

# Salome-Mecaを使用した 構造解析入門

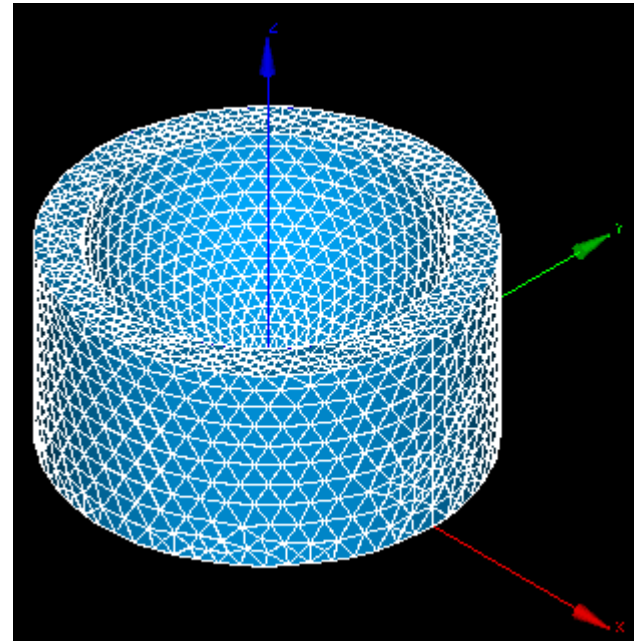
秋山善克

# Salome-Mecaとは・・・

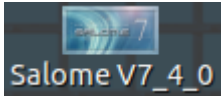
- EDF(フランス電力公社)が提供しているLinuxベースのオープンソース
- Code\_Aster : 解析ソルバー
- Salome-Meca : プリポストを中心とした統合プラットフォーム:[SALOME Platform](#)に、Code\_Asterをモジュールとして組み込んだもの
- Code\_Asterは、構造力学、熱力学を中心に非常に高度で多彩な機能と400を超える要素(1次元、2次元、3次元ほか)を有しています。また、2000以上のテストケースと、13000ページ以上のドキュメント(使用方法、テクニック、理論的背景)、公式フォーラムなどがあり、他のオープンソースCAEソフトと較べてサポート体制が充実しているのが特長です。
- <https://sites.google.com/site/codeastersalomemeca/> より
- インストール方法、使い方等上記ページを参照してください

# 本日の演習内容

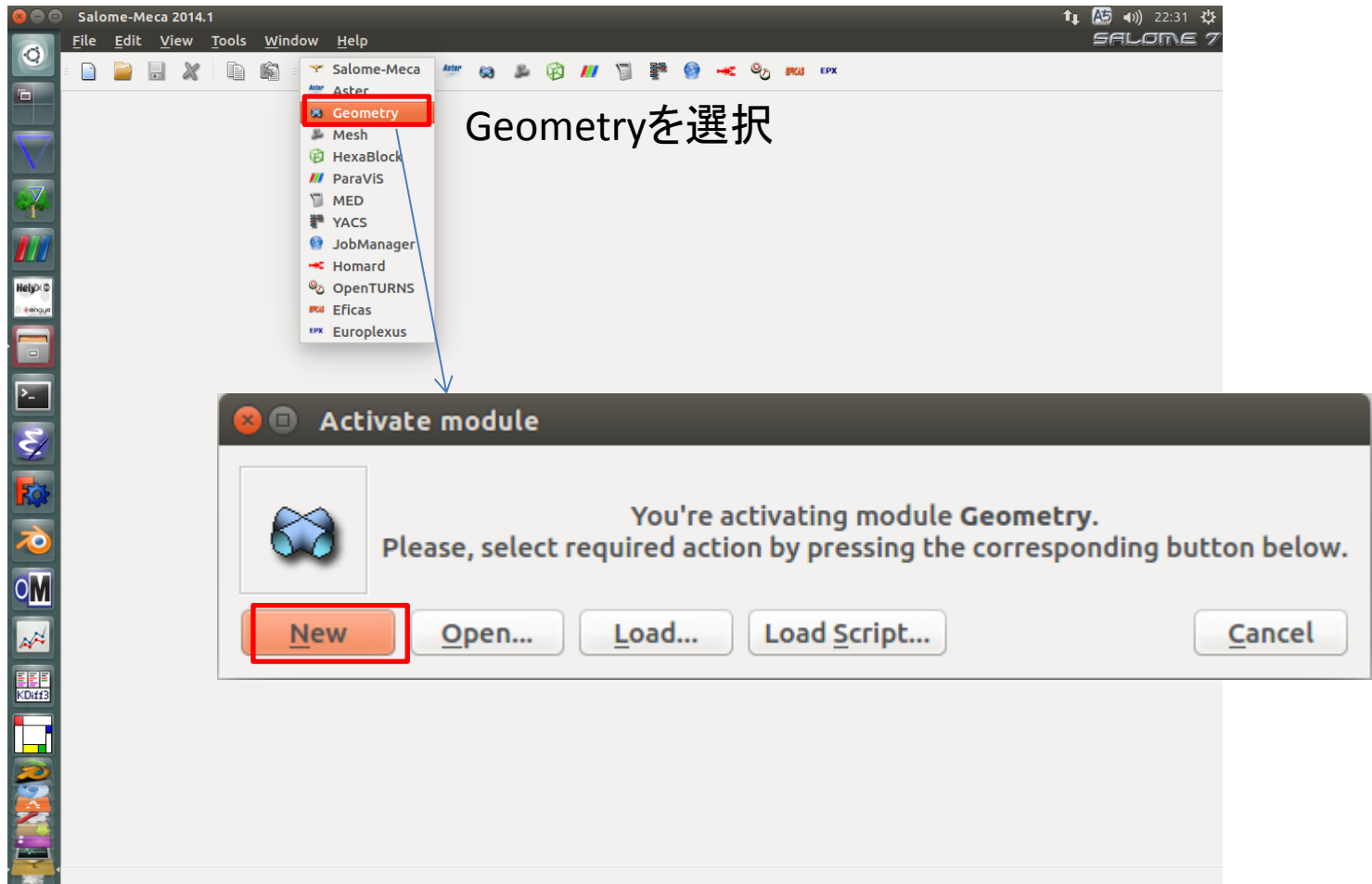
- 演習4 面荷重、線荷重、点荷重による解析
- 演習5 重力による解析
- 演習6 対称条件による解析
- 演習7 二種材料による解析



