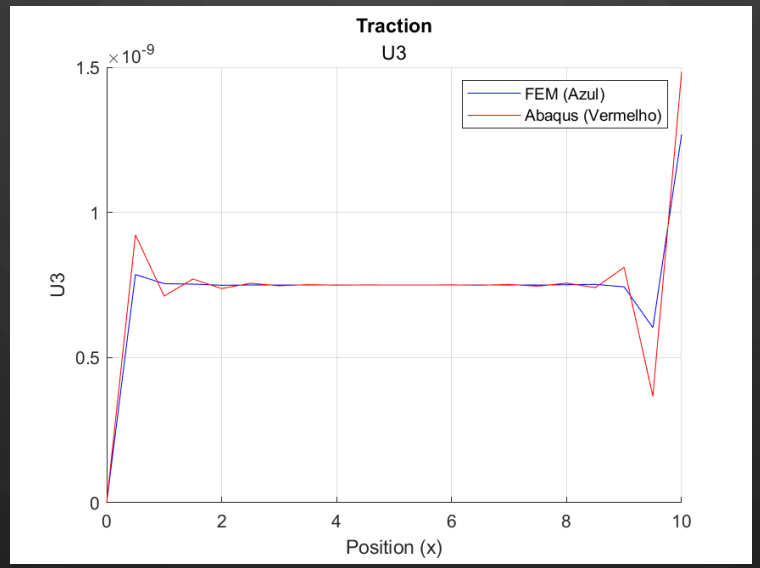


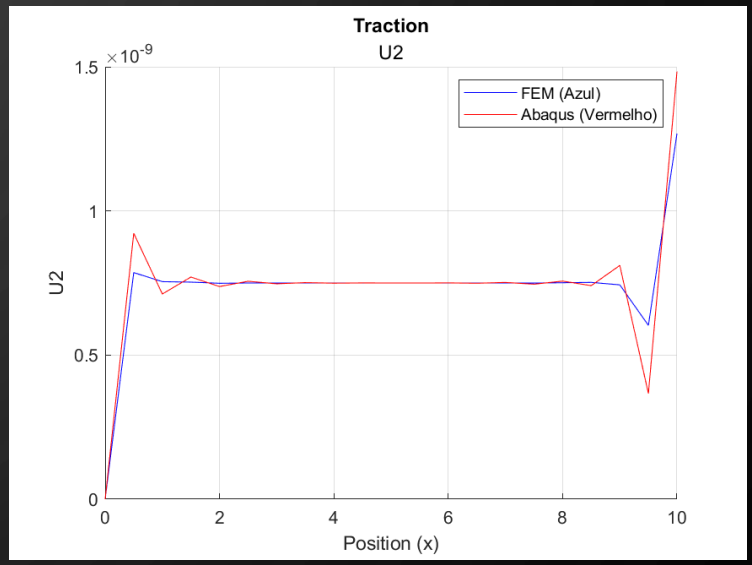
- Comprimento: 10 m
- Largura: 1 m
- Altura: 1 m
- Malha:
  - Comprimento: 20 el
  - Largura: 4 el
  - Altura: 4 el
- Carga: 1000 N destribuida igualmente em cada nó da face em que a força é exercida (cada um dos 25 nós recebe 40 N).

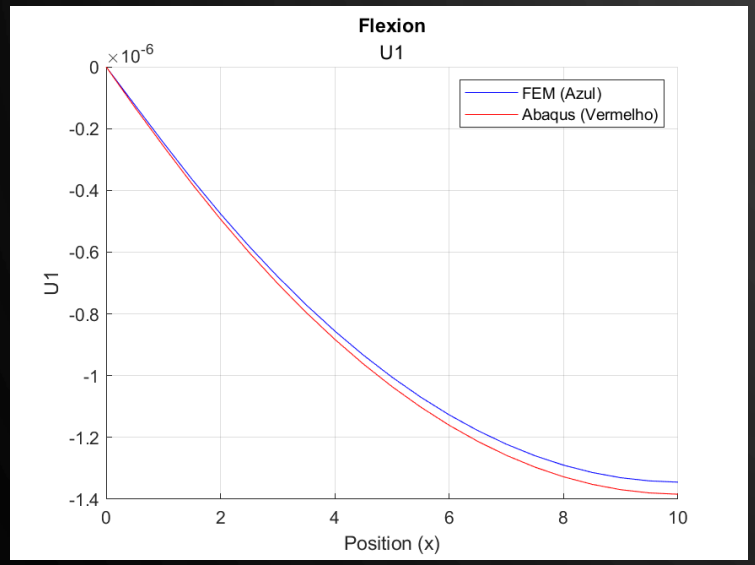
RESULTADOS

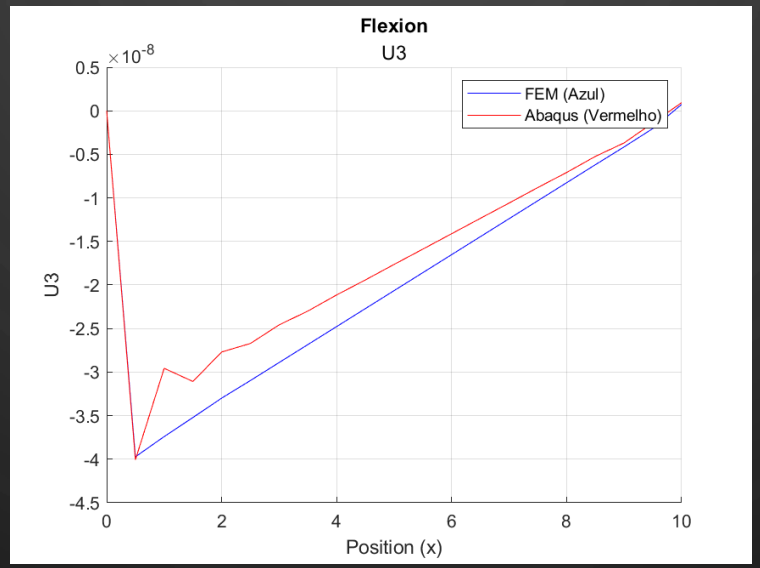
DESLOCAMENTO

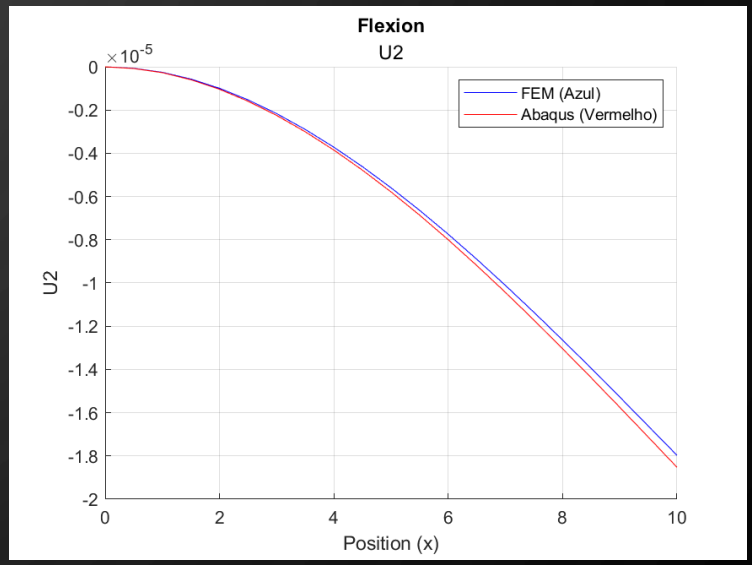

Traction
U1
×10^-8
6
5
4
3
2
1
0
U1
0
2
4
6
8
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)


Traction
U3
×10^-9
1.5
1
0.5
0
U3
0
2
4
6
8
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)


Traction
U2
×10^-9
1.5
1
0.5
0
U2
0
2
4
6
8
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)

