3次元非線形解析

Pull-Off Simulation

HACHINOHE INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ARCHITECTURAL ENGINEERING

By PS. CHEN

陳　沛山

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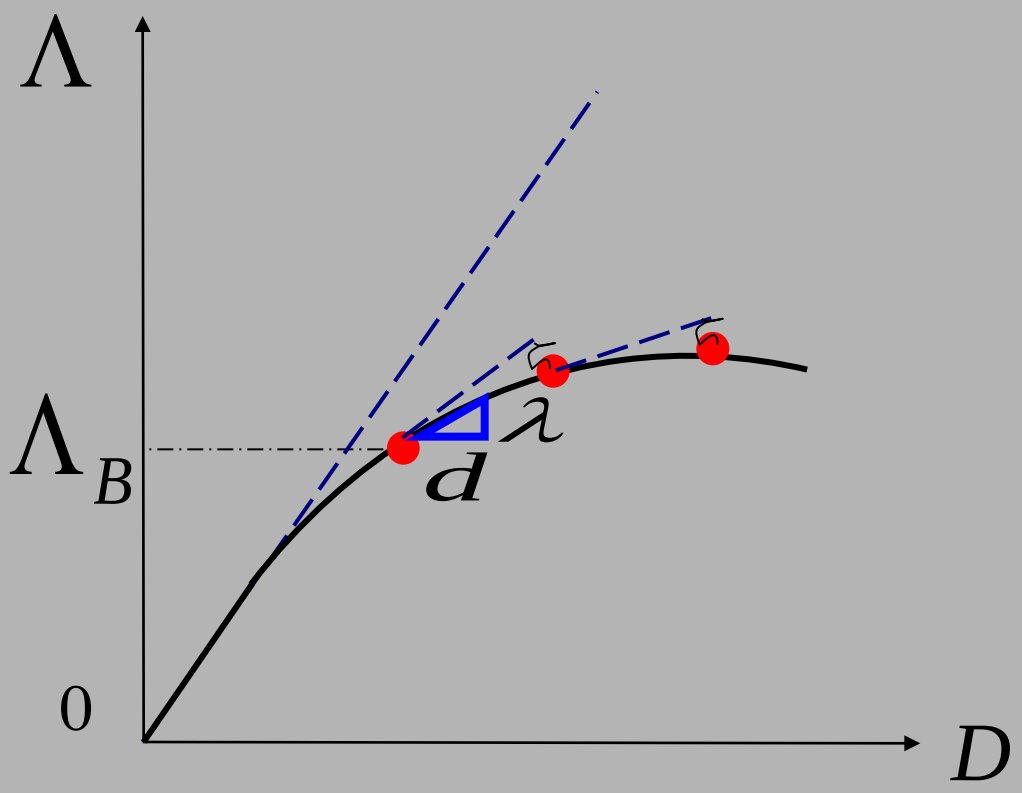
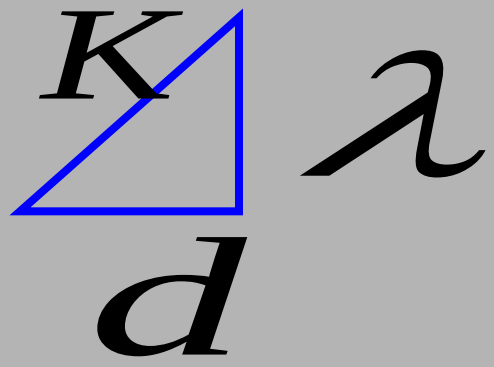
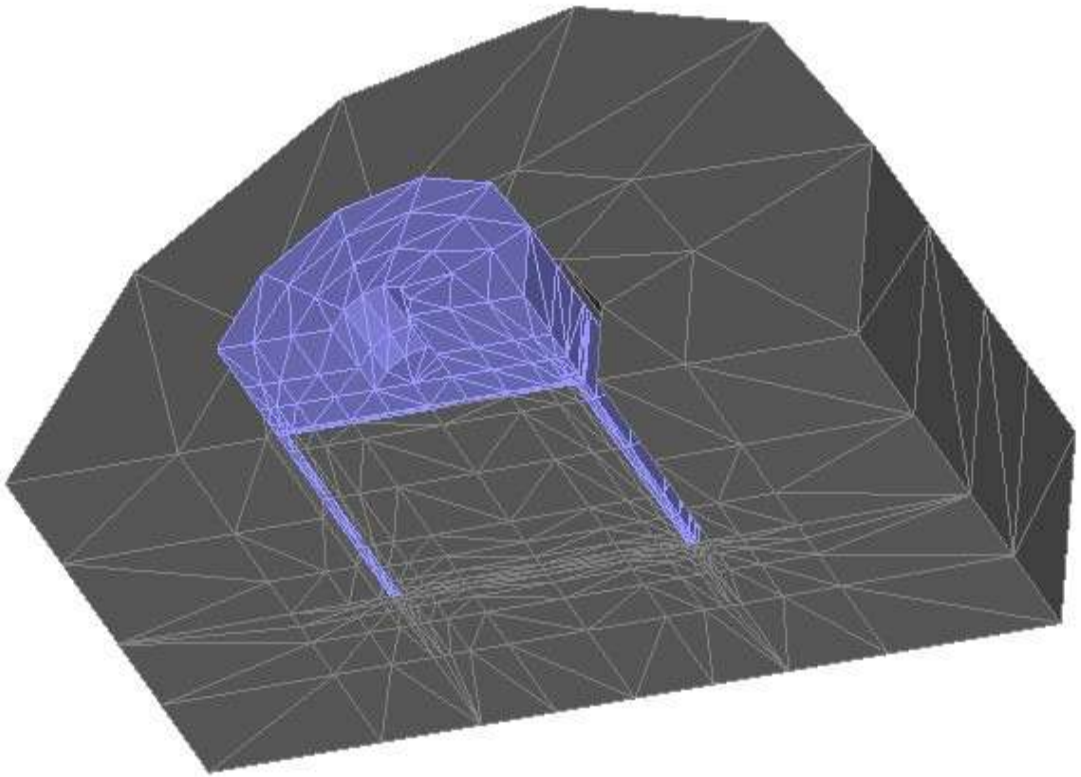
Concept of Nonlinear Analysis