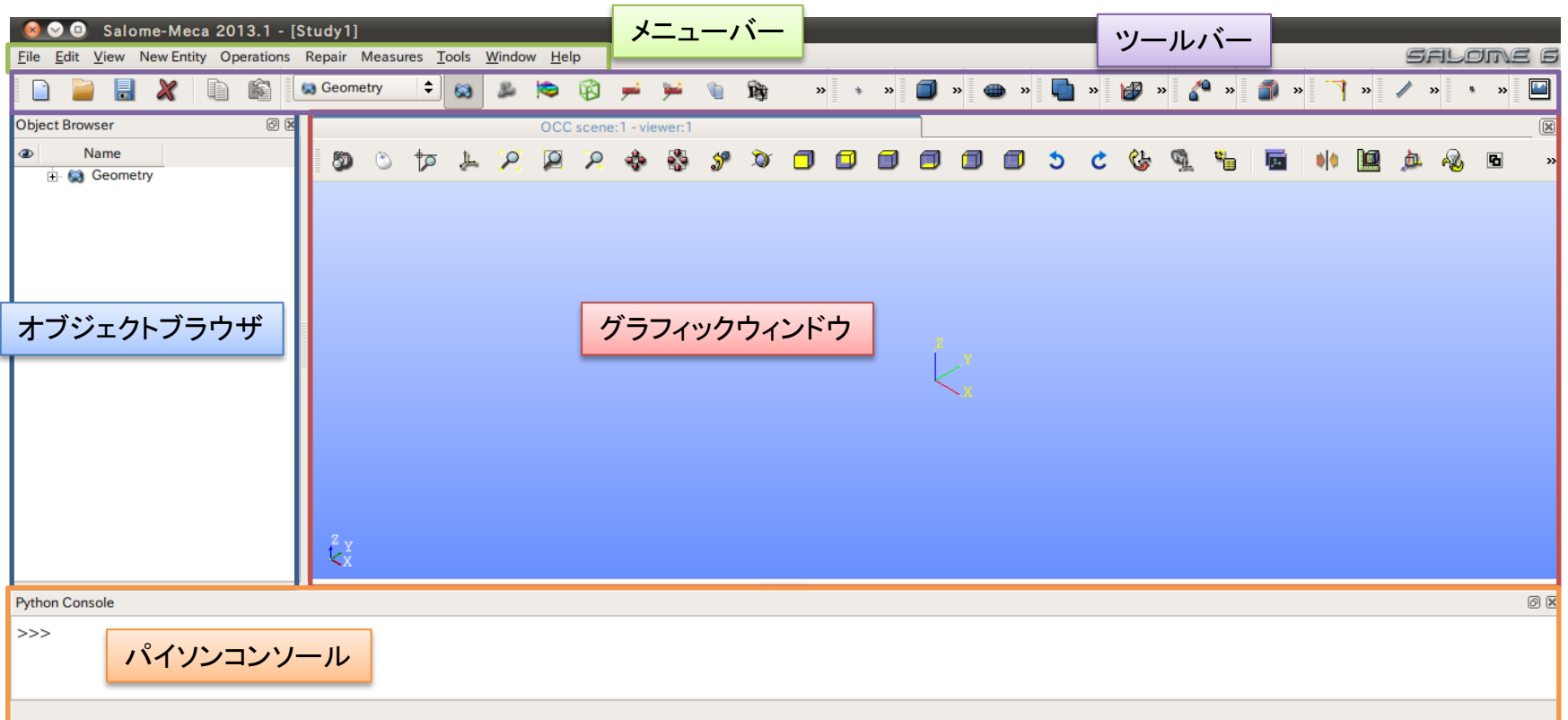
# Salome-Mecaの起動



デスクトップ上のアイコンをクリック

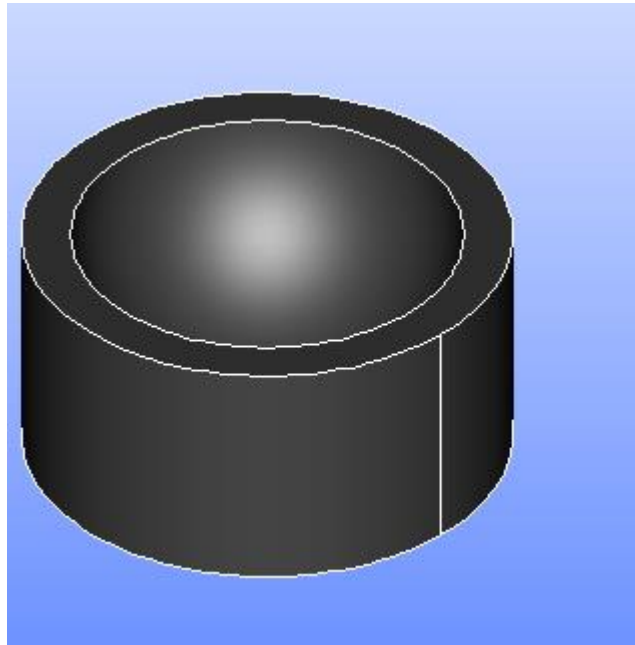


# Geometry起動画面



# 演習1 Primitivesによるモデル作成

- ①XY平面を底面基準とし、Z軸を中心軸とする半径50mm、高さ50mmの円柱を作成する。(ソリッドモデルA)
- ②座標値(0,0,50)を中心とする半径40mmの球形状を作成する。(ソリッドモデルB)
- ③円柱(ソリッドモデルA)と球(ソリッドモデルB)を組み合わせる。

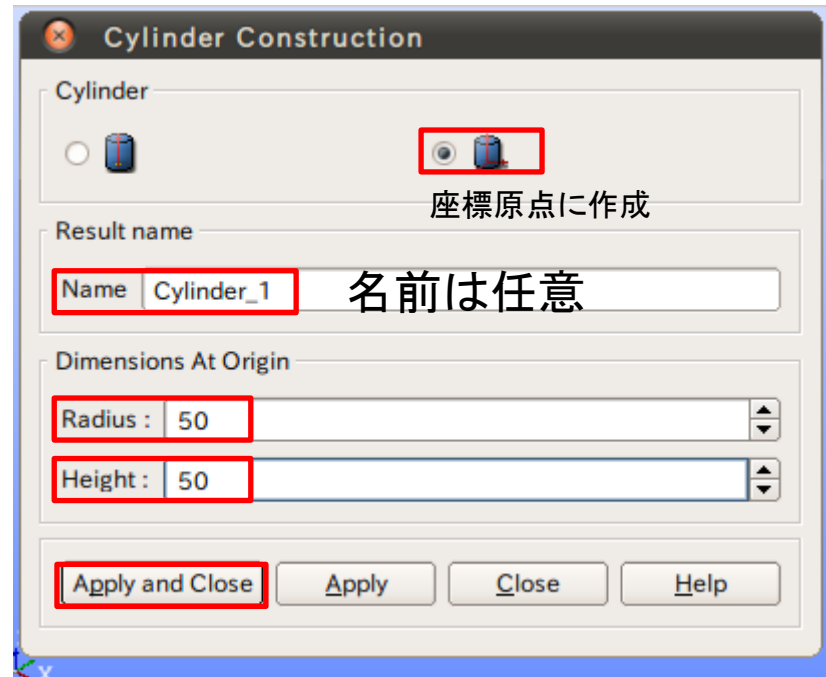
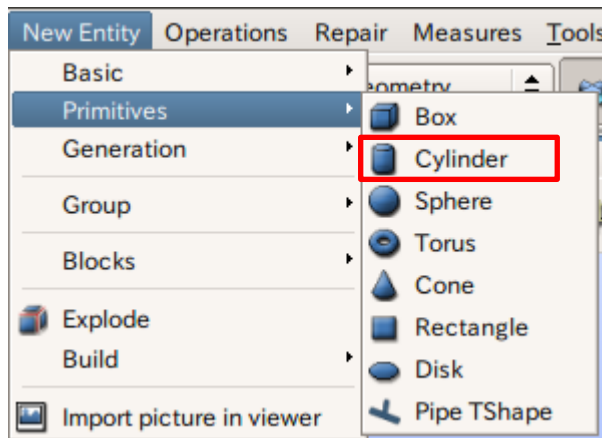


# 演習1 Primitivesによるモデル作成

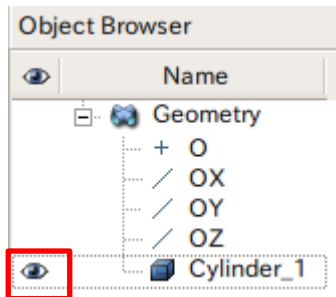
- ①XY平面を底面基準とし、Z軸を中心軸とする半径50mm、高さ50mmの円柱を作成する。  
(ソリッドモデルA)