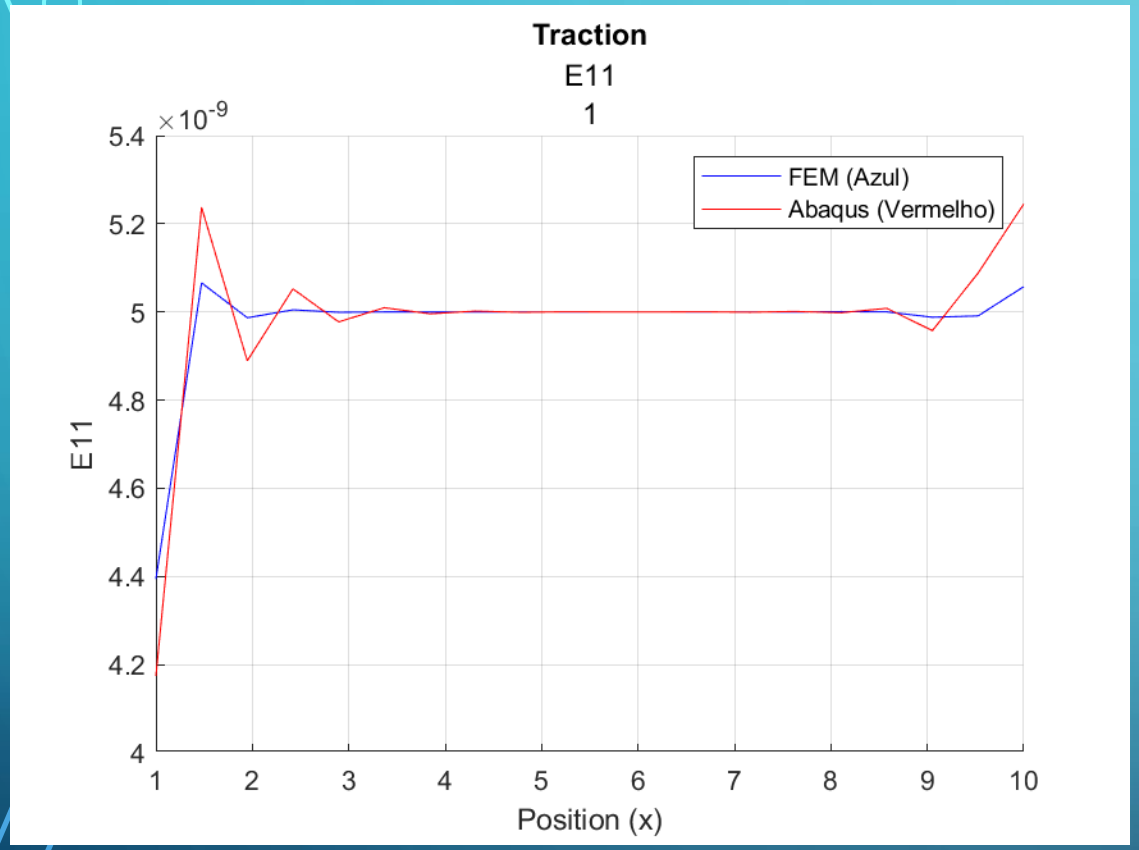

Flexion
U1
×10^-6
FEM (Azul)
Abaqus (Vermelho)
U1
Position (x)

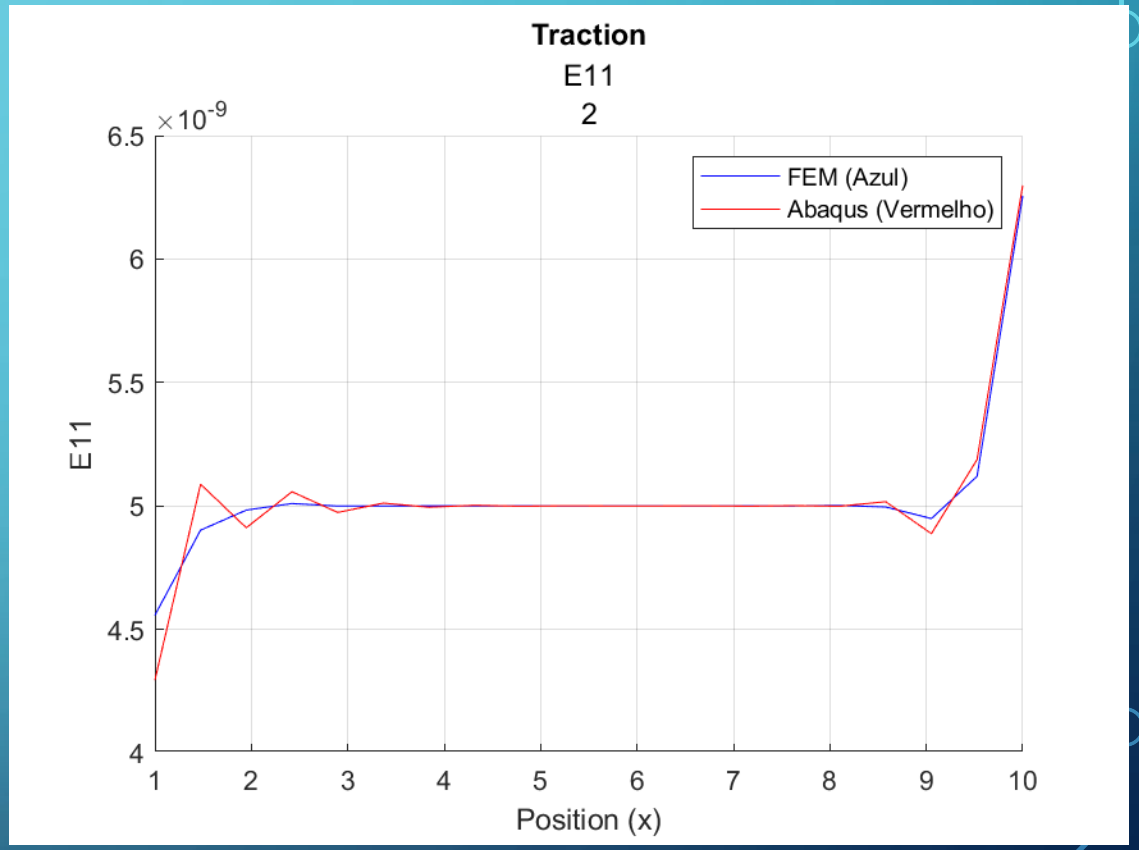

Flexion
U3
×10^-8
FEM (Azul)
Abaqus (Vermelho)
U3
Position (x)

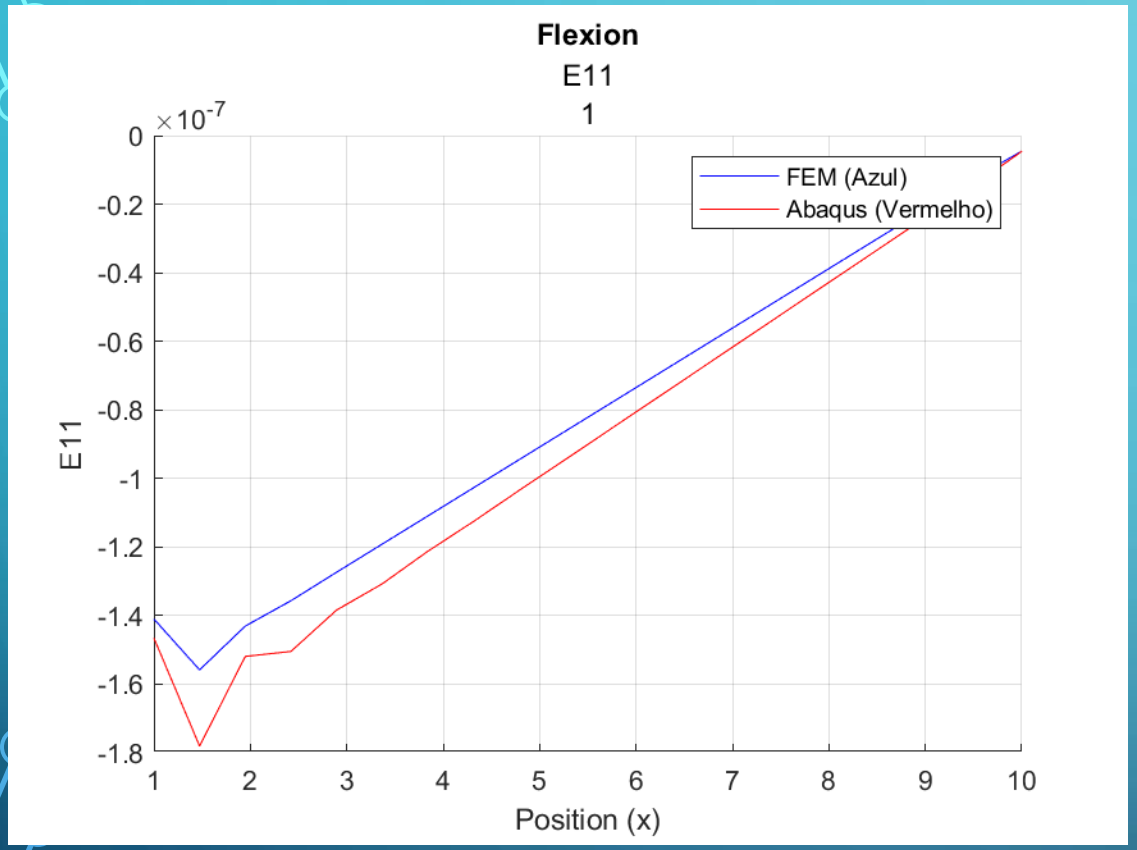

Flexion
U2
×10^-5
FEM (Azul)
Abaqus (Vermelho)
U2
Position (x)