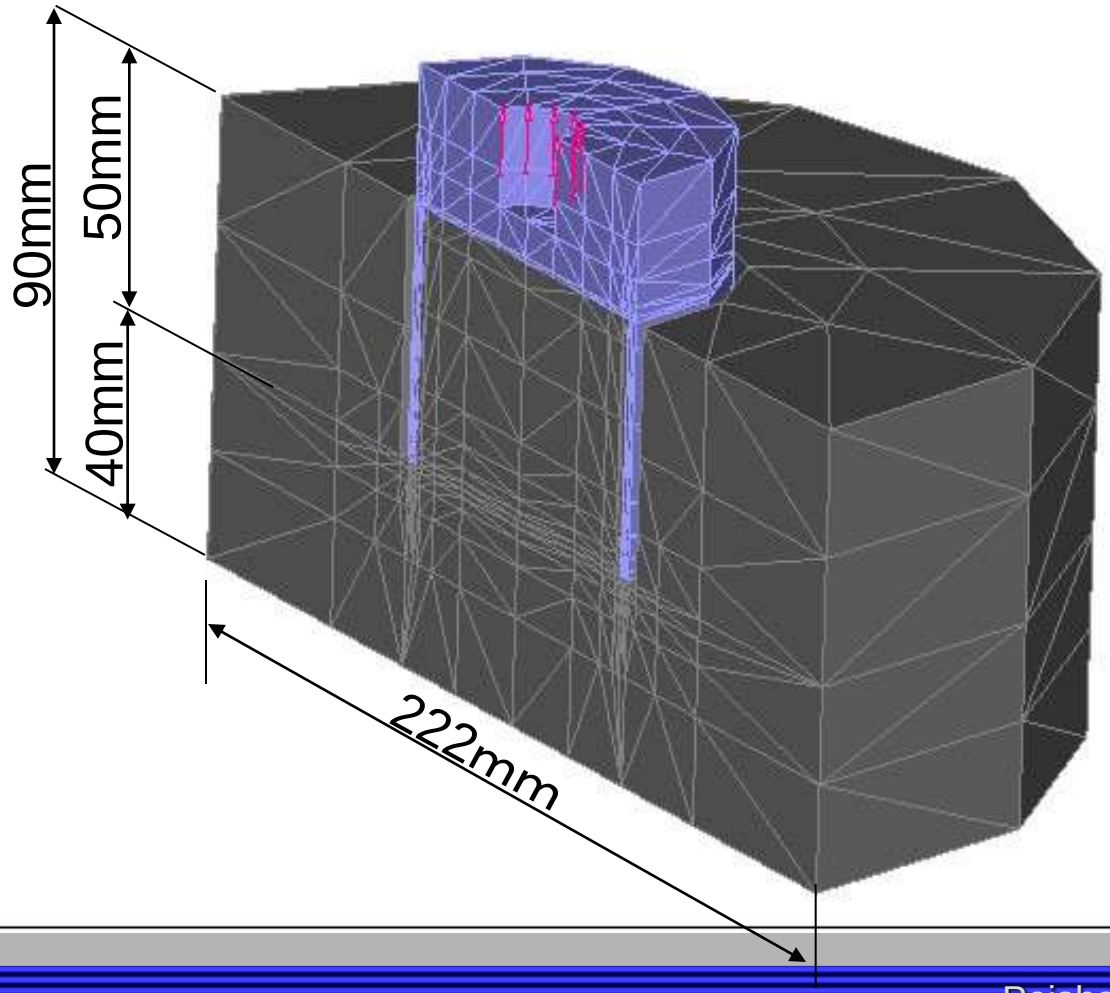


$$\mathbf{Kd} = \lambda \mathbf{f}$$

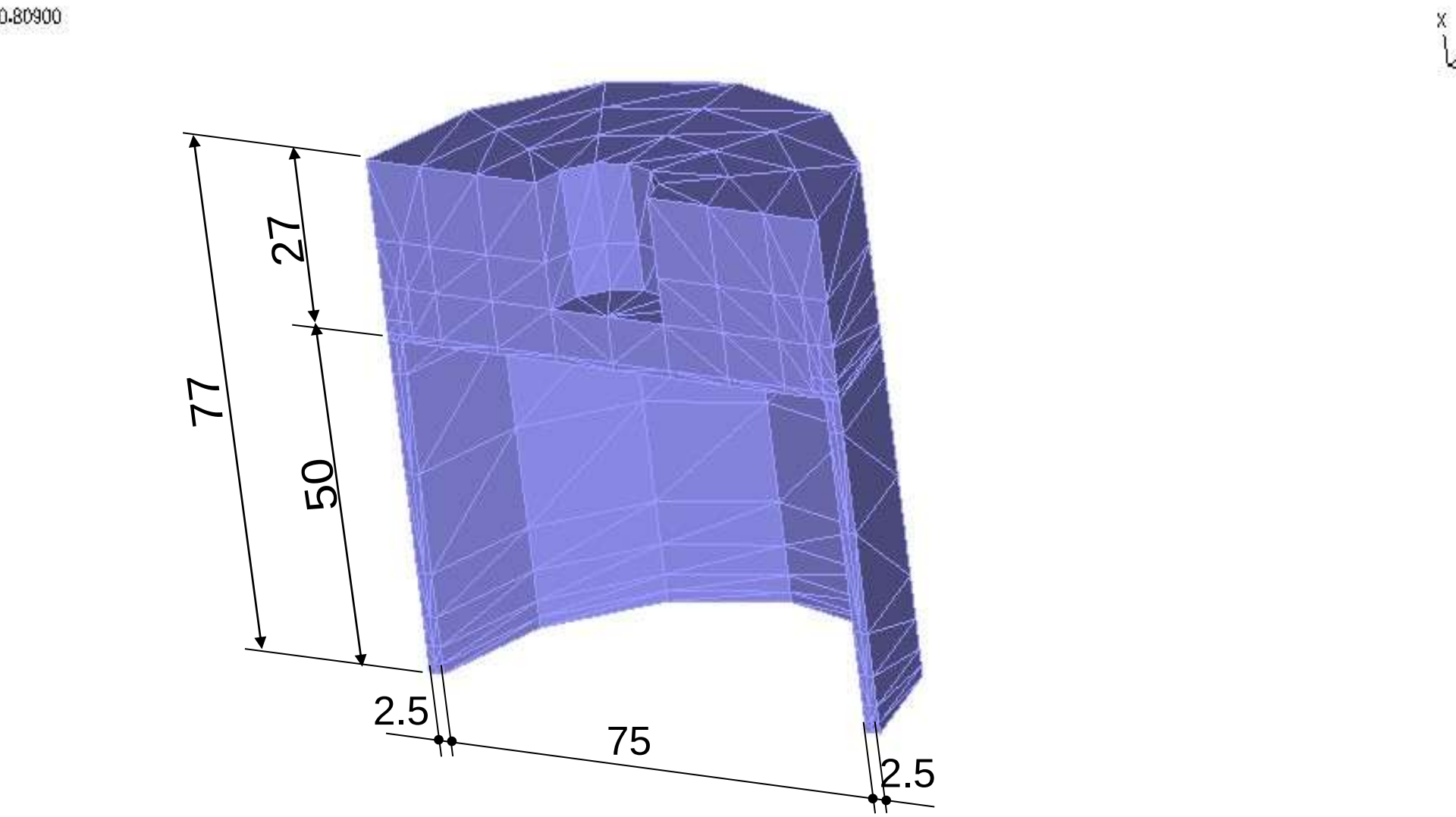
The Analysis Model



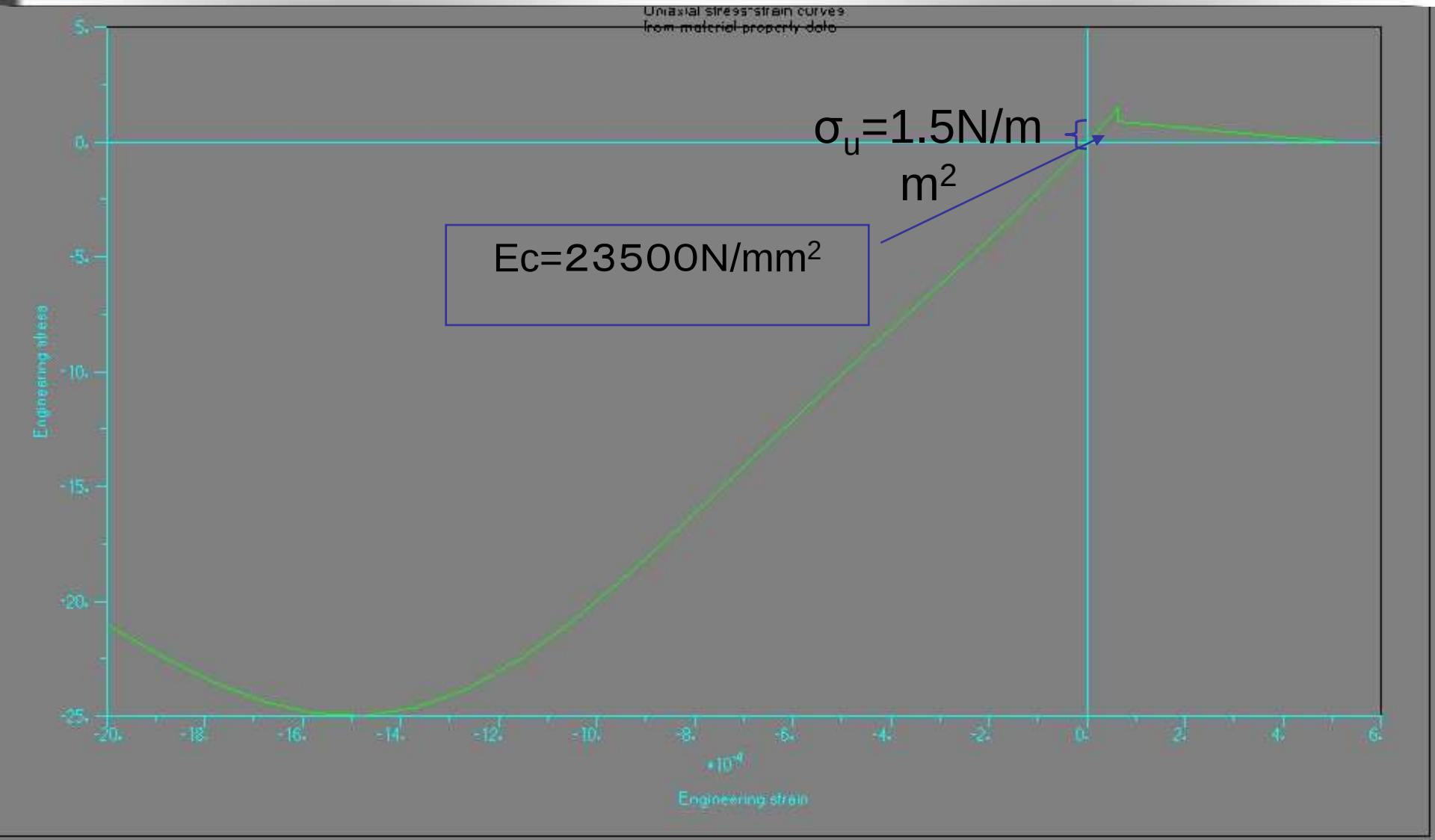
The Analysis Model



Steel Cap



コンクリート材料の性質



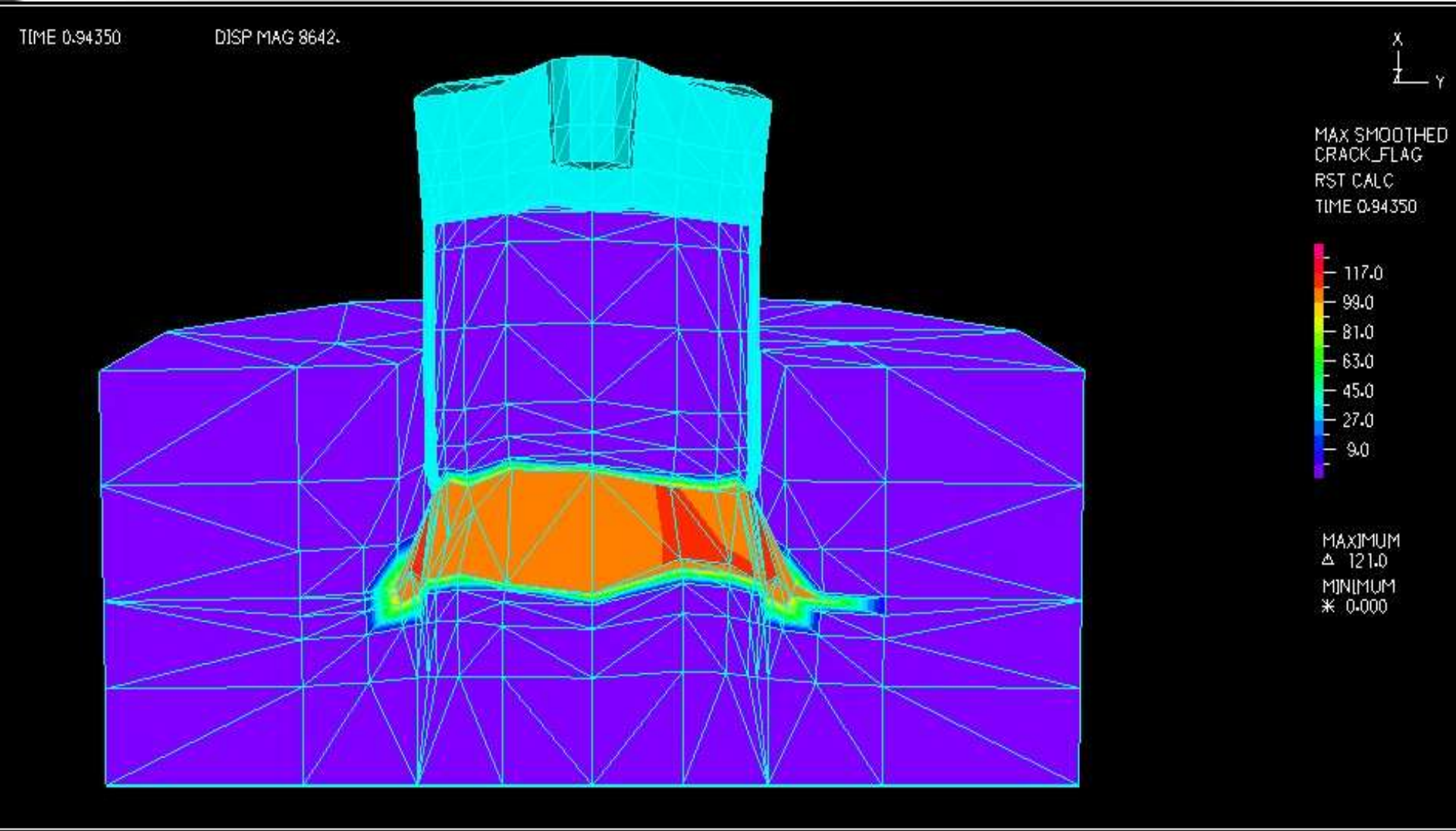
基　本　設　定

- コンクリート:　引張り強度:　1.5N/mm^2