## 円柱の作成

New Entity>Primitives>Cylinder



連続して作成する場合はApply



オブジェクトブラウザに追加される

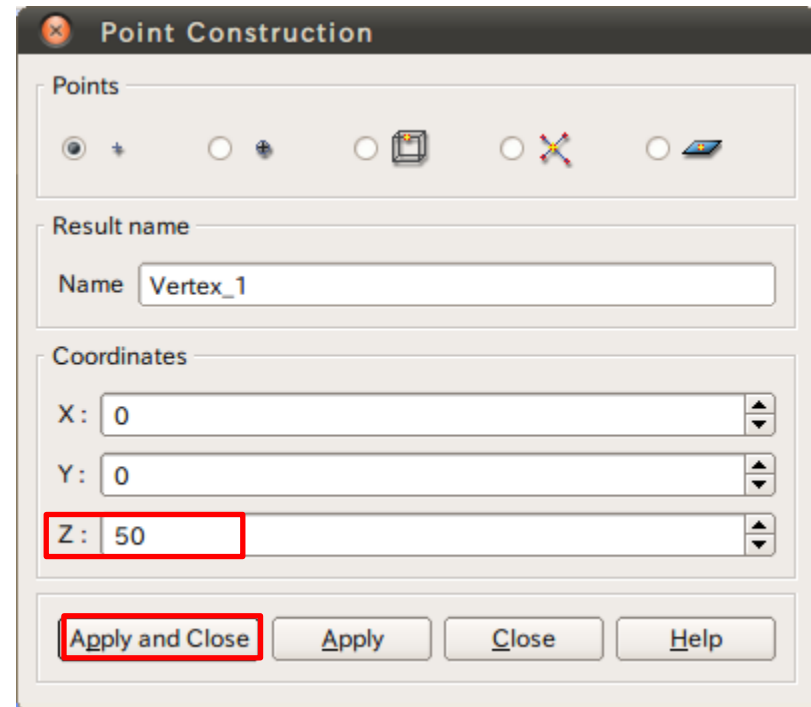
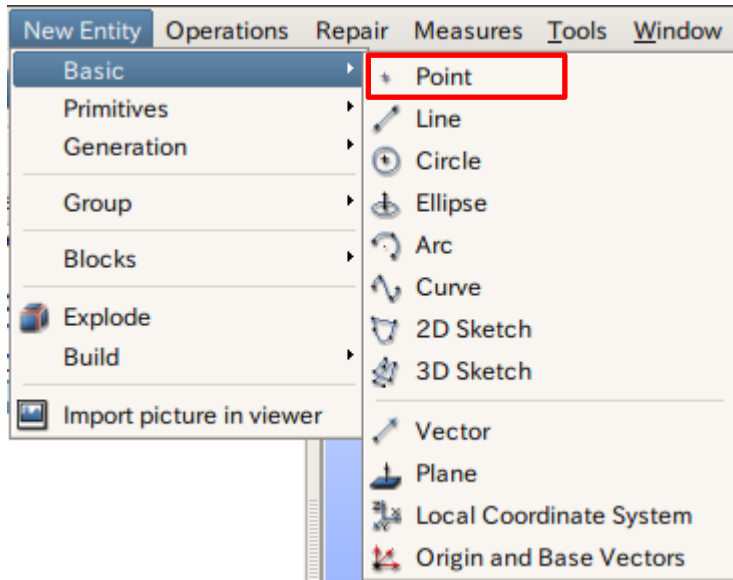
表示/非表示切り替え

# 演習1 Primitivesによるモデル作成

②座標値(0,0,50)を中心とする半径40mmの球形状を作成する。(ソリッドモデルB)

## 点の作成

New Entity>Basic>Point



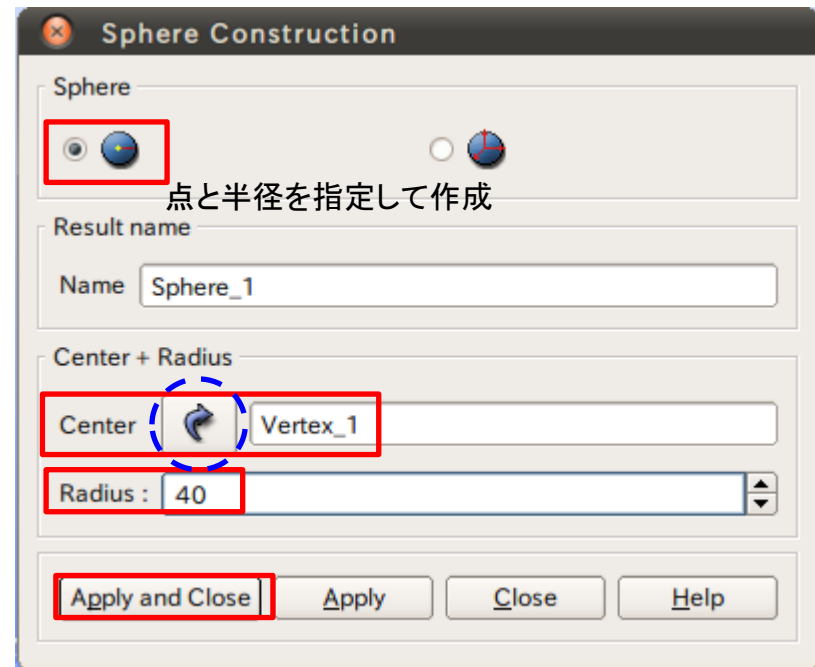
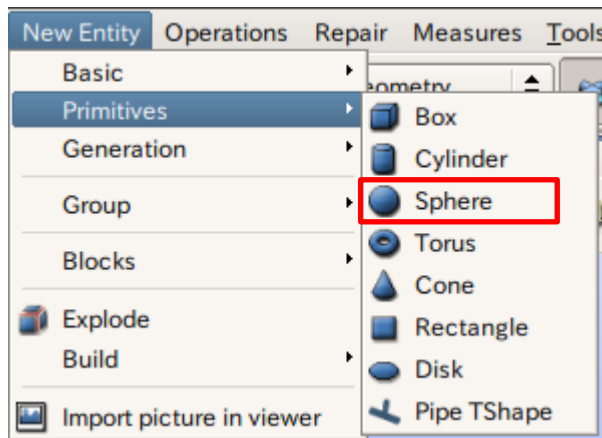


# 演習1 Primitivesによるモデル作成

②座標値(0,0,50)を中心とする半径40mmの球形状を作成する。(ソリッドモデルB)