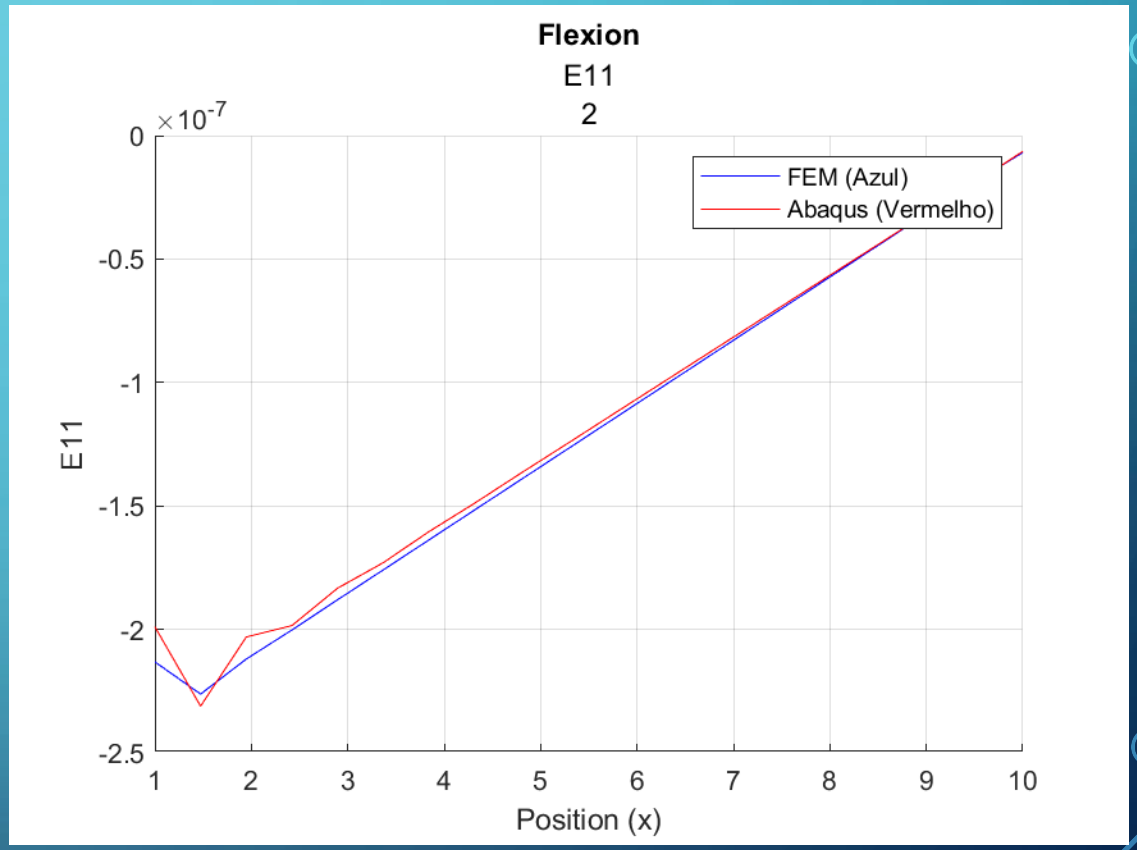
RESULTADOS

DEFORMAÇÃO


Traction
E11
1
×10^-9
5.4
5.2
5
4.8
4.6
4.4
4.2
4
E11
1
2
3
4
5
6
7
8
9
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)


Traction
E11
2
×10^-9
6.5
6
5.5
5
4.5
4
E11
1
2
3
4
5
6
7
8
9
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)

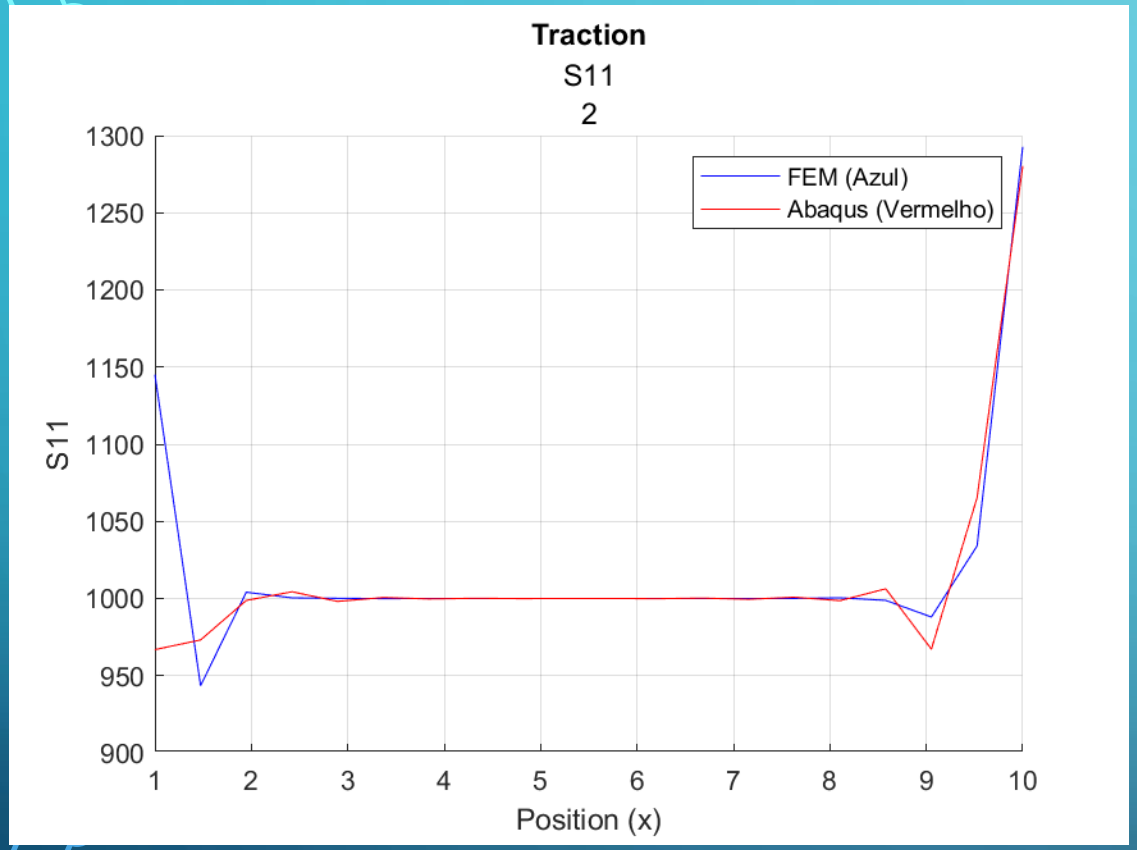

Flexion
E11
1
×10^-7
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
E11
1
2
3
4
5
6
7
8
9
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)

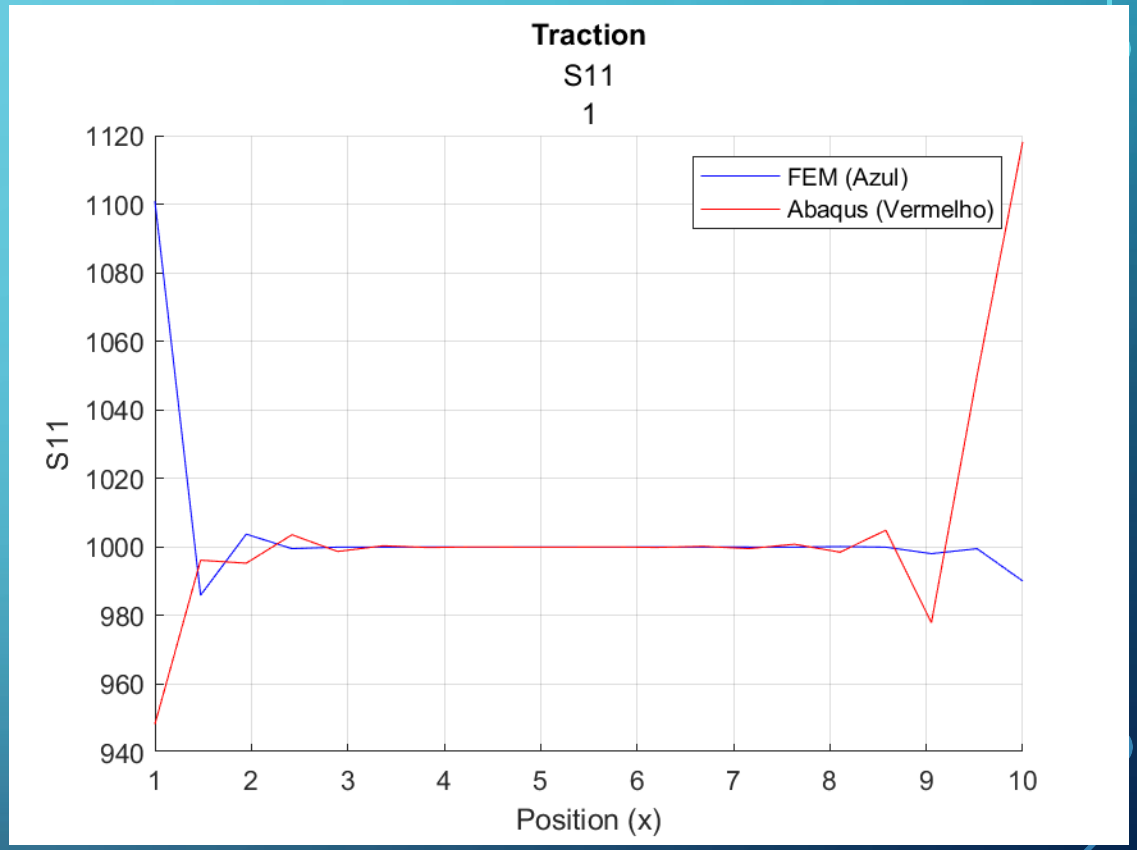

Flexion
E11
2
×10^-7
0
-0.5
-1
-1.5
-2
-2.5
E11
1
2
3
4
5
6
7
8
9
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)