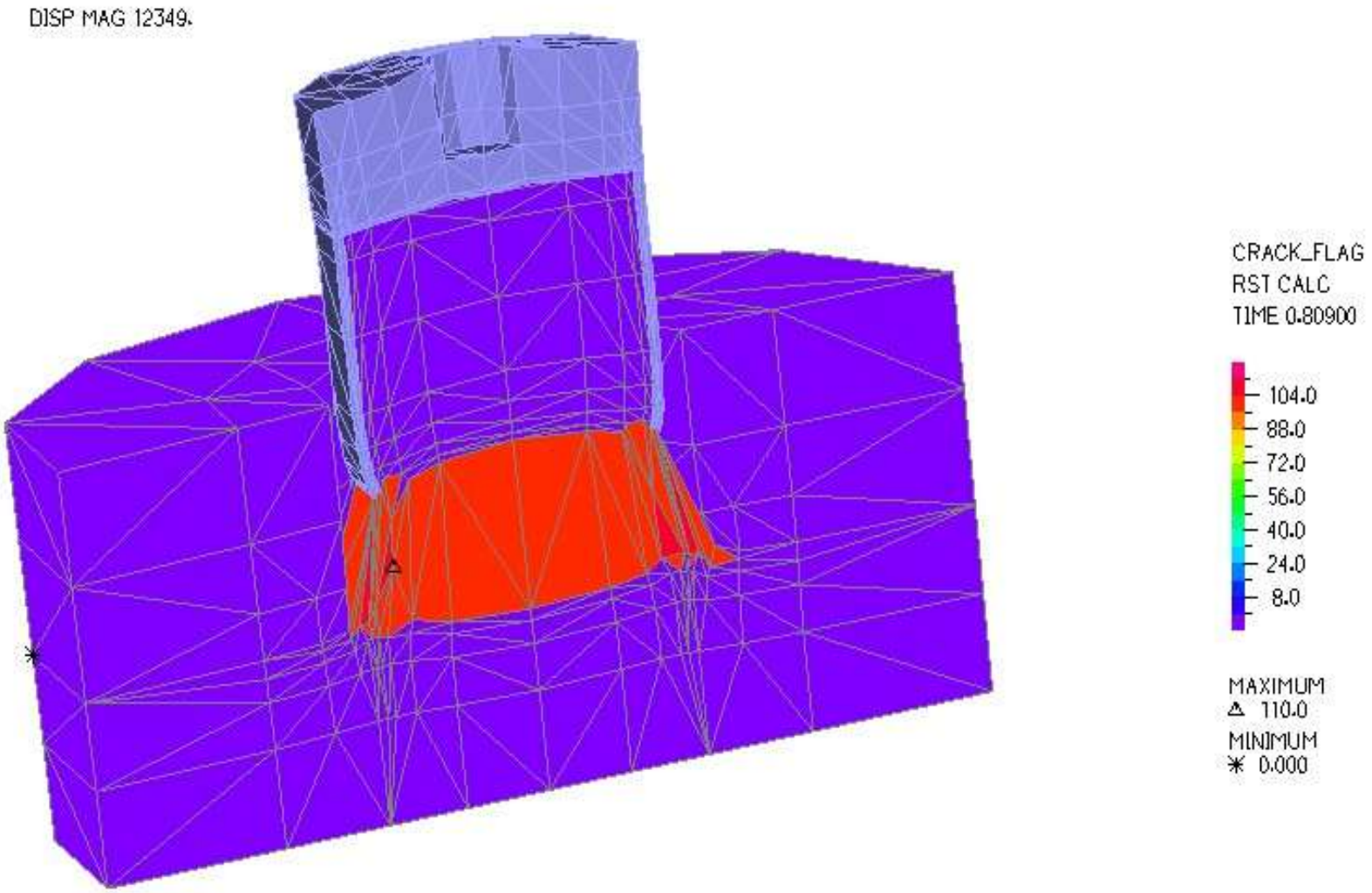
  Ec = 23500N/mm^2
- 鋼　材:　Es = 205000 N/mm^2

  線形材料とする。
- 解　析:　静的材料非線形、亀裂破壊を考慮する。強制変位増分、収束解析。

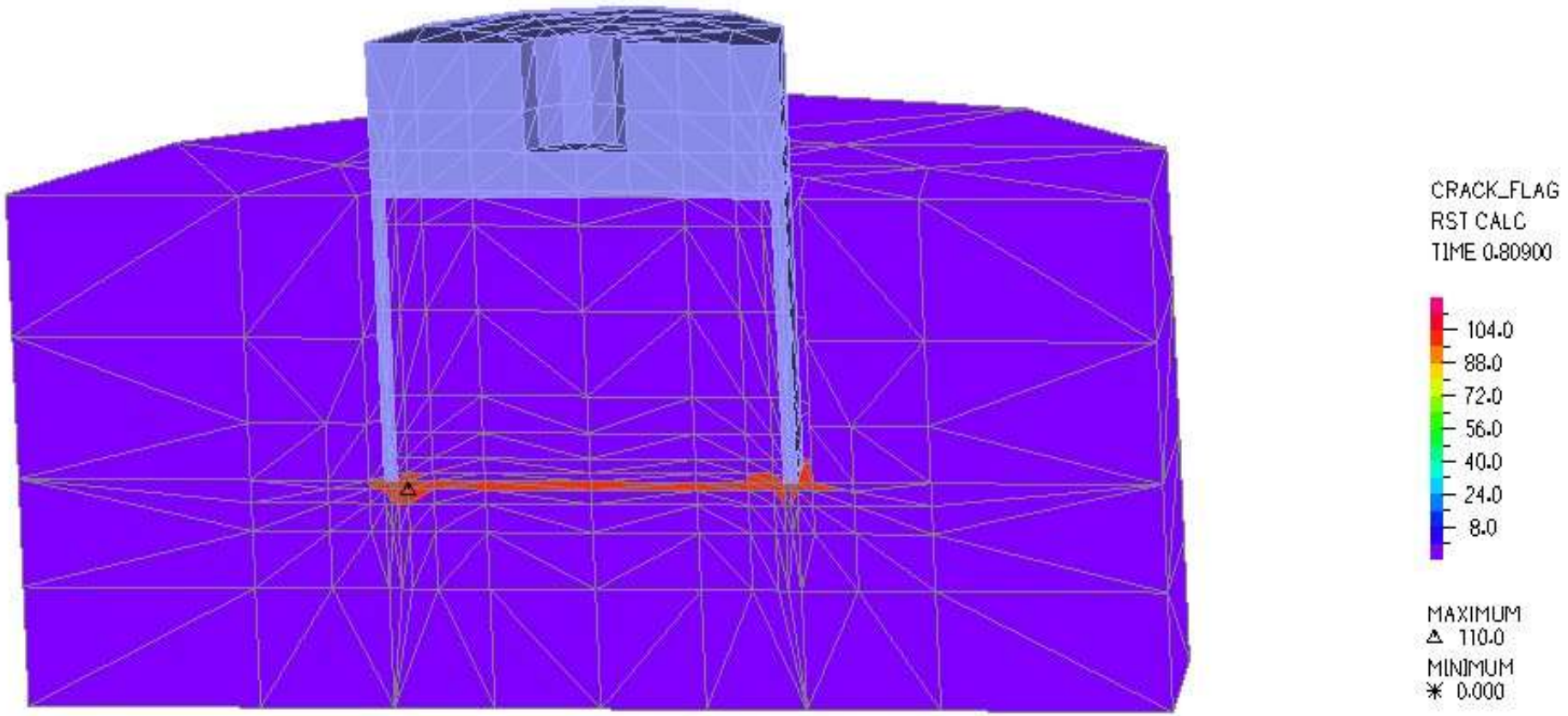
The Crack (1)


TIME 0.94350
DISP MAG 8642.
X
Y
MAX SMOOTHED
CRACK_FLAG
RST CALC
TIME 0.94350
117.0
99.0
81.0
63.0
45.0
27.0
9.0
MAXIMUM
△ 121.0
MINIMUM
✳ 0.000