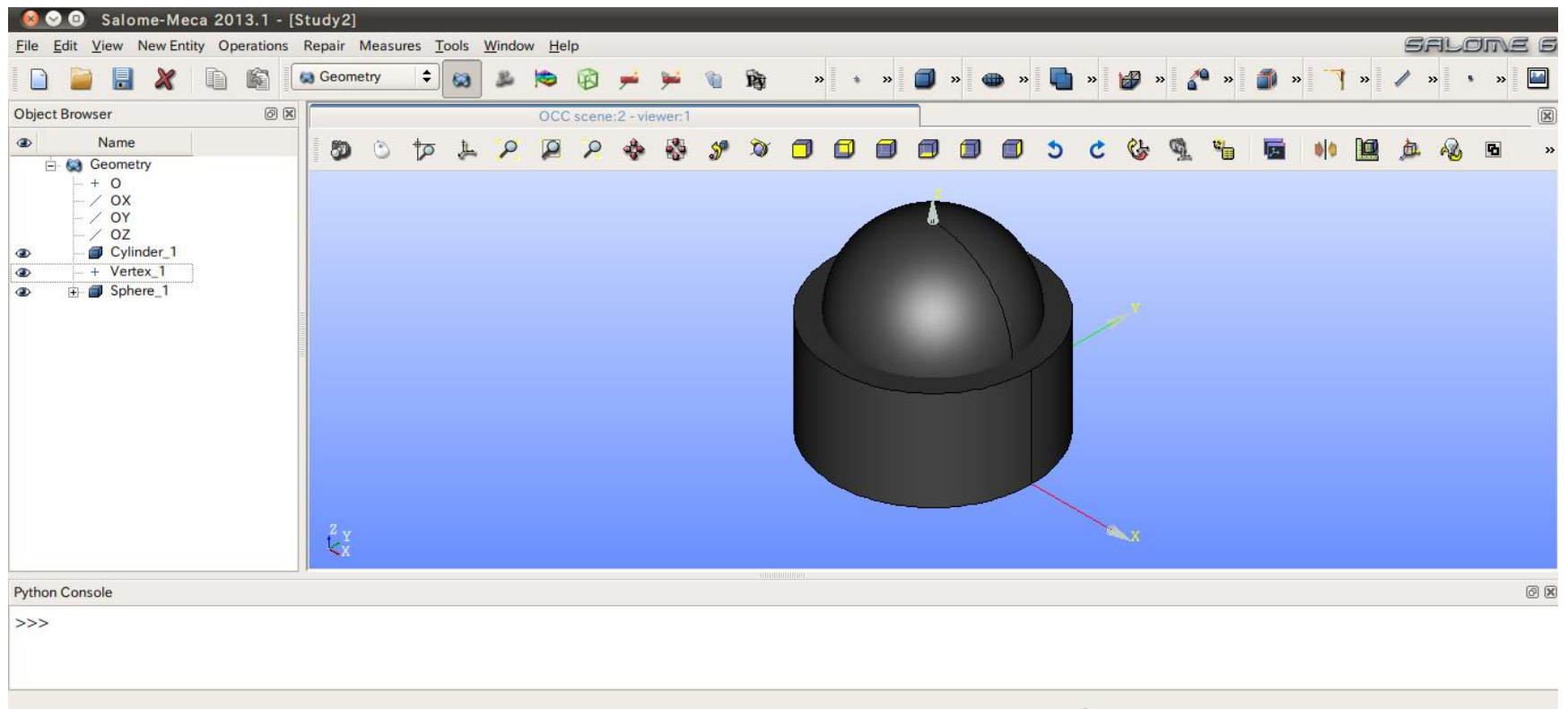
## 球の作成

New Entity>Primitives>Sphere



矢印を選択するとグラフィックウインドウまたはオブジェクトブラウザから選択可能

# 演習1 Primitivesによるモデル作成

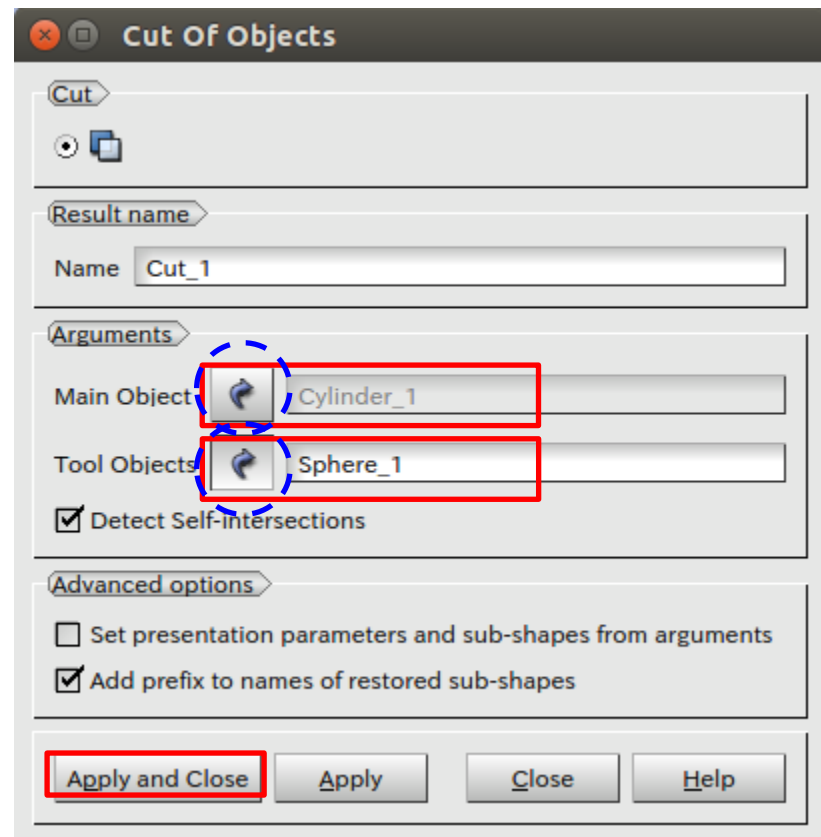
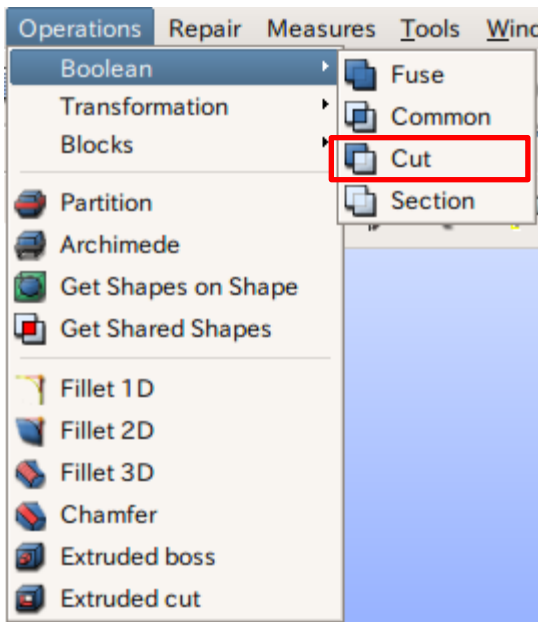