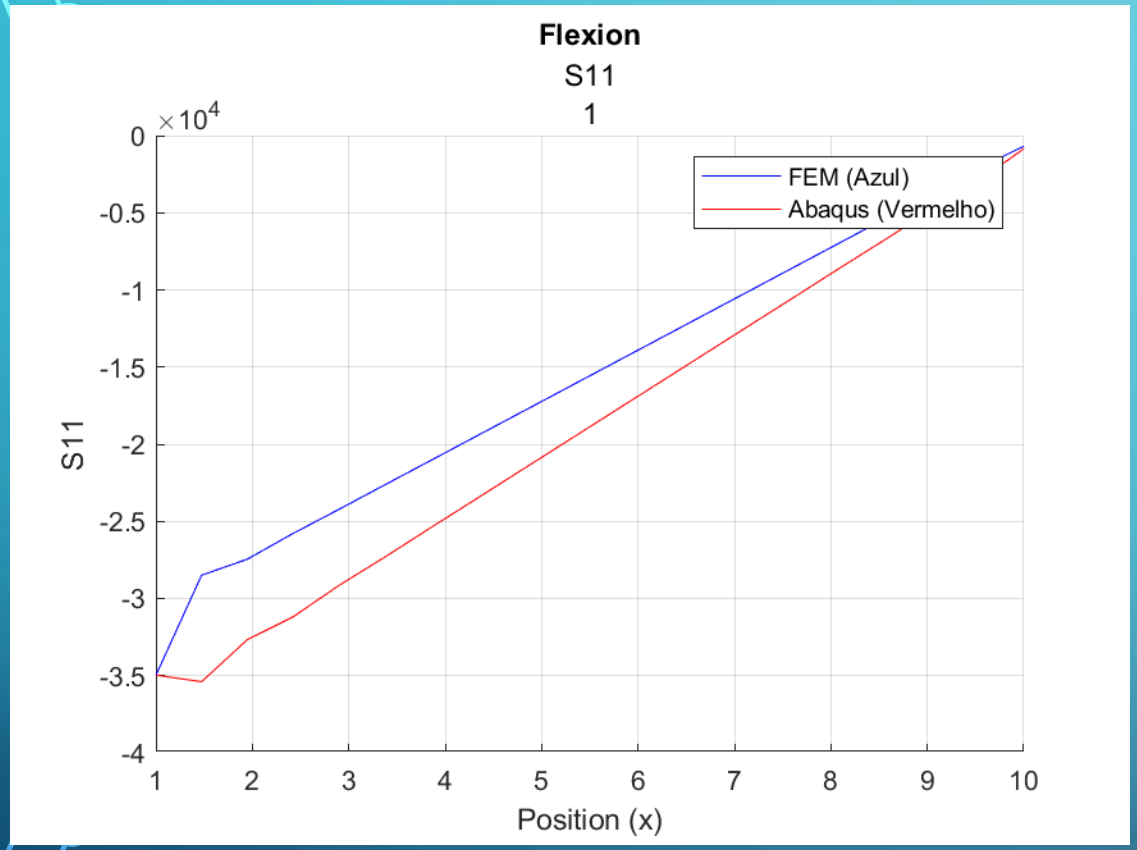
```
clear Abacus FEM nodes x ind comp folder name
close all
clc
%% Abaqus Solution
Abaqus = csvread('C:\Users\Paulo Bolsista\Desktop\FEM_Local\testes-abacus\teste 1\Flexion\U.csv', 0);
folder = 'C:\Users\Paulo Bolsista\Desktop\FEM_Local\testes-abacus\teste 1\Flexion\imagens\U\';
%% Fem solution
FEM = M.U;
%% Index
nodes = M.Matrix.Pre.Mesh.Nodes;
y = nodes(:, 2)==0;
z = nodes(:, 3)==0;
ind = logical(y.*z);
%% Plot
comp = 'U1';
figure()
grid on
hold all
plot(nodes(ind, :), -FEM(ind, 1), '-b')
plot(nodes(ind, :), flip(Abaqus(ind, 1)), '-r')
legend('FEM (Azul)', 'Abaqus (Vermelho)')
title(load, comp)
xlabel('Position (x)')
ylabel('Displacement')
name = sprintf('%s%s_%s.png', folder, load, comp);
saveas(gcf, name);

comp = 'U2';
figure()
grid on
hold all
plot(nodes(ind, :), FEM(ind, 2), '-b')
```

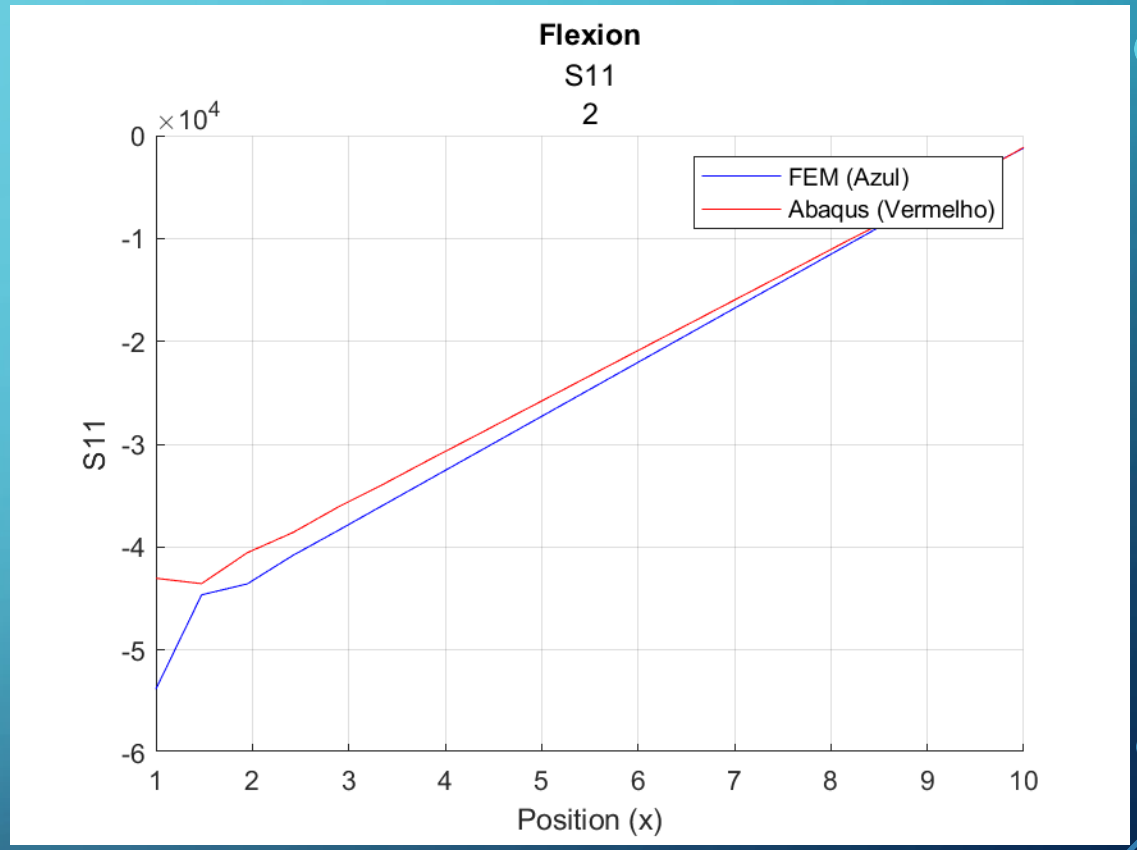
RESULTADOS

TENSÃO


Traction
S11
2
FEM (Azul)
Abaqus (Vermelho)
S11
Position (x)
1300
1250
1200
1150
1100
1050
1000
950
900
1
2
3
4
5
6
7
8
9
10