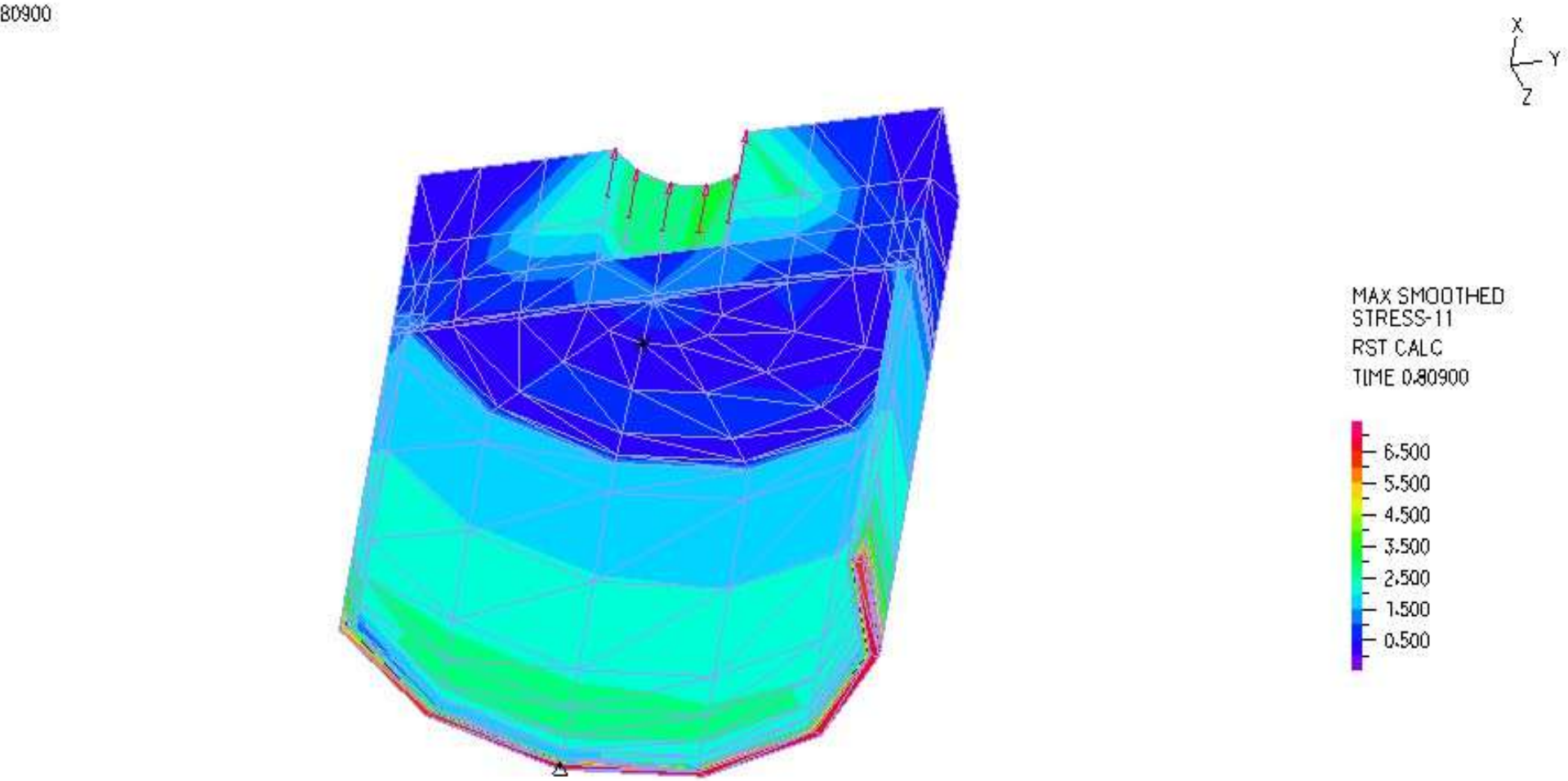
The Crack (2)


DISP MAG 12349.
CRACK_FLAG
RST CALC
TIME 0.80900
104.0
88.0
72.0
56.0
40.0
24.0
8.0
MAXIMUM
△ 110.0
MINIMUM
✳ 0.000

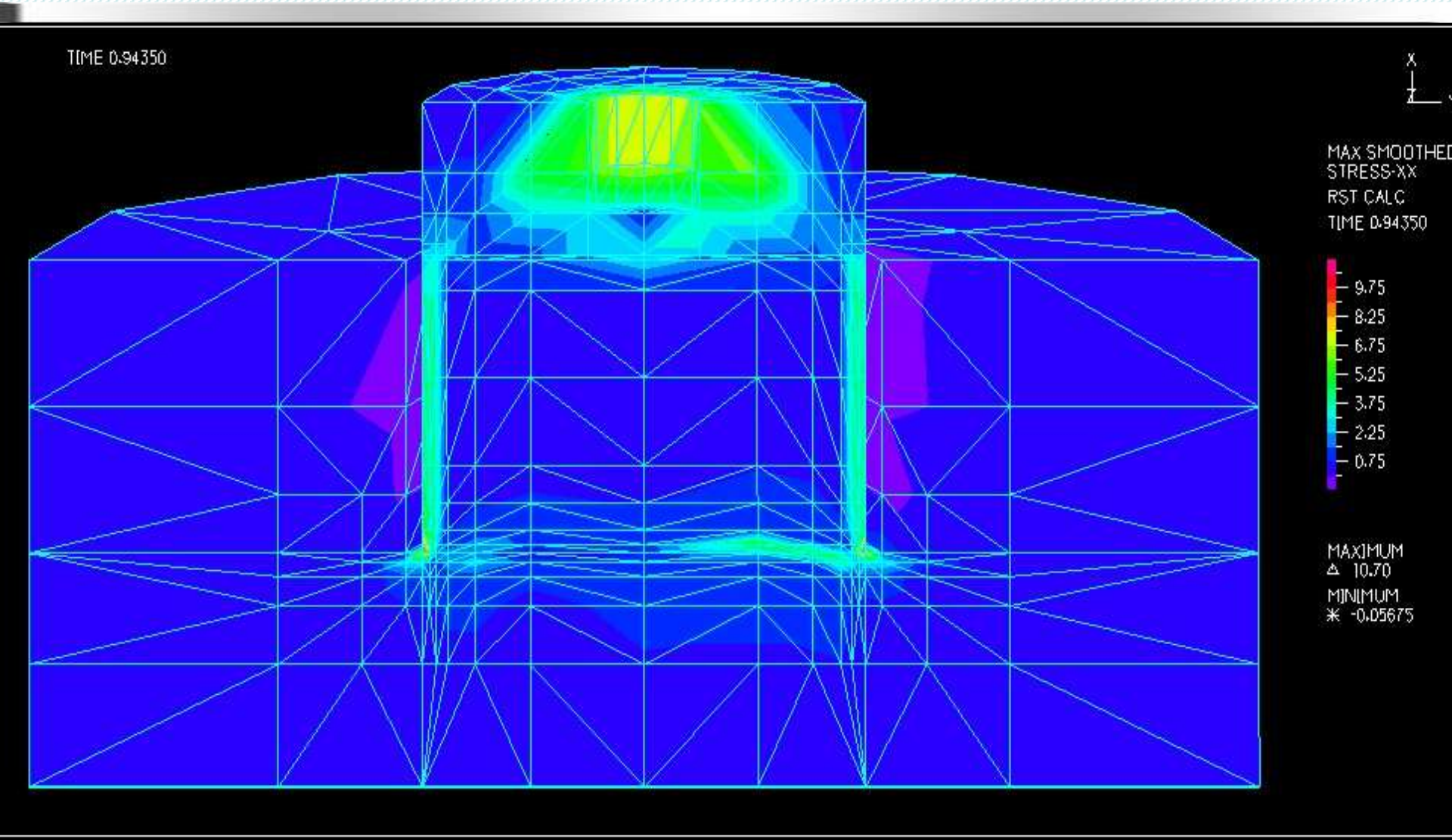
The Crack (3)