# 演習1 Primitivesによるモデル作成

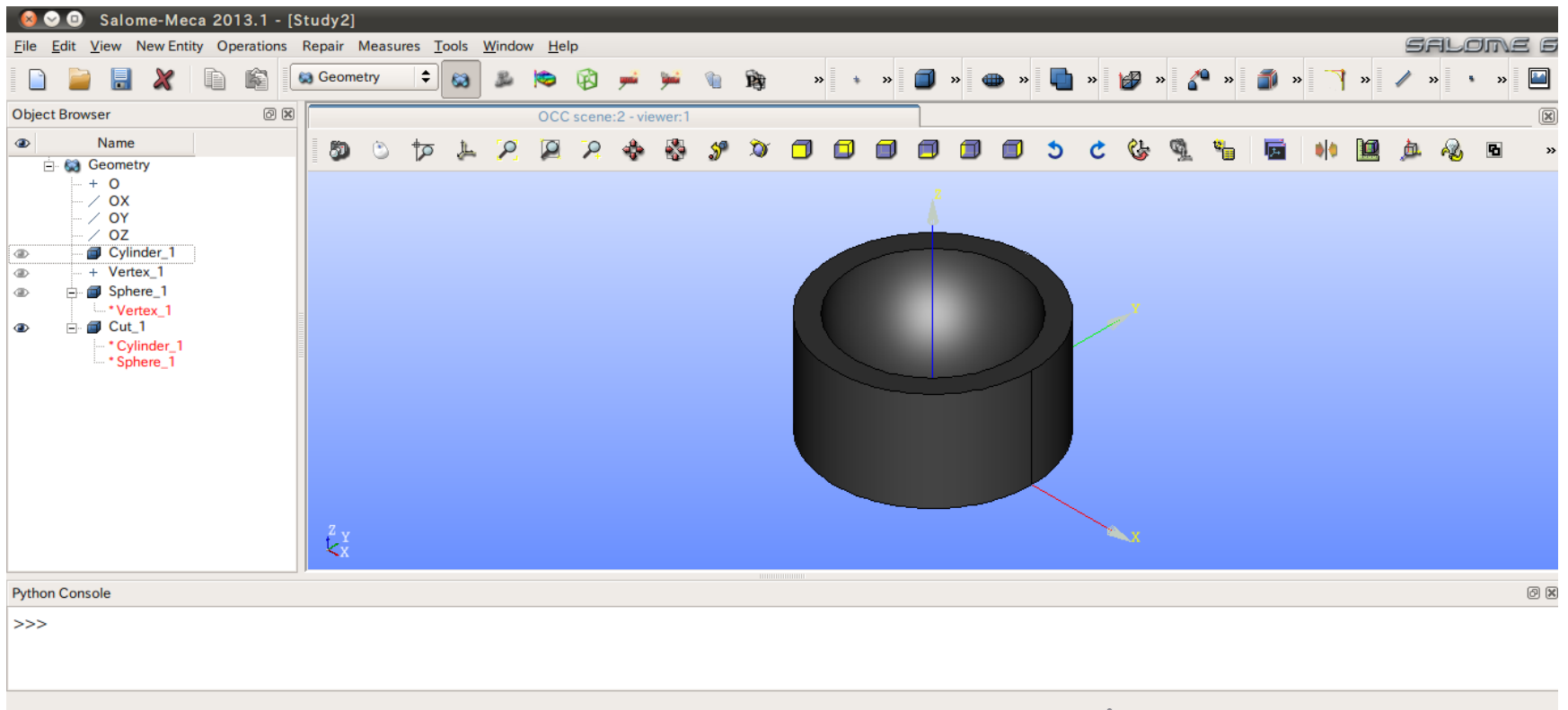
③円柱(ソリッドモデルA)と球(ソリッドモデルB)を組み合わせる。

## 球の作成

Operations>Boolean>Cut



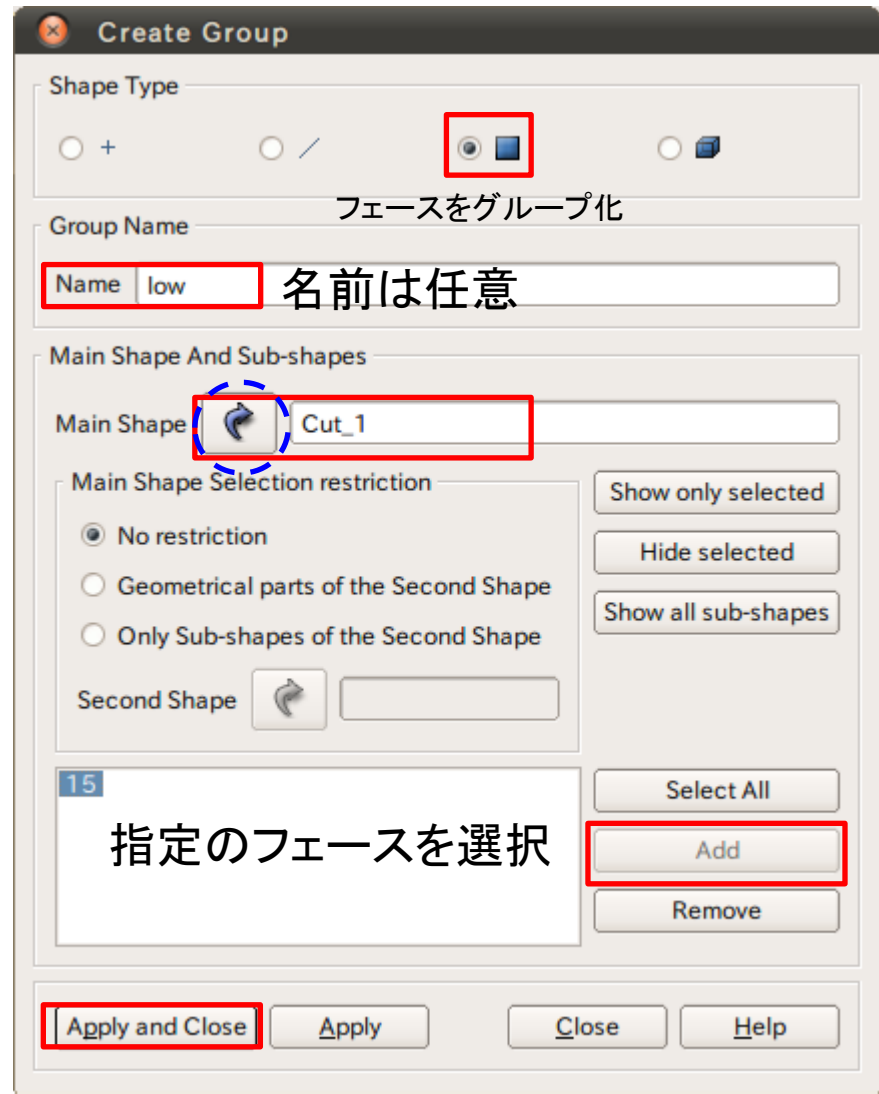
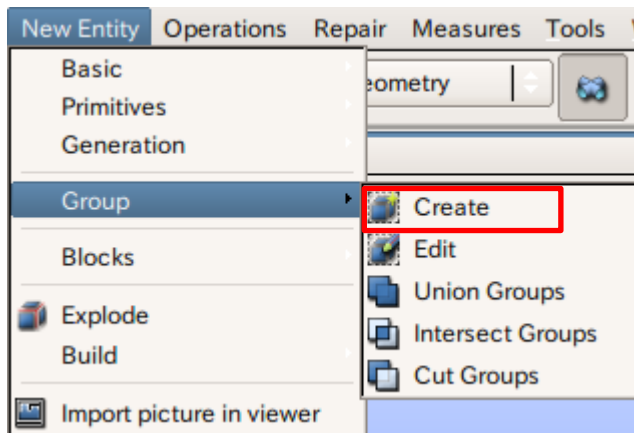
# 演習1 Primitivesによるモデル作成