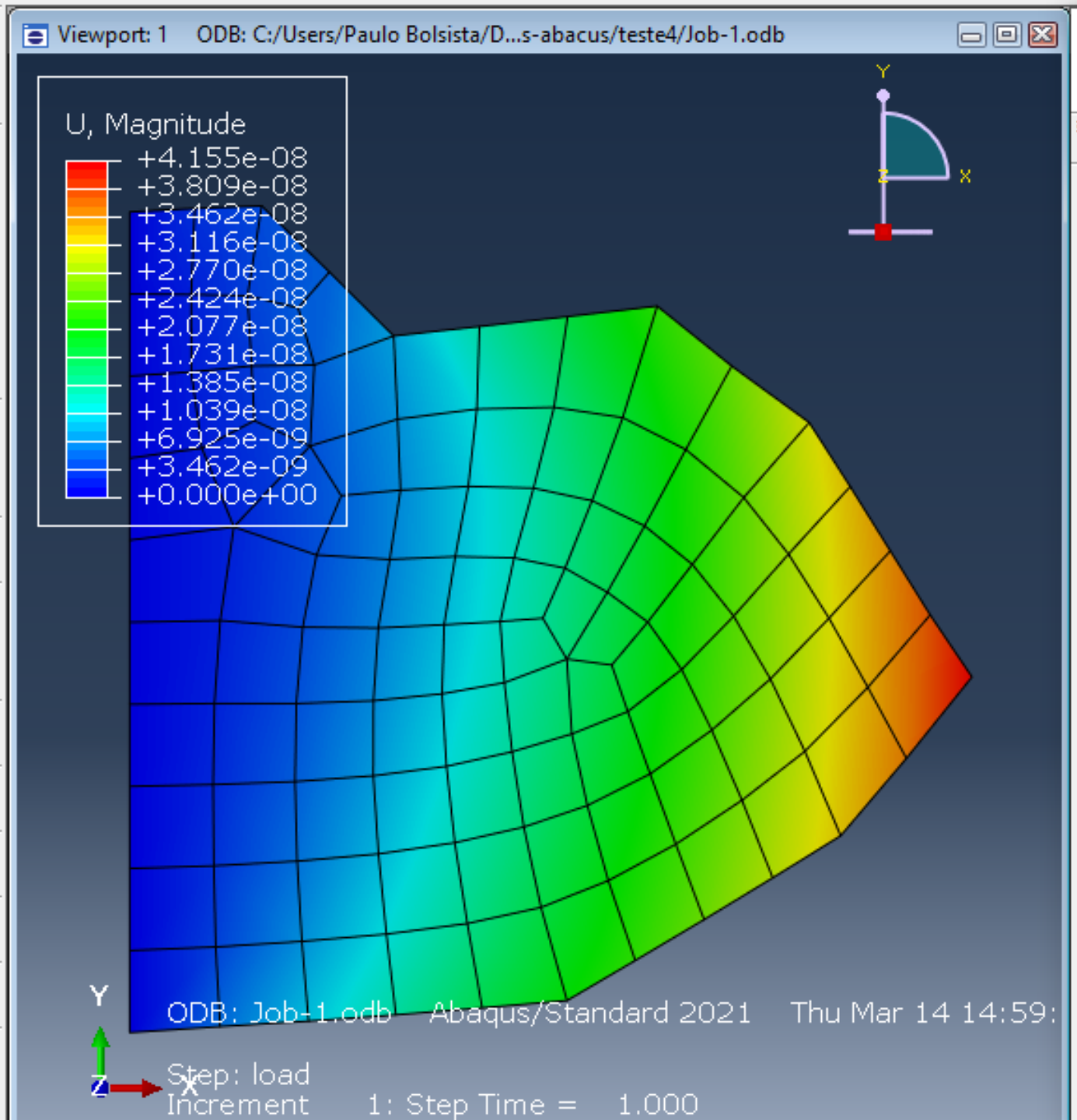

Traction
S11
1
FEM (Azul)
Abaqus (Vermelho)
S11
Position (x)
1120
1100
1080
1060
1040
1020
1000
980
960
940
1
2
3
4
5
6
7
8
9
10


Flexion
S11
1
×10^4
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
S11
1
2
3
4
5
6
7
8
9
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)


Flexion
S11
2
×10^4
0
-1
-2
-3
-4
-5
-6
S11
1
2
3
4
5
6
7
8
9
10
Position (x)
FEM (Azul)
Abaqus (Vermelho)

TESTES COM MALHA IMPORTADA

FEM VS ABAQUS


Viewport: 1 ODB: C:/Users/Paulo Bolsista/D...s-abacus/teste4/Job-1.odb
U, Magnitude
+4.155e-08
+3.809e-08
+3.462e-08
+3.116e-08
+2.770e-08
+2.424e-08
+2.077e-08
+1.731e-08
+1.385e-08
+1.039e-08
+6.925e-09
+3.462e-09
+0.000e+00
Y
X
Z
ODB: Job-1.odb Abaqus/Standard 2021 Thu Mar 14 14:59:
Step: load
Increment 1: Step Time = 1.000

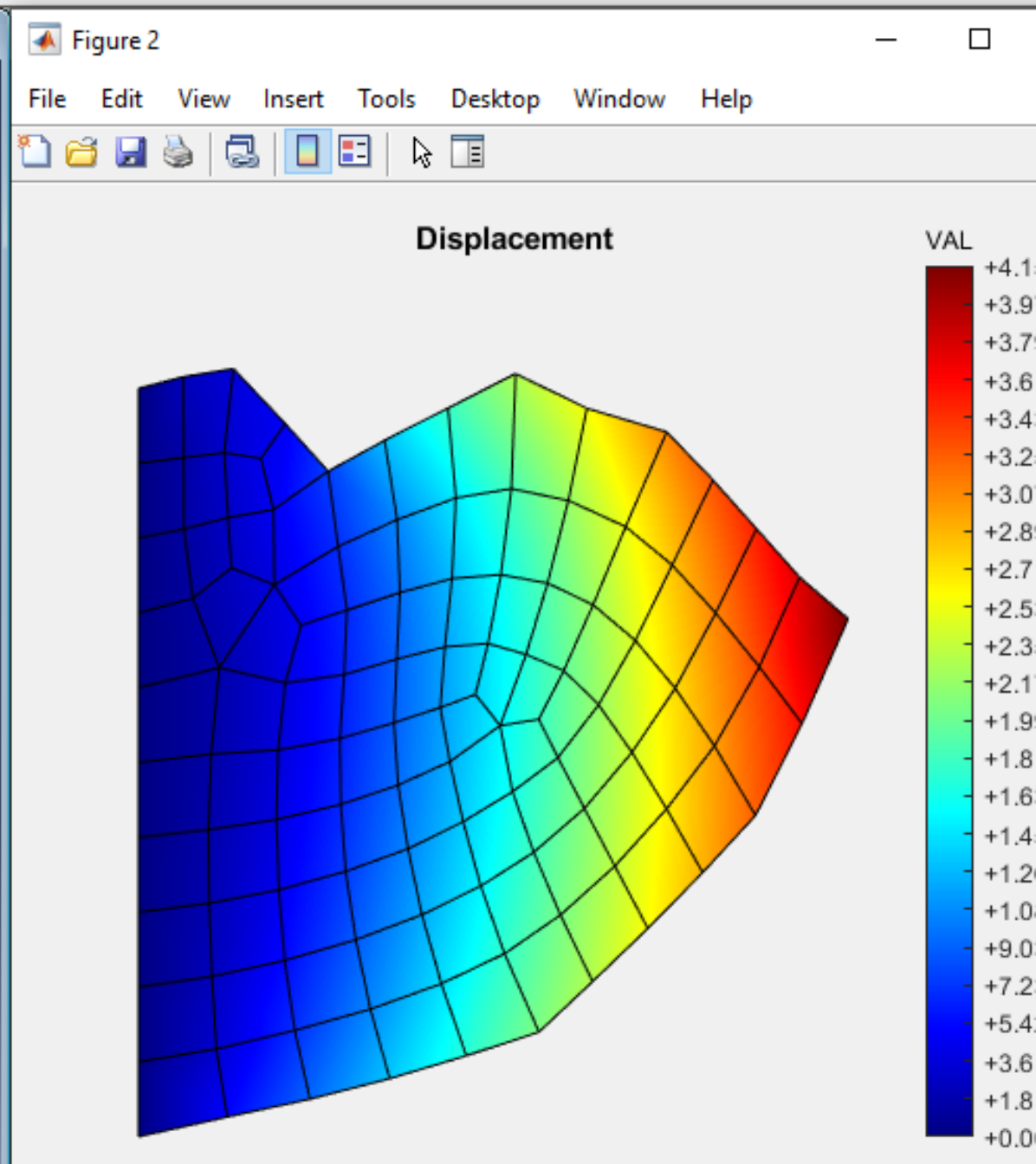
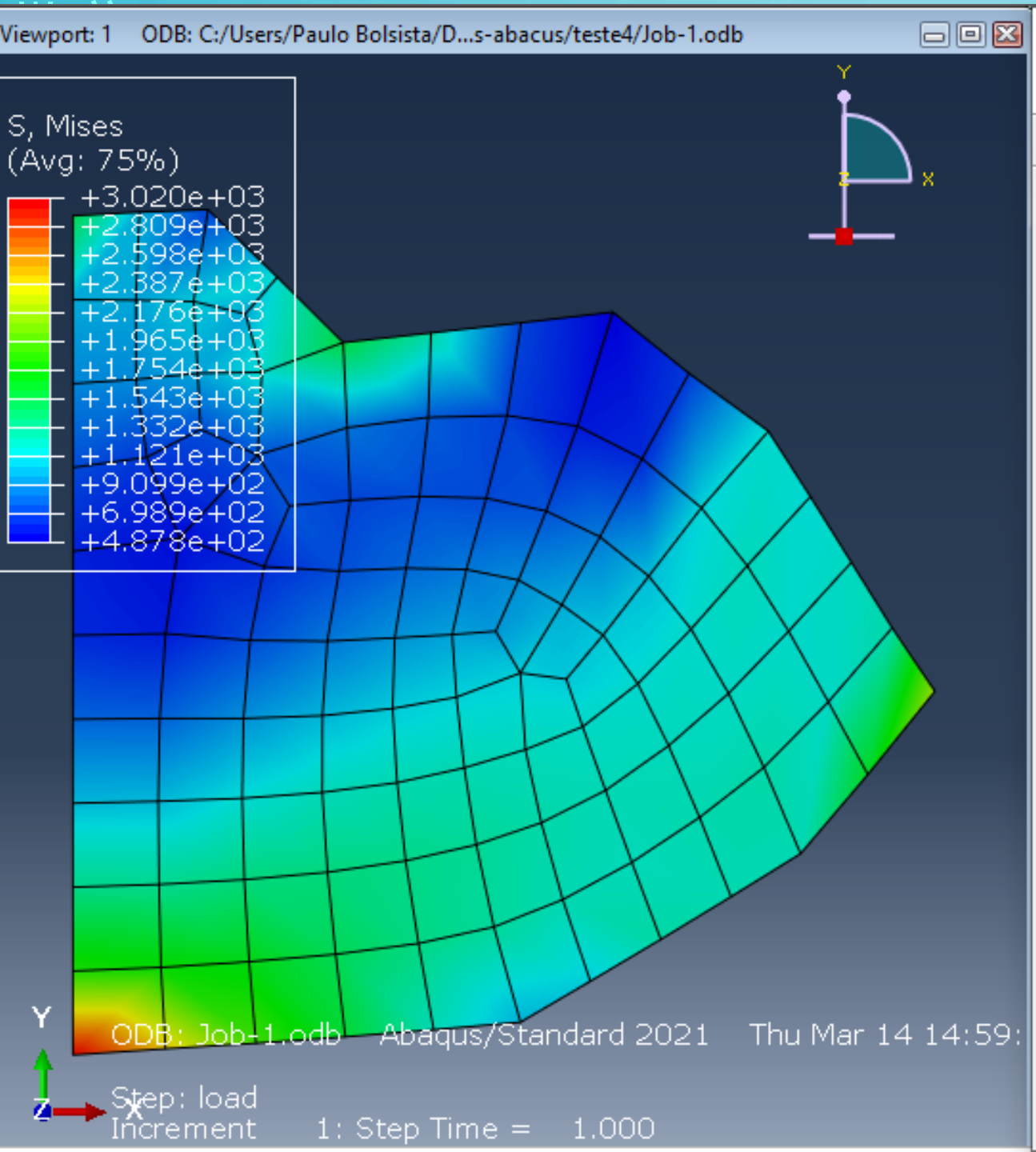