CRACK_FLAG
RST CALC
TIME 0.80900
104.0
88.0
72.0
56.0
40.0
24.0
8.0
MAXIMUM
△ 110.0
MINIMUM
✳ 0.000

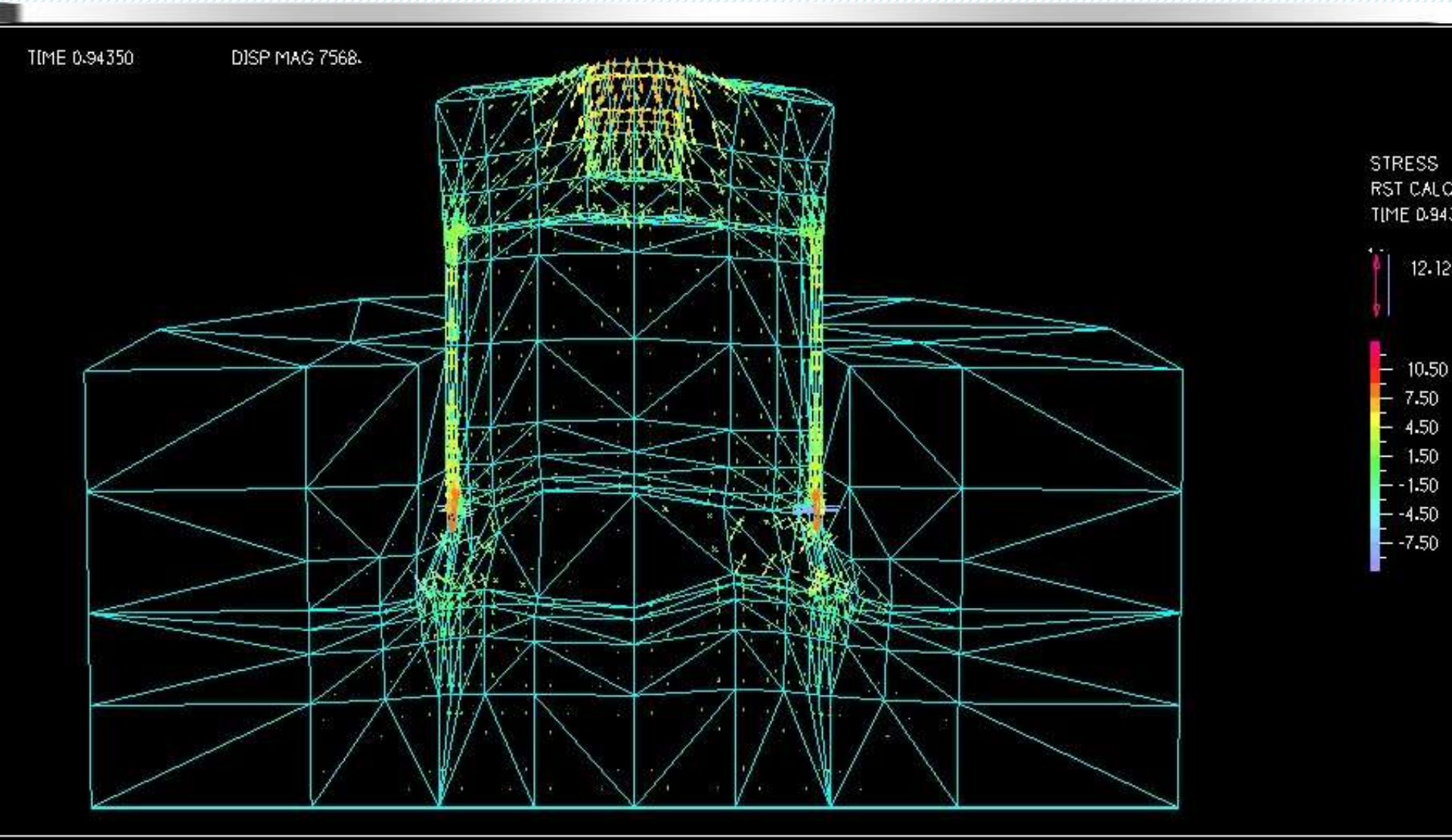
Stress in the Cap



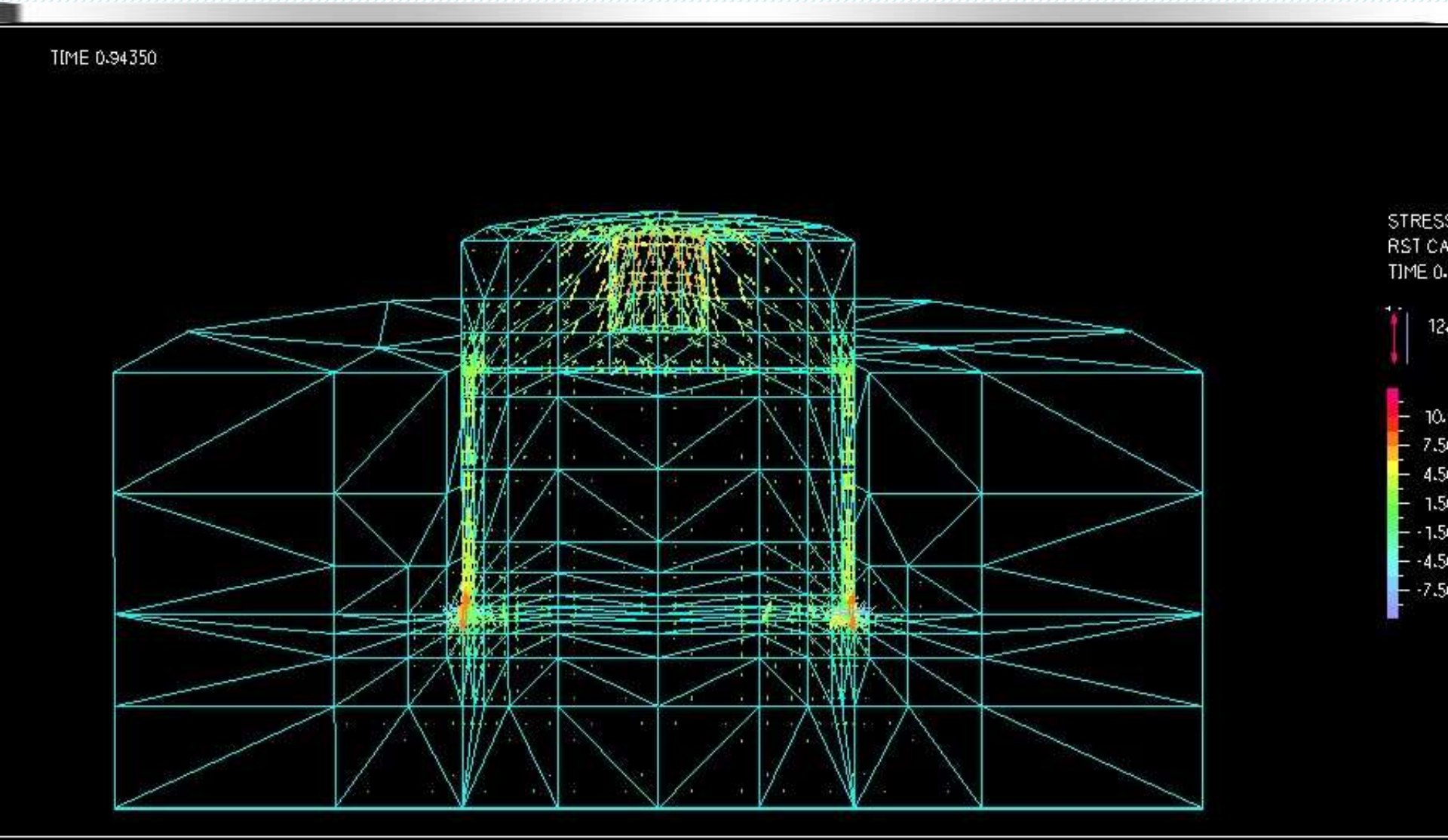
Stress Distribution



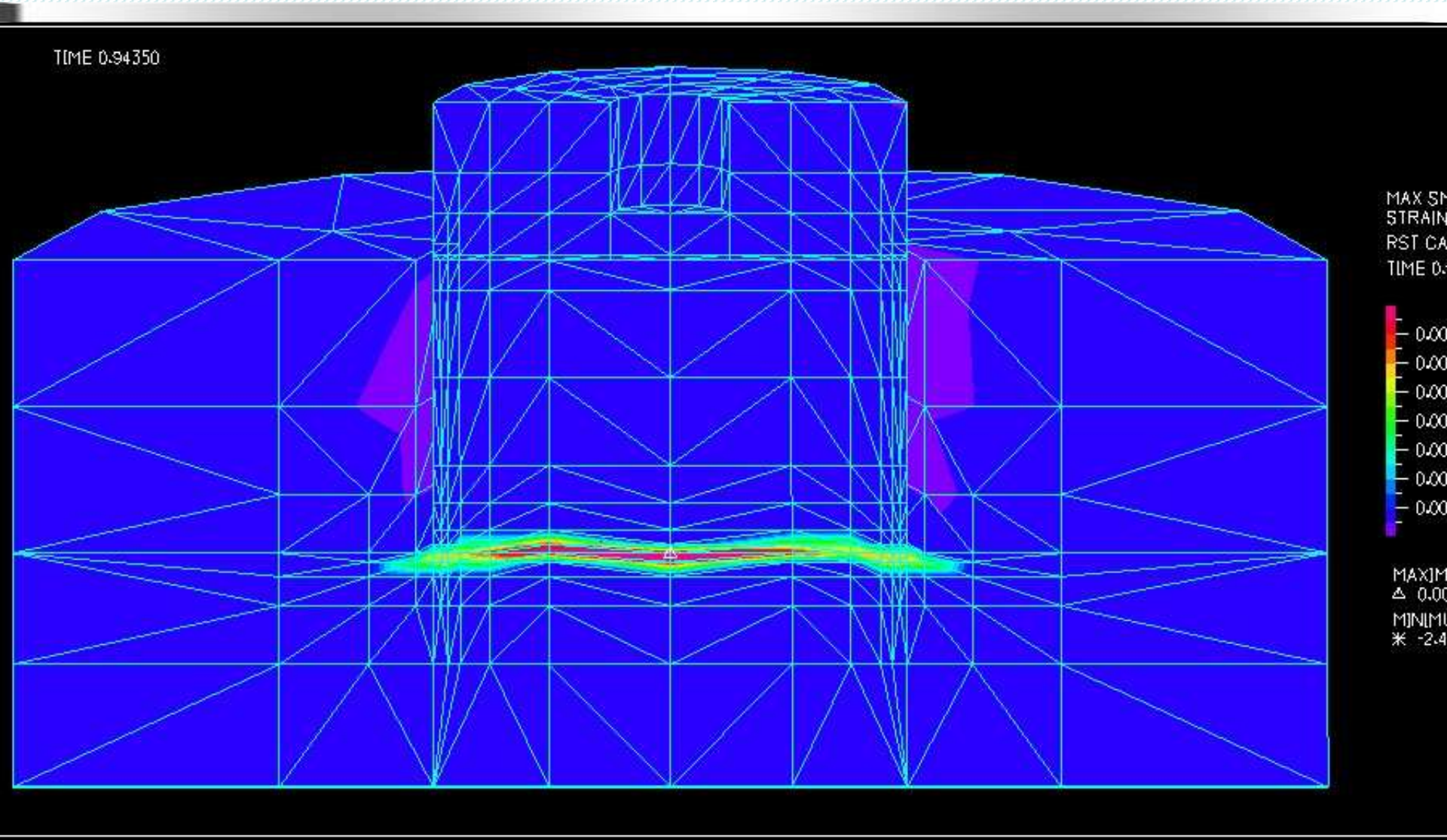
応力度の流れ(1)