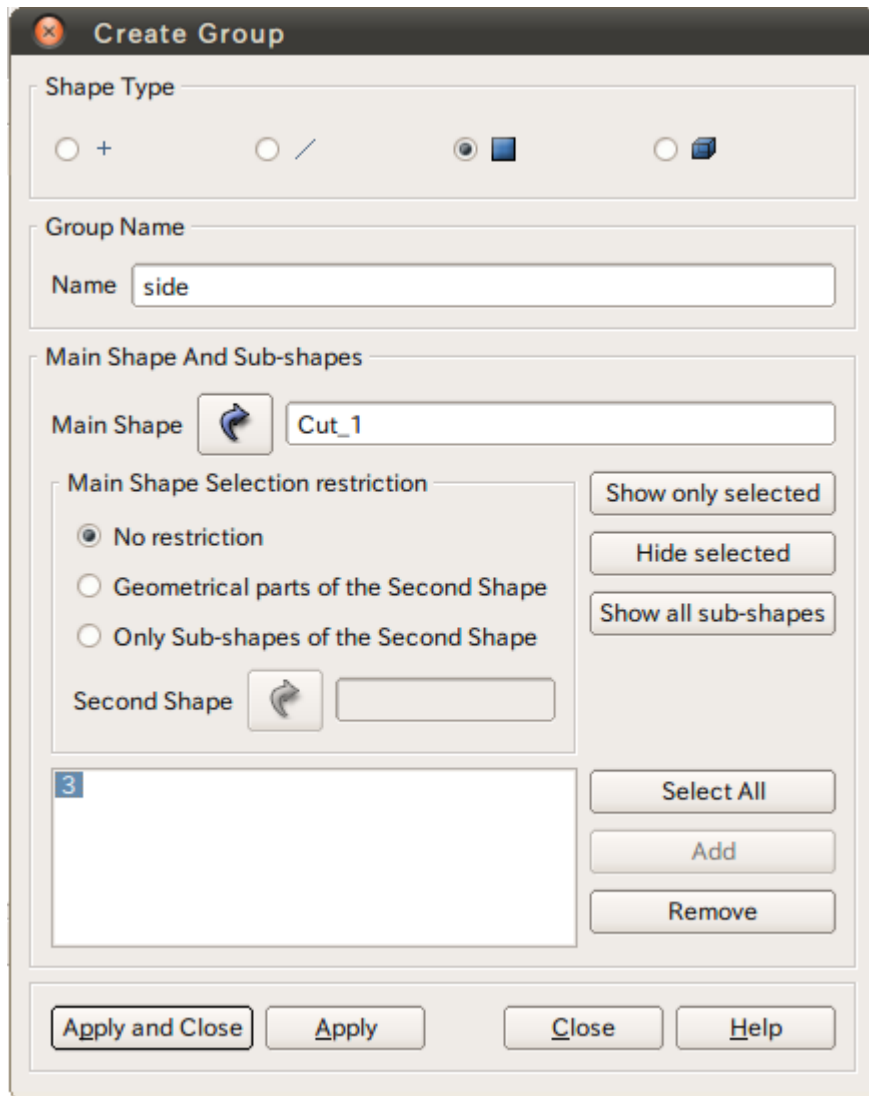
# 演習1 グループの作成

## グループの作成

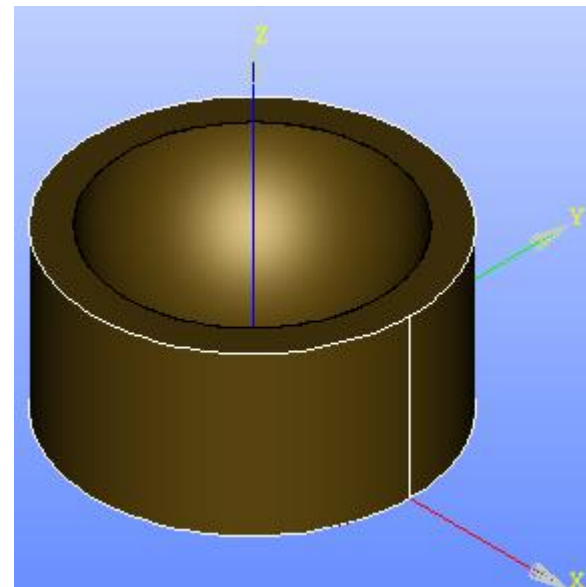
New Entity>Group>Create



# 演習1 グループの作成



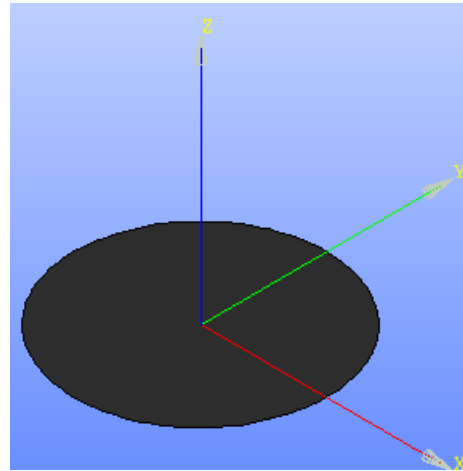
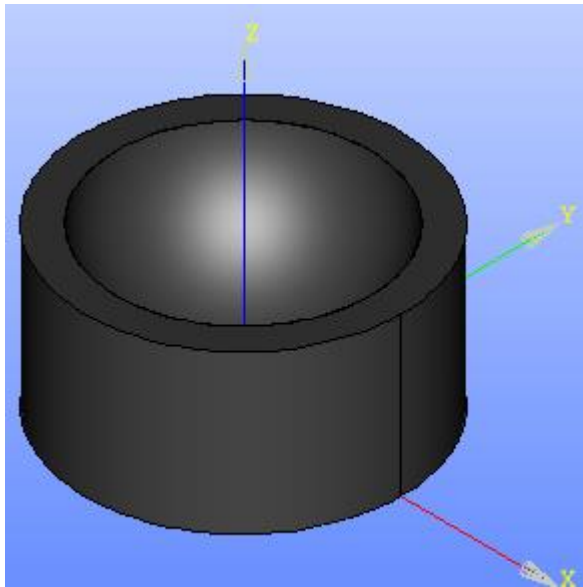
作成中