Figure 2
File Edit View Insert Tools Desktop Window Help
Displacement
VAL
+4.1
+3.9
+3.7
+3.6
+3.4
+3.2
+3.0
+2.8
+2.7
+2.5
+2.3
+2.1
+1.9
+1.8
+1.6
+1.4
+1.2
+1.0
+9.0
+7.2
+5.4
+3.6
+1.8
+0.0


Viewport: 1 ODB: C:/Users/Paulo Bolsista/D...s-abacus/teste4/Job-1.odb
S, Mises
(Avg: 75%)
+3.020e+03
+2.809e+03
+2.598e+03
+2.387e+03
+2.176e+03
+1.965e+03
+1.754e+03
+1.543e+03
+1.332e+03
+1.121e+03
+9.099e+02
+6.989e+02
+4.878e+02
Y
Z
X
ODB: Job-1.odb Abaqus/Standard 2021 Thu Mar 14 14:59:
Y
Z
X
Step: load
Increment 1: Step Time = 1.000

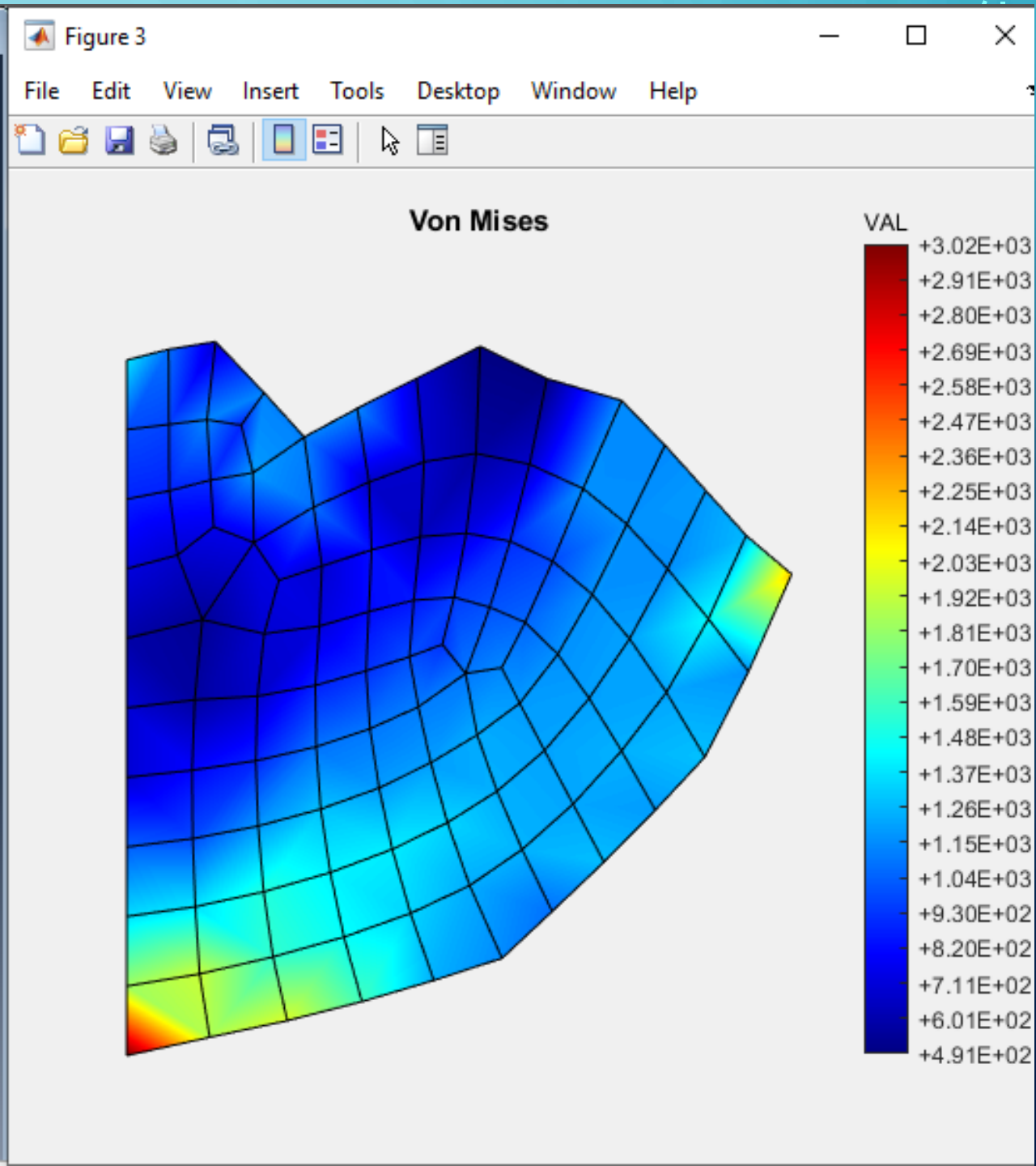
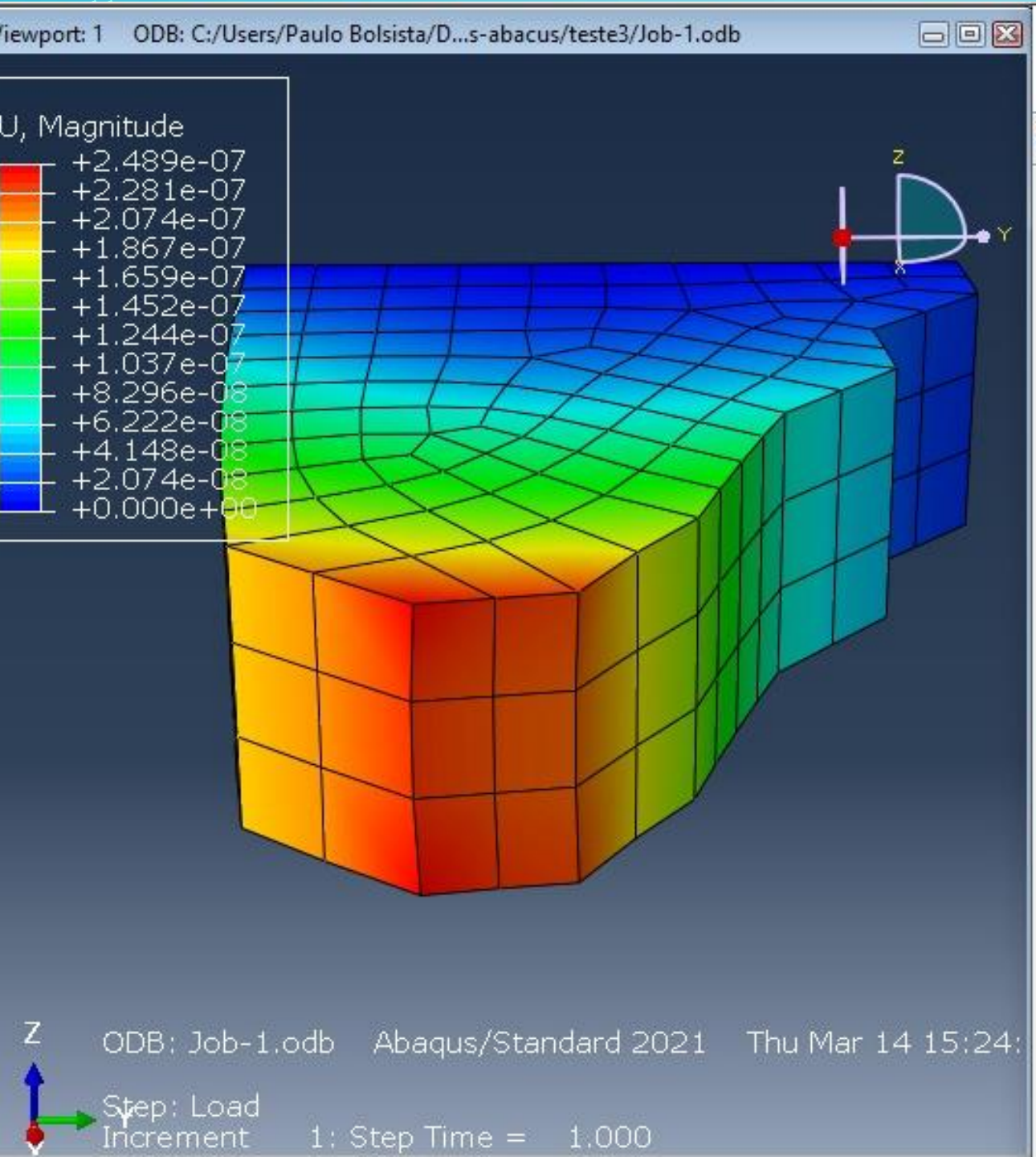