TIME 0.94350
DISP MAG 7568.
STRESS
RST CALC
TIME 0.943
12.12
10.50
7.50
4.50
1.50
-1.50
-4.50
-7.50

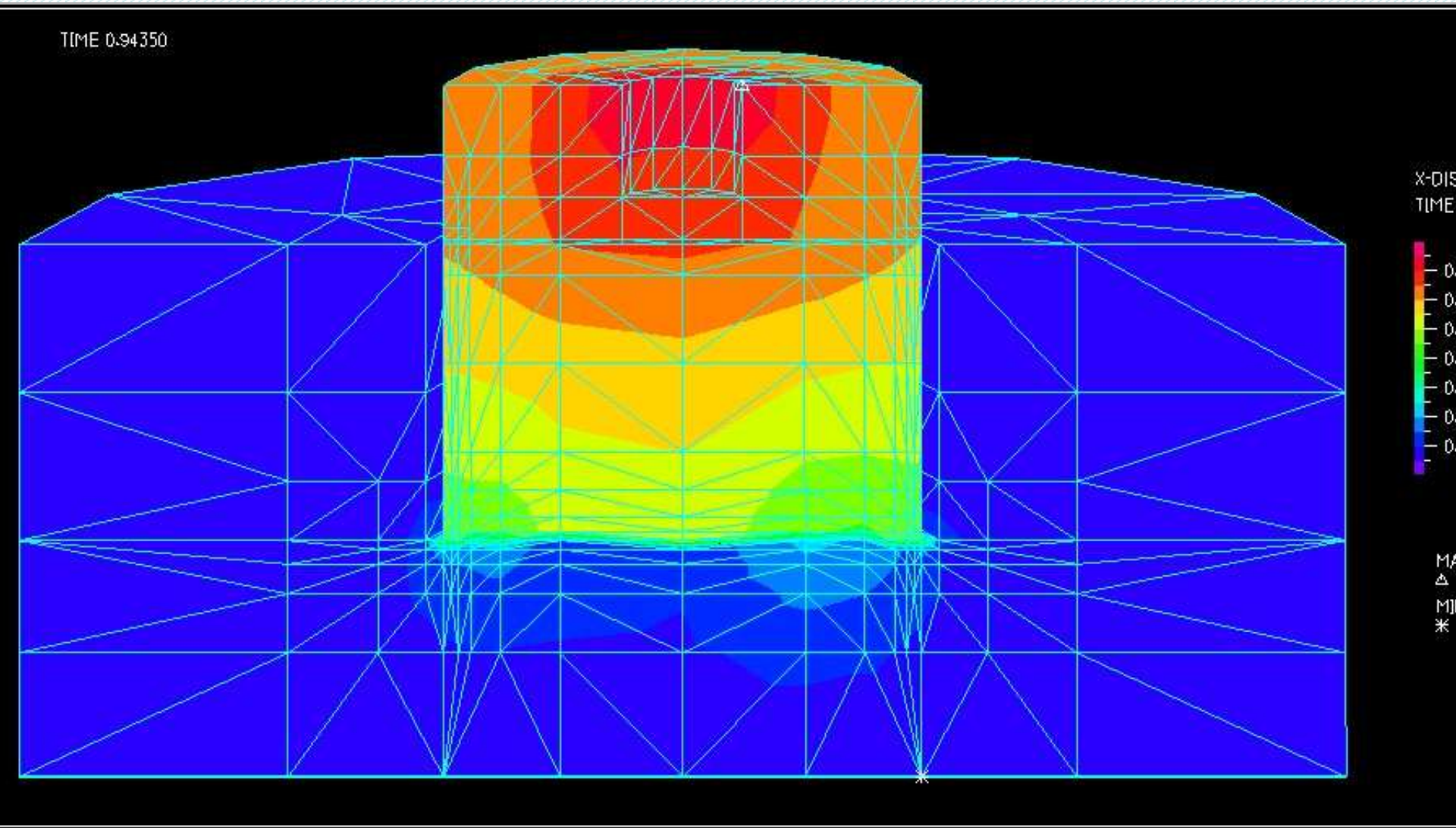
応力度の流れ(2)