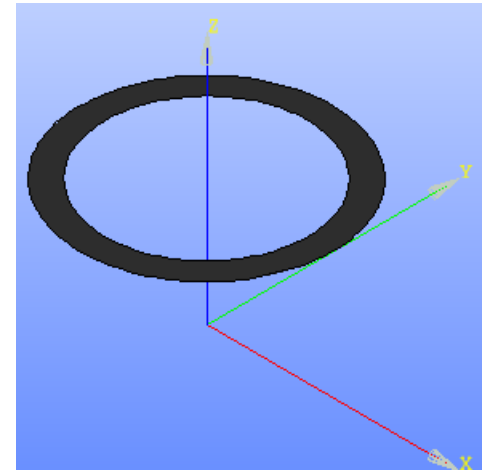
選択するとハイライトされる

# 演習1 グループの作成

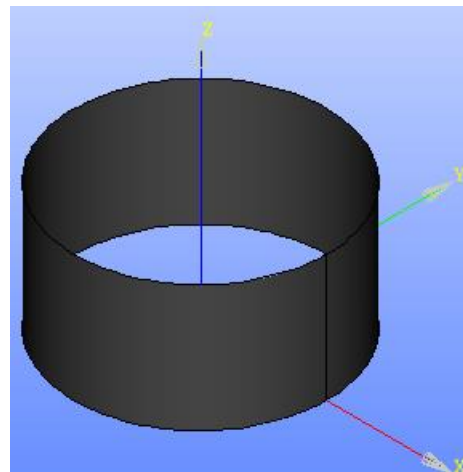
グループの作成



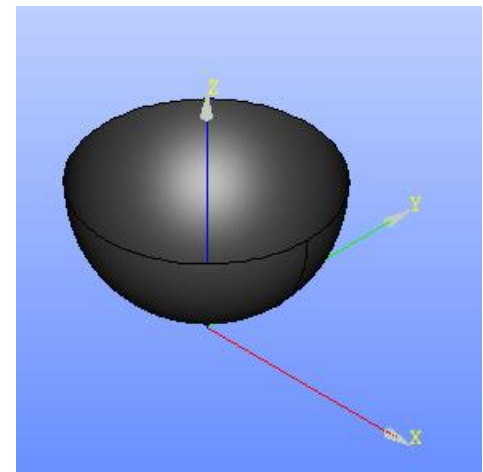
low



up

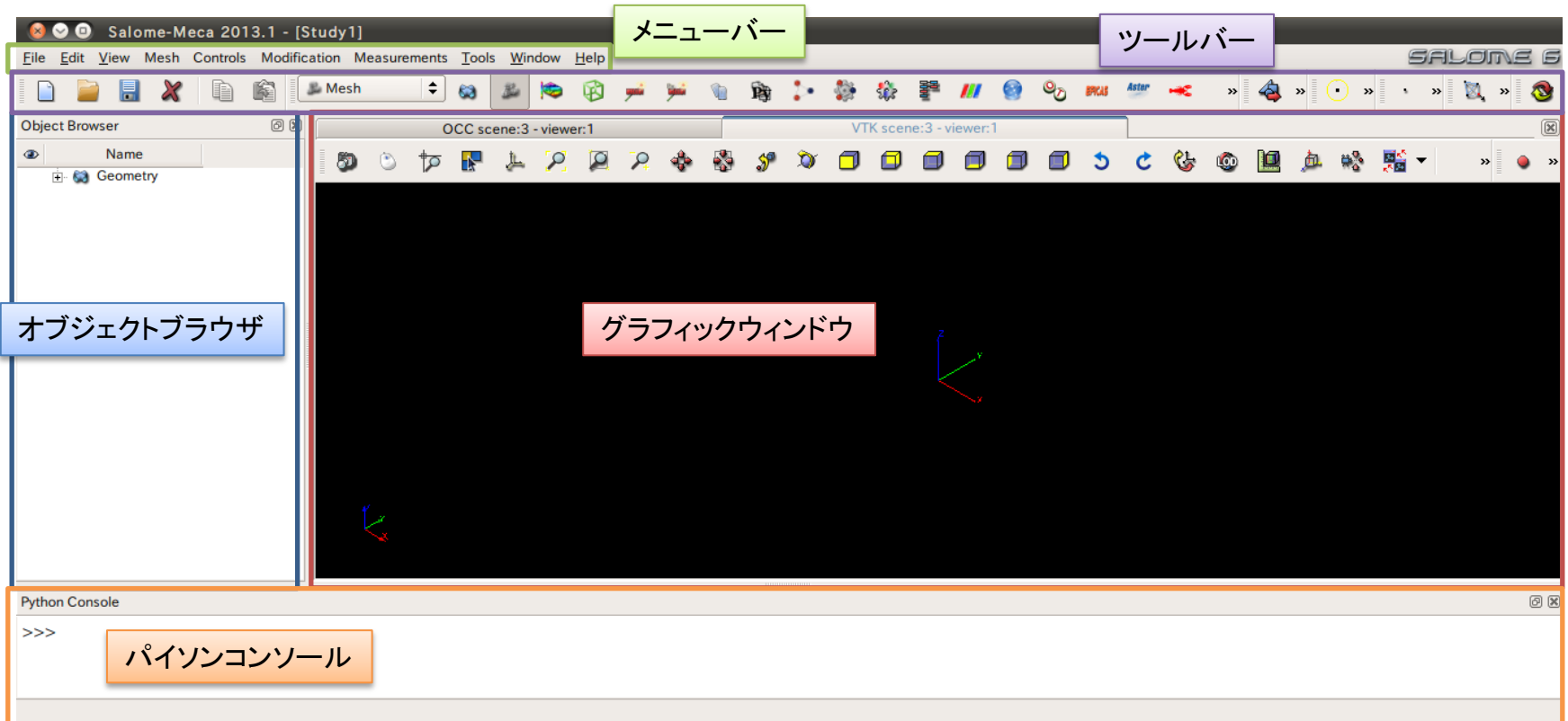


side



hole

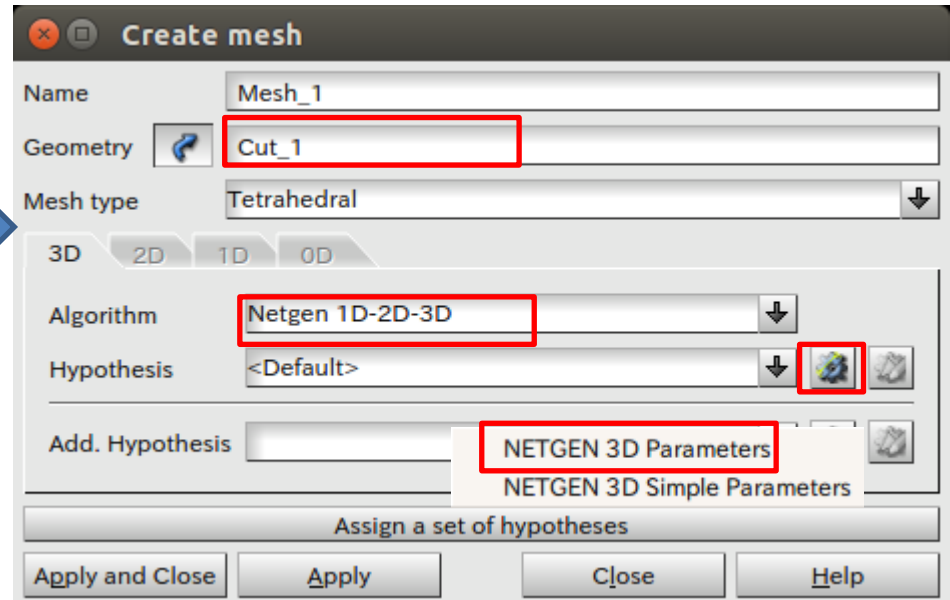
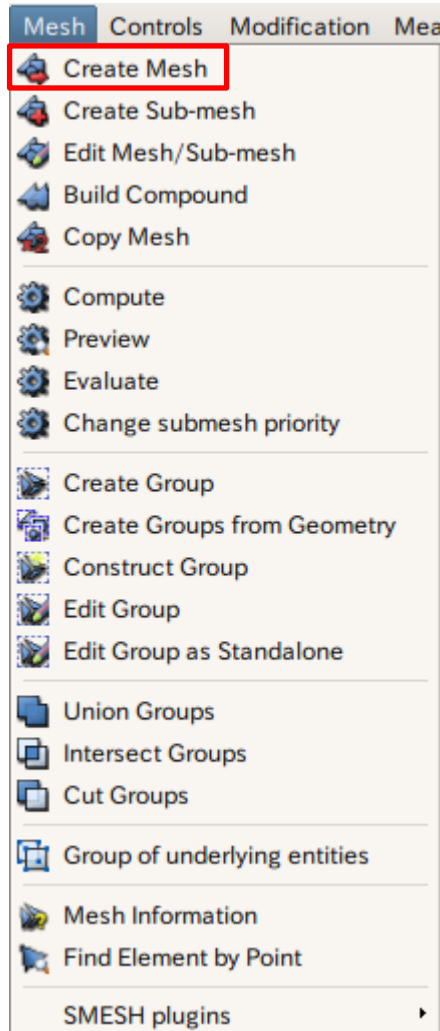
# Mesh起動画面