Figure 3
File Edit View Insert Tools Desktop Window Help
Von Mises
VAL
+3.02E+03
+2.91E+03
+2.80E+03
+2.69E+03
+2.58E+03
+2.47E+03
+2.36E+03
+2.25E+03
+2.14E+03
+2.03E+03
+1.92E+03
+1.81E+03
+1.70E+03
+1.59E+03
+1.48E+03
+1.37E+03
+1.26E+03
+1.15E+03
+1.04E+03
+9.30E+02
+8.20E+02
+7.11E+02
+6.01E+02
+4.91E+02


iewport: 1 ODB: C:/Users/Paulo Bolsista/D...s-abacus/teste3/Job-1.odb
U, Magnitude
+2.489e-07
+2.281e-07
+2.074e-07
+1.867e-07
+1.659e-07
+1.452e-07
+1.244e-07
+1.037e-07
+8.296e-08
+6.222e-08
+4.148e-08
+2.074e-08
+0.000e+00
Z
Y
Z
ODB: Job-1.odb Abaqus/Standard 2021 Thu Mar 14 15:24:
Step: Load
Increment 1: Step Time = 1.000

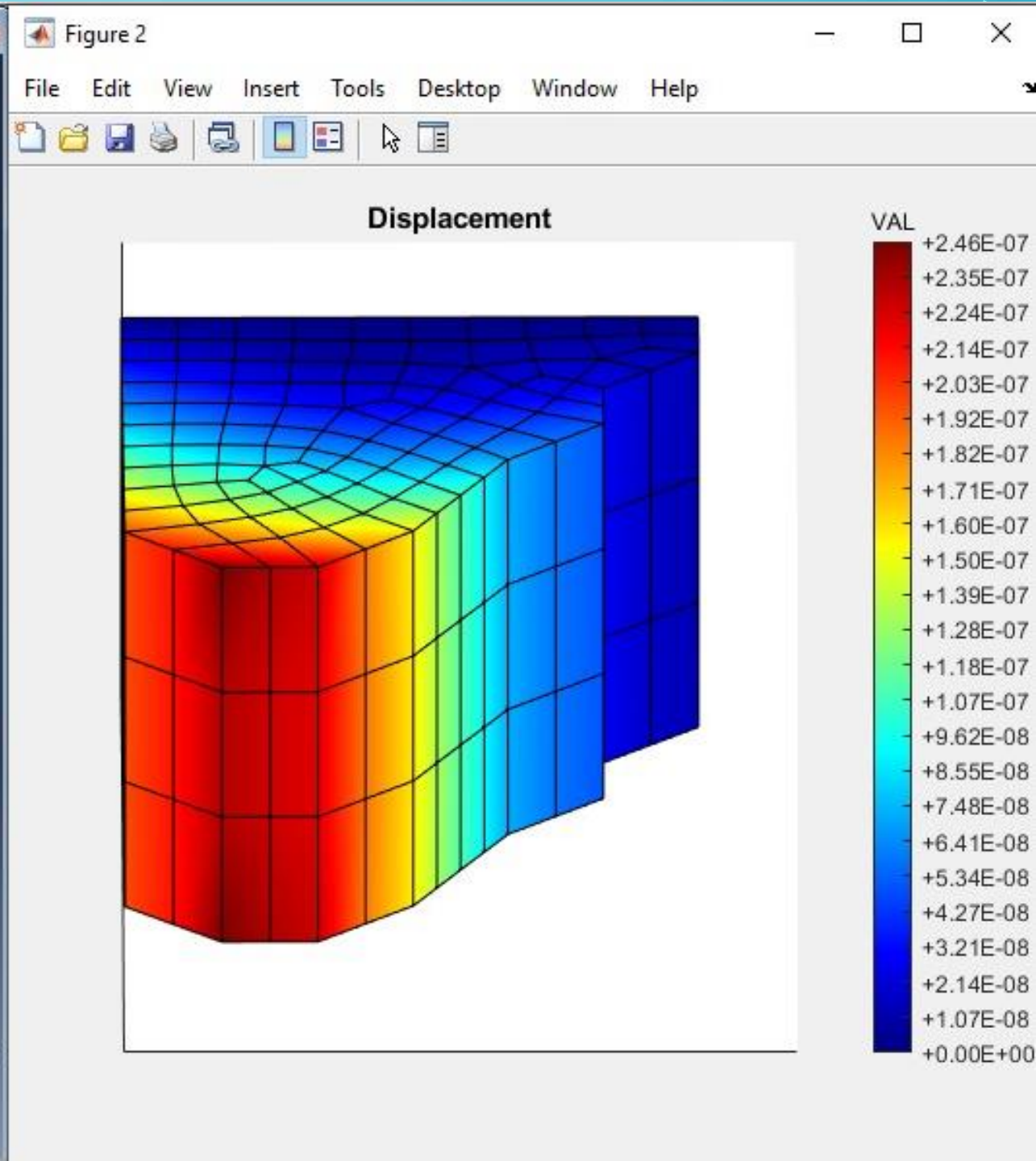
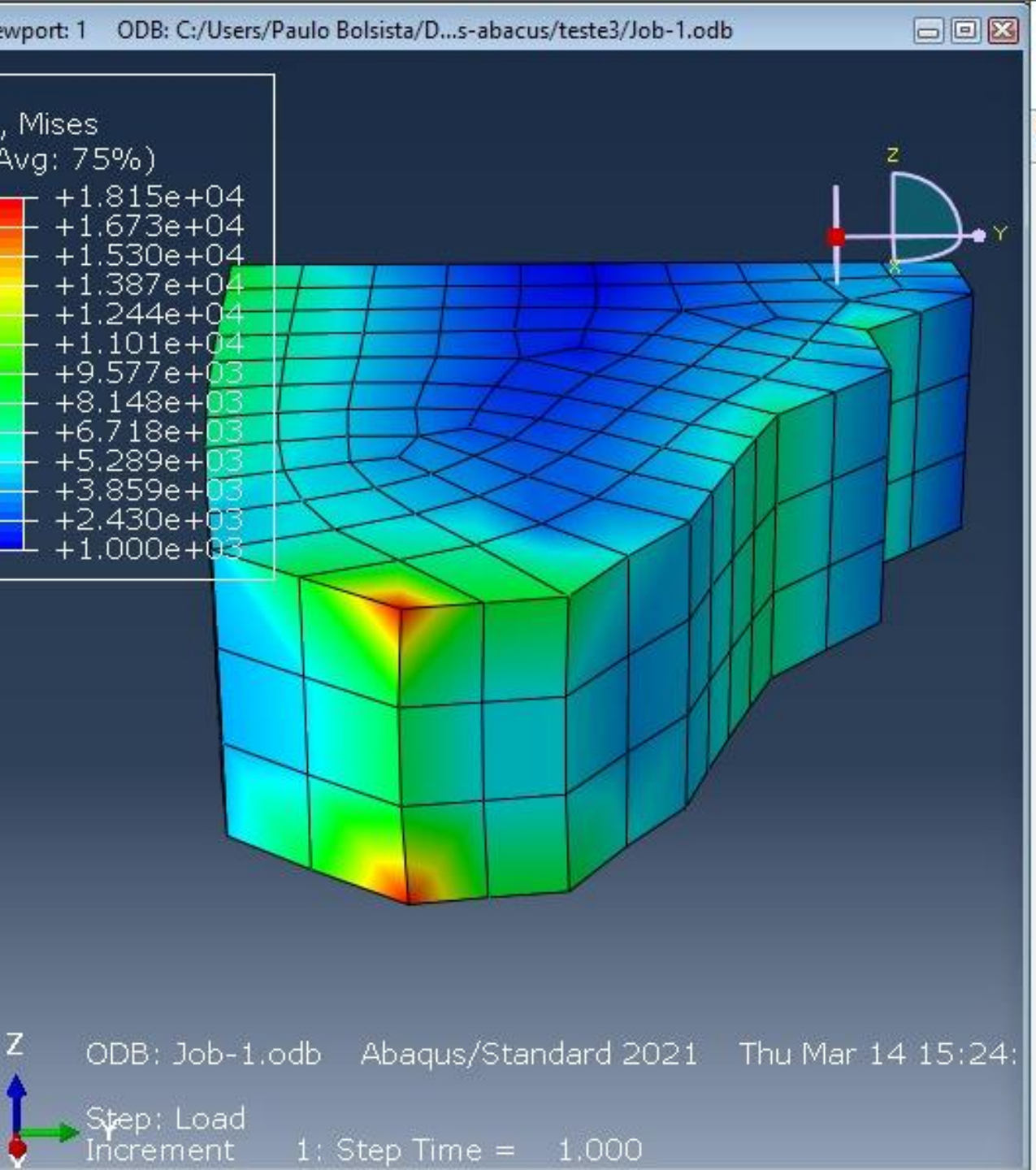