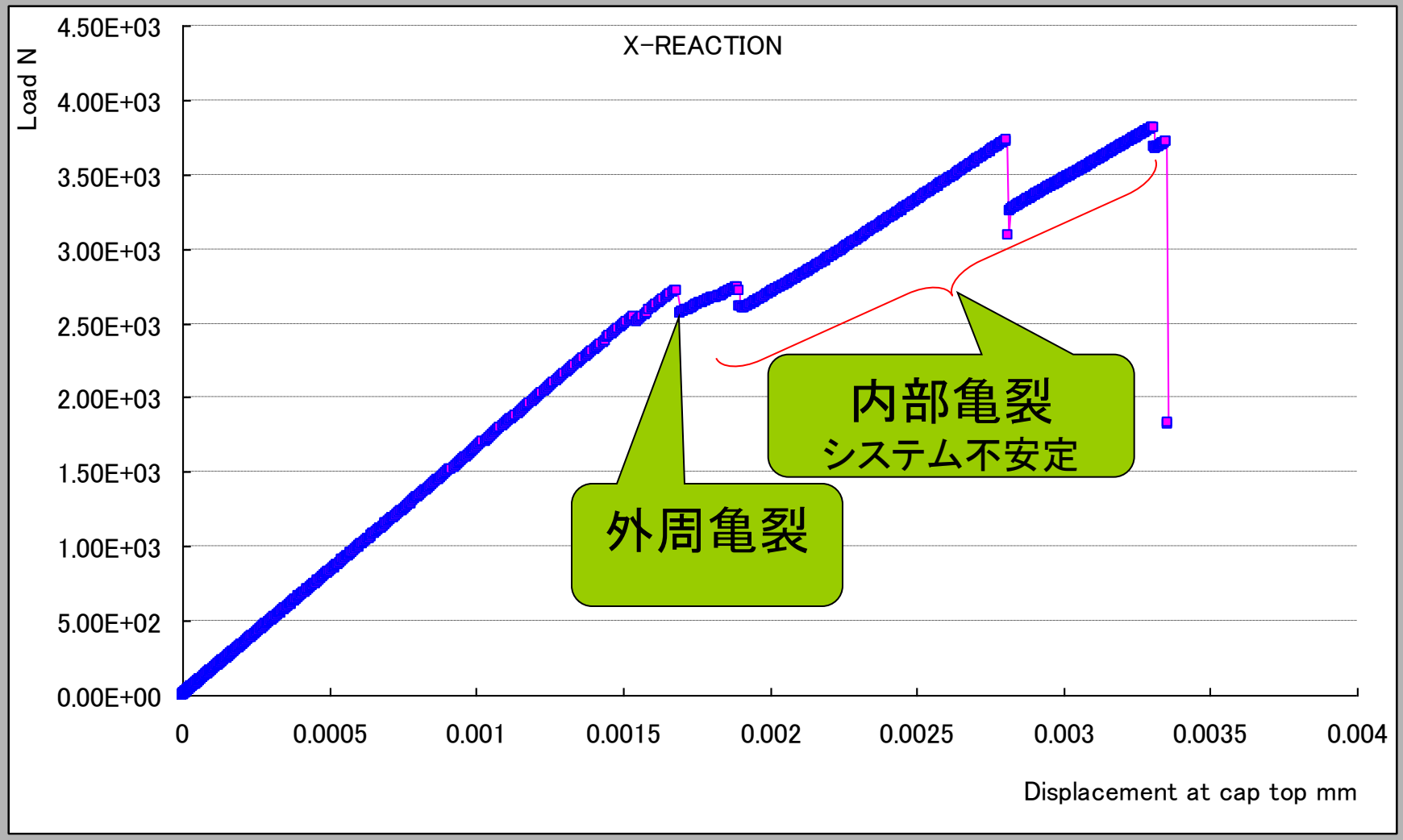
Strain Distribution



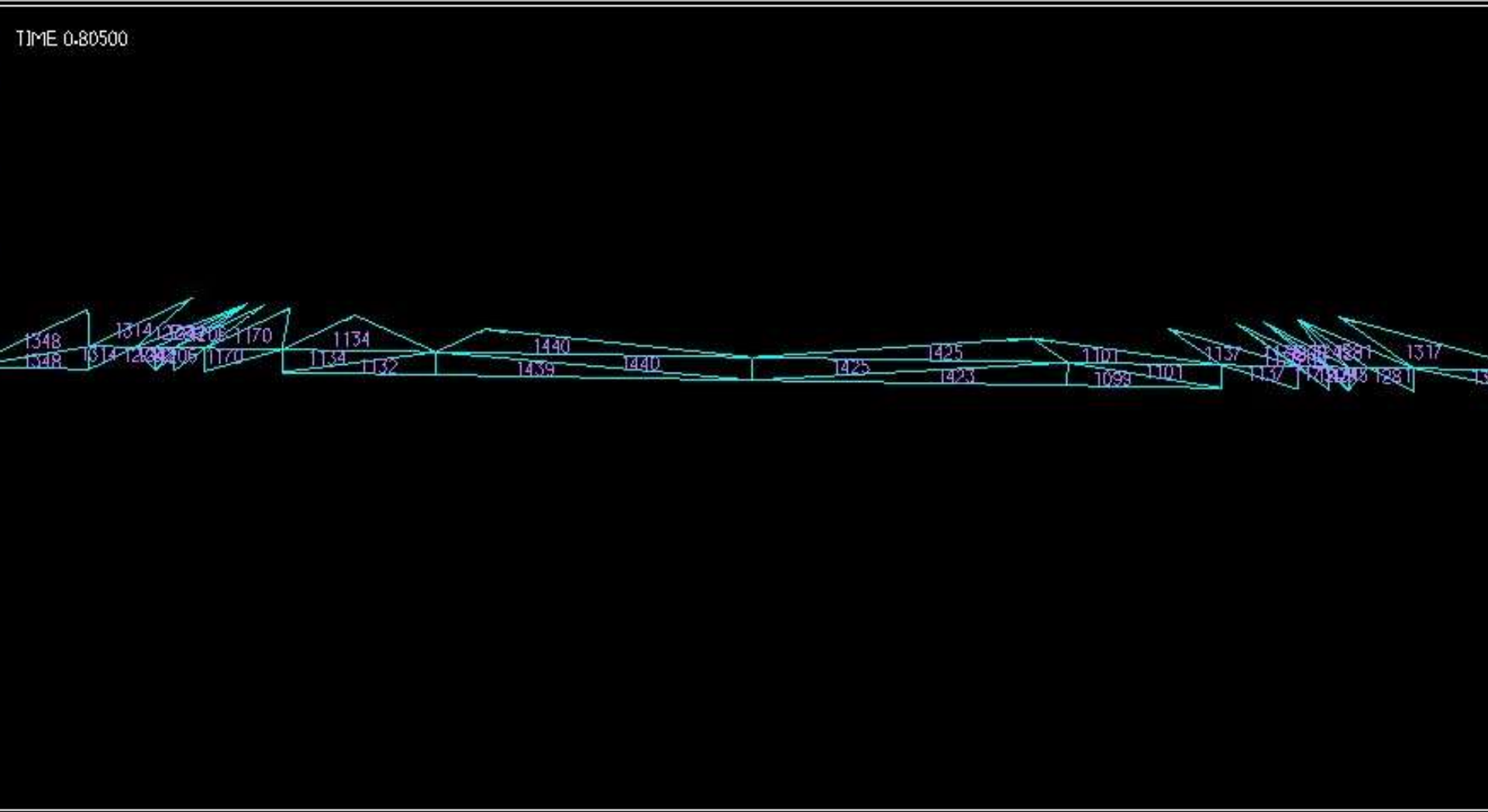
変位の分布



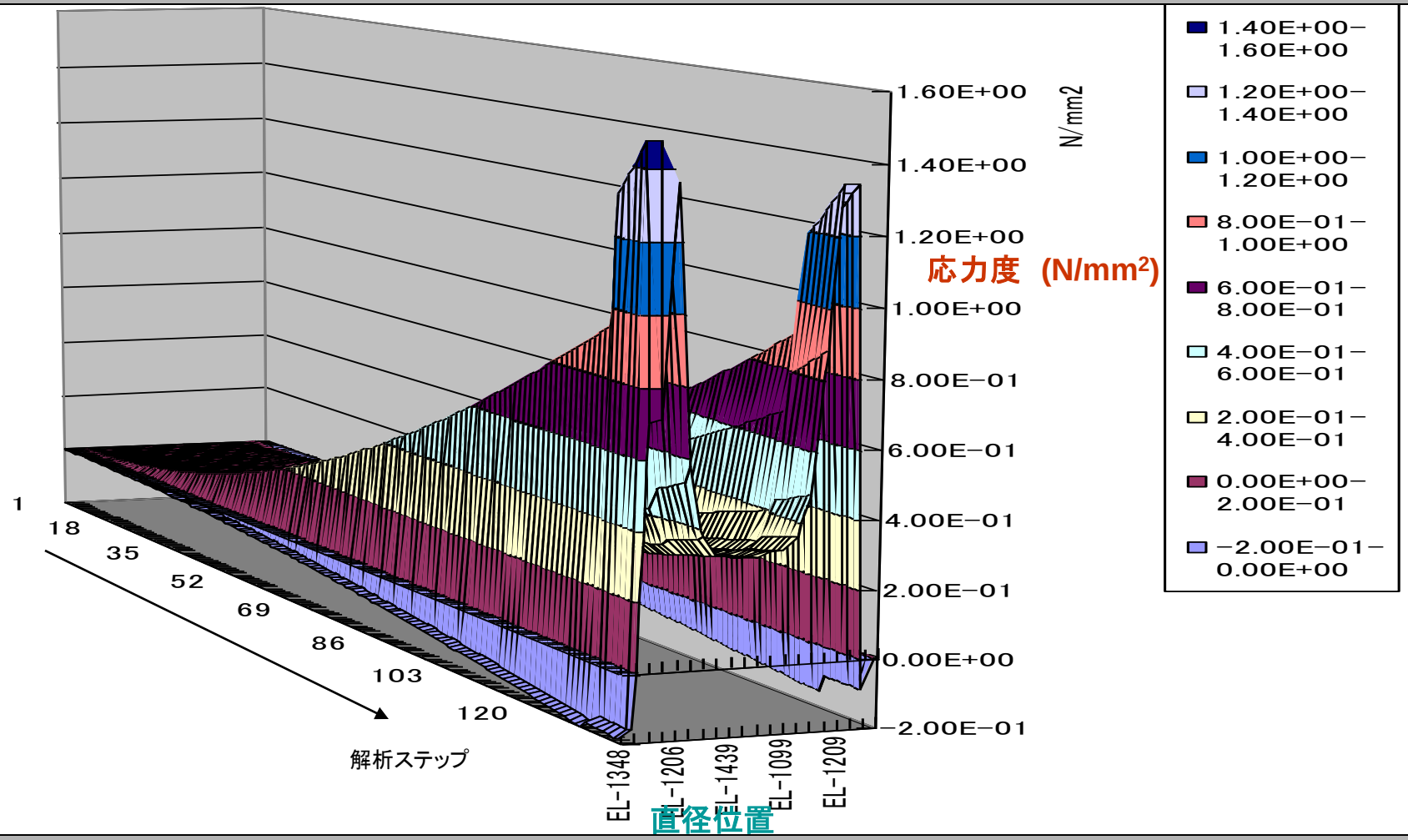
荷重-変位曲線


X-REACTION
Load N
4.50E+03
4.00E+03
3.50E+03
3.00E+03
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
0
0.0005
0.001
0.0015
0.002
0.0025
0.003
0.0035
0.004
Displacement at cap top mm
内部亀裂
システム不安定
外周亀裂