Figure 2
File Edit View Insert Tools Desktop Window Help
Displacement
VAL
+2.46E-07
+2.35E-07
+2.24E-07
+2.14E-07
+2.03E-07
+1.92E-07
+1.82E-07
+1.71E-07
+1.60E-07
+1.50E-07
+1.39E-07
+1.28E-07
+1.18E-07
+1.07E-07
+9.62E-08
+8.55E-08
+7.48E-08
+6.41E-08
+5.34E-08
+4.27E-08
+3.21E-08
+2.14E-08
+1.07E-08
+0.00E+00


ewport: 1 ODB: C:/Users/Paulo Bolsista/D...s-abacus/teste3/Job-1.odb
, Mises
Avg: 75%)
+1.815e+04
+1.673e+04
+1.530e+04
+1.387e+04
+1.244e+04
+1.101e+04
+9.577e+03
+8.148e+03
+6.718e+03
+5.289e+03
+3.859e+03
+2.430e+03
+1.000e+03
Z
Y
Z
ODB: Job-1.odb Abaqus/Standard 2021 Thu Mar 14 15:24:
Step: Load
Increment 1: Step Time = 1.000

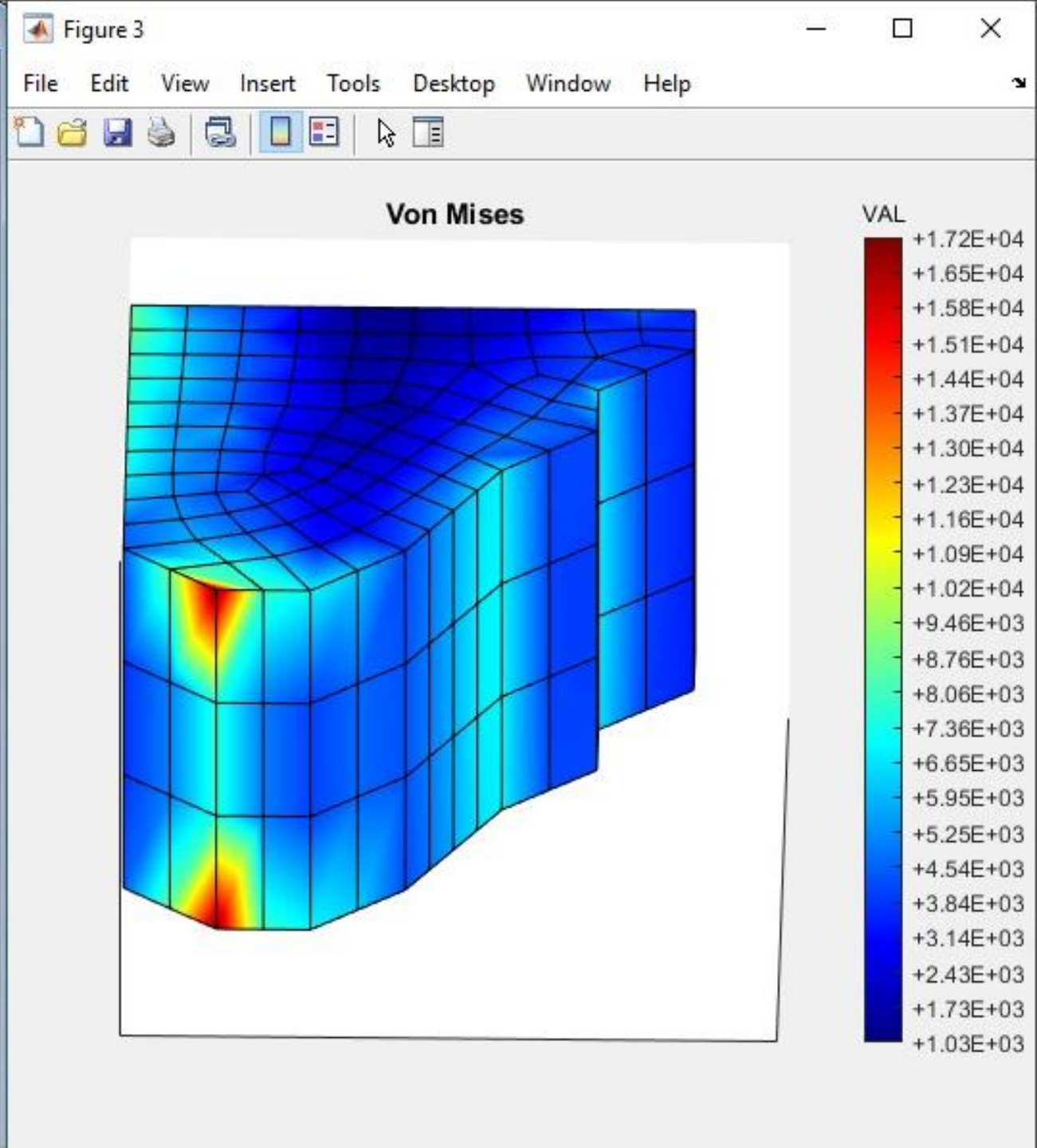


Figure 3
File Edit View Insert Tools Desktop Window Help
Von Mises
VAL
+1.72E+04
+1.65E+04
+1.58E+04
+1.51E+04
+1.44E+04
+1.37E+04
+1.30E+04
+1.23E+04
+1.16E+04
+1.09E+04
+1.02E+04
+9.46E+03
+8.76E+03
+8.06E+03
+7.36E+03
+6.65E+03
+5.95E+03
+5.25E+03
+4.54E+03
+3.84E+03
+3.14E+03
+2.43E+03
+1.73E+03
+1.03E+03