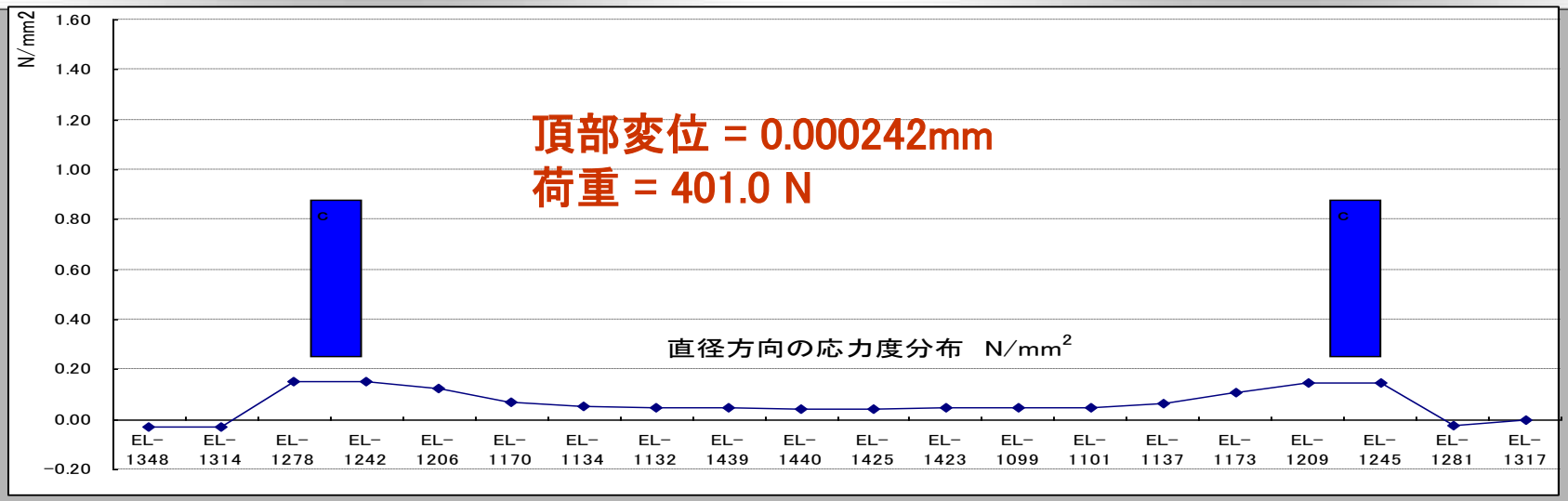
直径上の要素分布

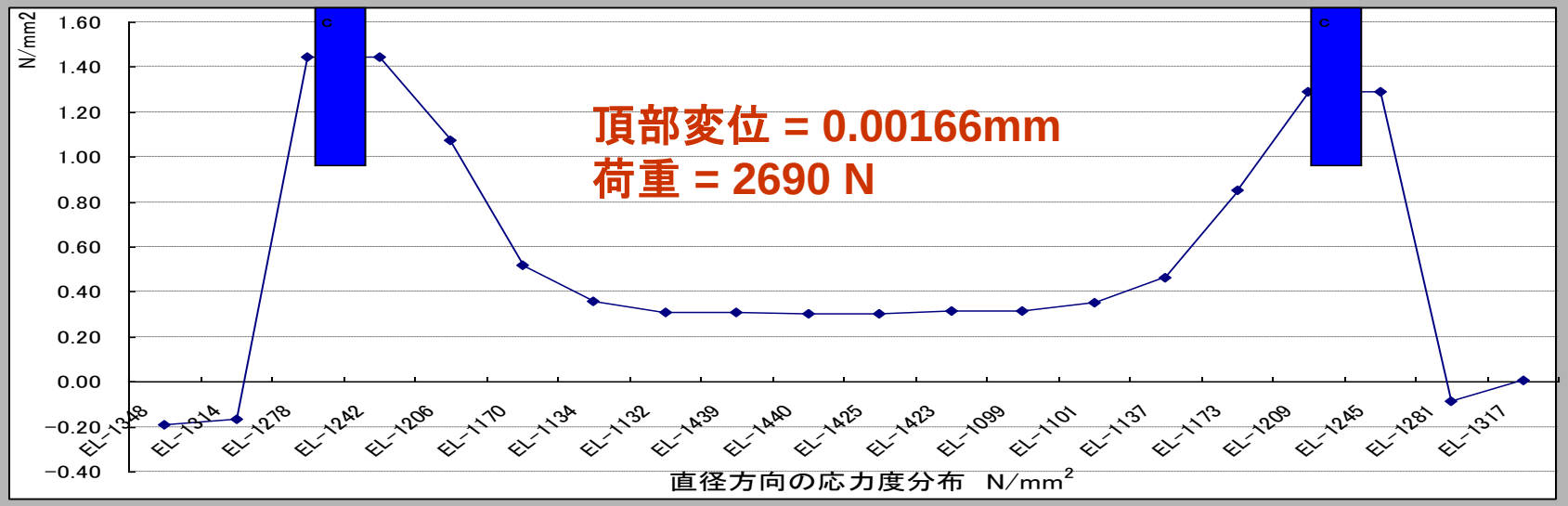


直径上の応力度の分布

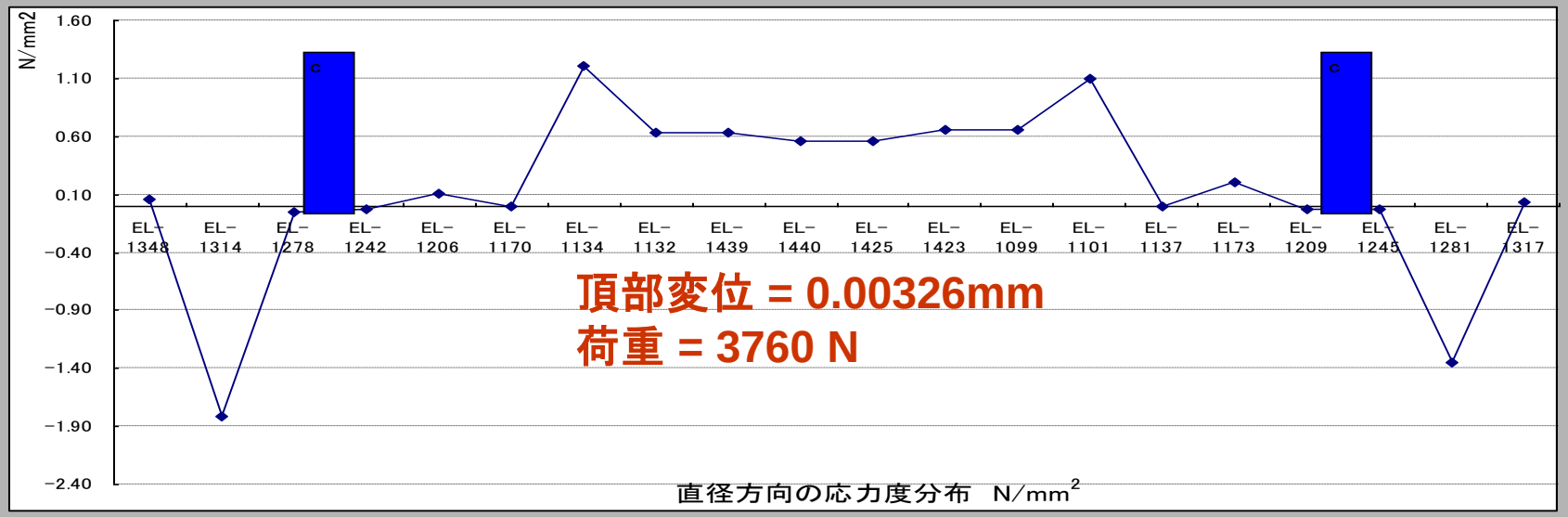

1.40E+00−1.60E+00
1.20E+00−1.40E+00
1.00E+00−1.20E+00
8.00E−01−1.00E+00
6.00E−01−8.00E−01
4.00E−01−6.00E−01
2.00E−01−4.00E−01
0.00E+00−2.00E−01
−2.00E−01−0.00E+00
1.60E+00
1.40E+00
1.20E+00
1.00E+00
8.00E−01
6.00E−01
4.00E−01
2.00E−01
0.00E+00
−2.00E−01
N/mm2
応力度 (N/mm²)
1
18
35
52
69
86
103
120
解析ステップ
EL-1348
EL-1206
EL-1439
EL-1099
EL-1209
直径位置

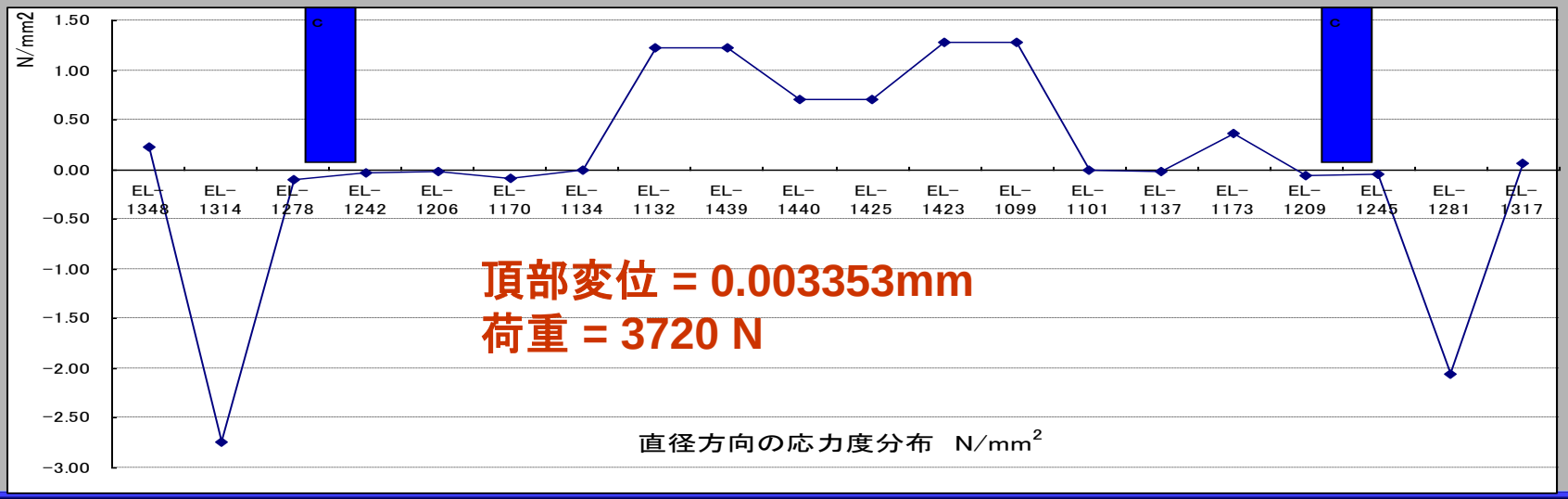
直径上の応力度分布の変化(1)



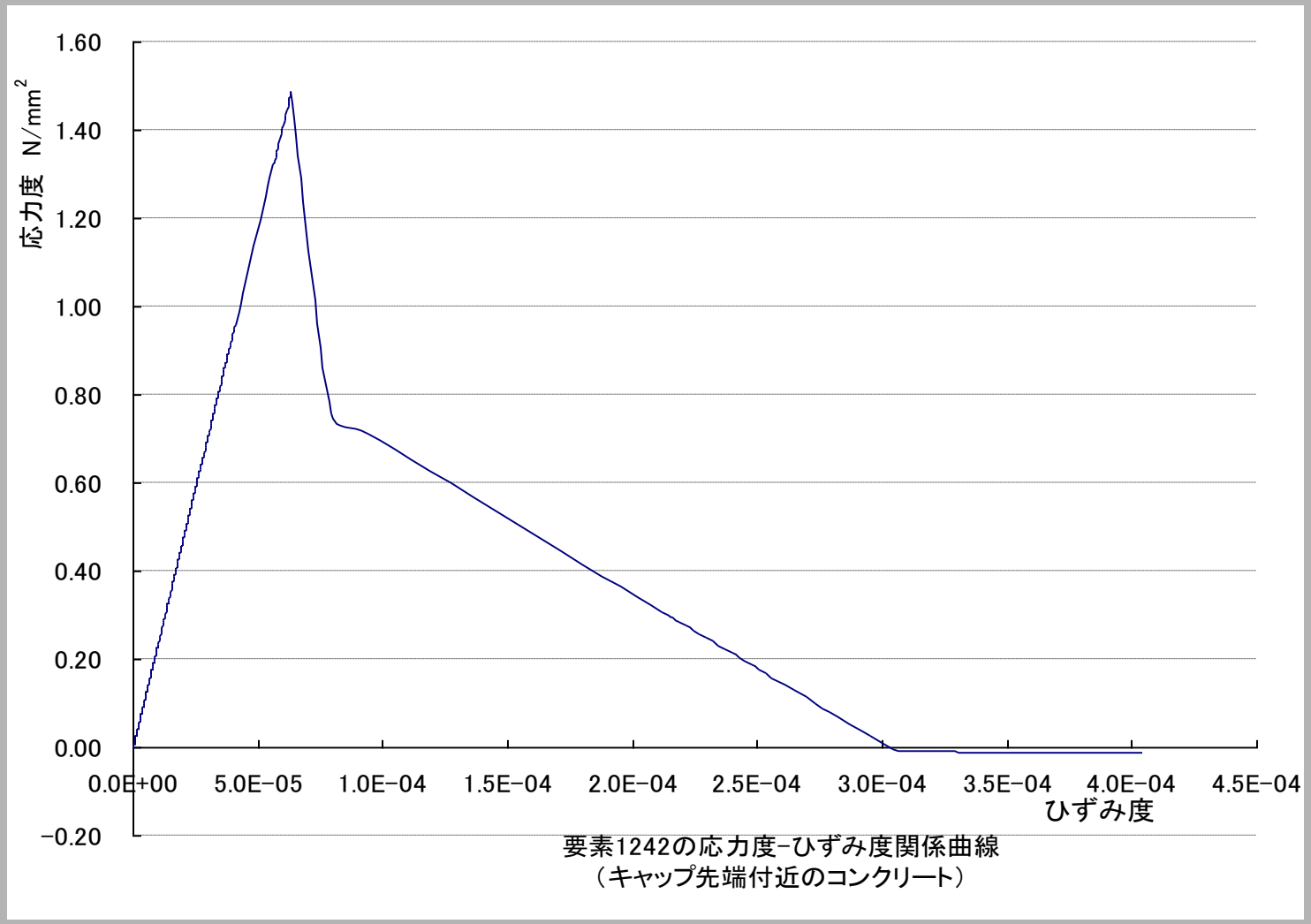


直径上の応力度分布の変化(2)





応力度-歪み度関係



要素1242の応力度−ひずみ度関係曲線
（キャップ先端付近のコンクリート）

動画シミュレーション