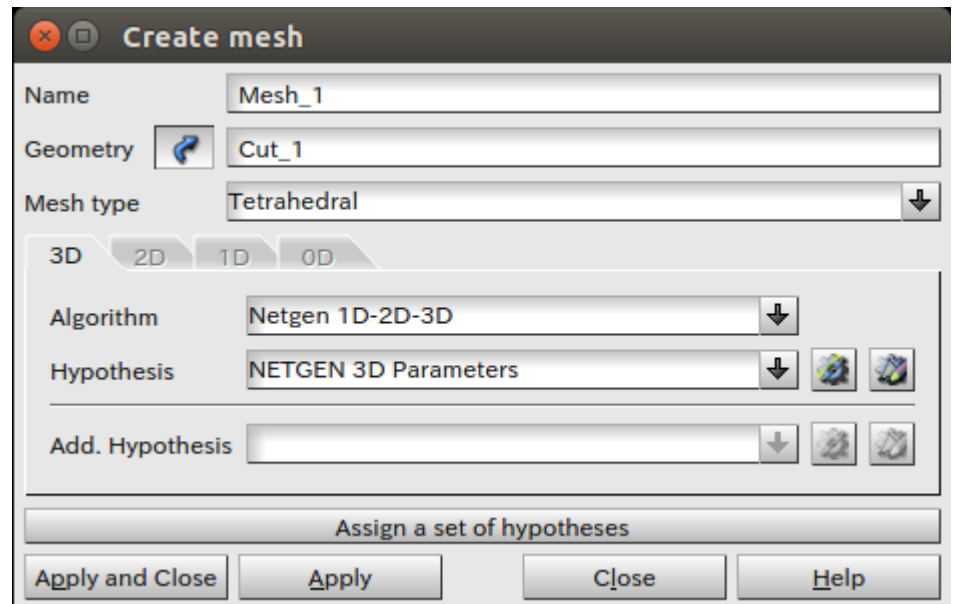
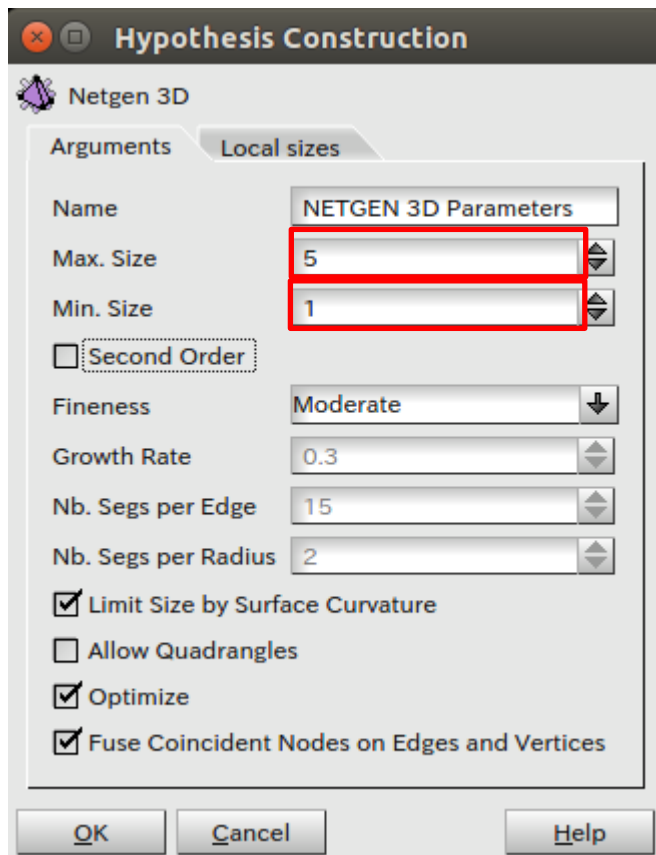


# 演習1 メッシュの作成

Mesh>Create Mesh



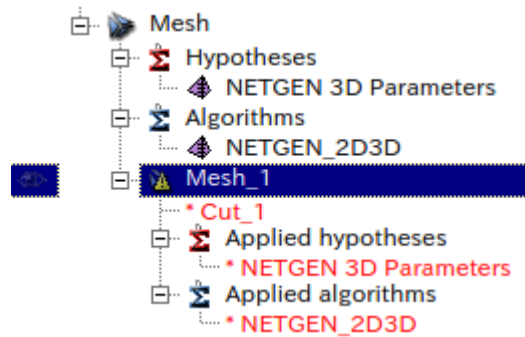
# 演習1 メッシュサイズの設定



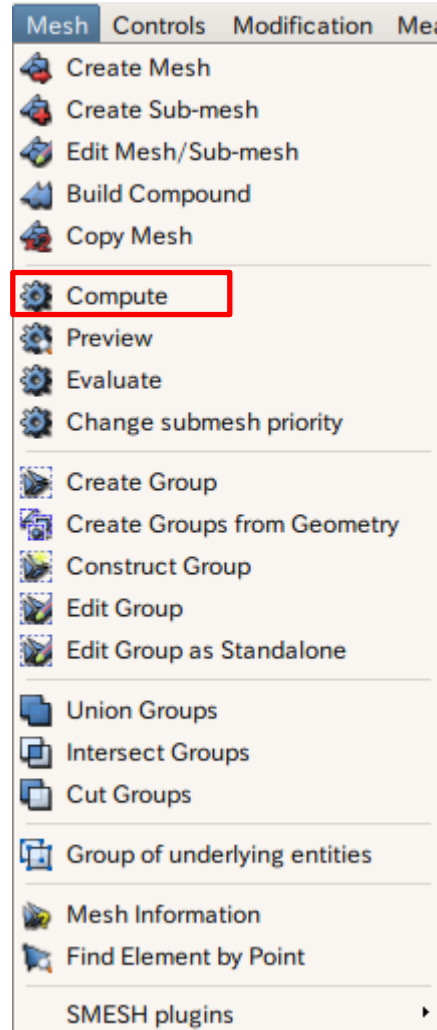
# 演習1 メッシュの作成

メッシュの作成

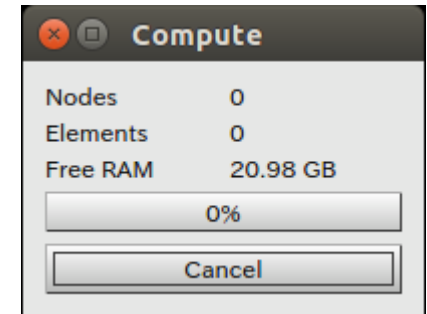
Mesh>Compute



Mesh\_1を選択



メッシュ作成中



# 演習1 メッシュの作成

Mesh computation succeed

Compute mesh

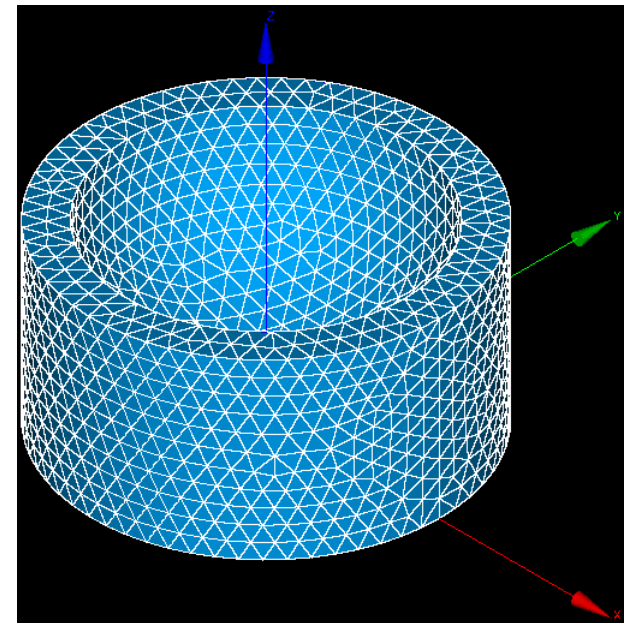
Name  
Mesh 1

Mesh Infos

	Total	Linear	Quadratic	Bi-Quadratic
Nodes :	2174			
OD Elements :	0			
Balls :	0			
Edges :	199	199	0	
Faces :	3288	3288	0	0
Triangles :	3288	3288	0	0
Quadrangles :	0	0	0	0
Polygons :	0			
Volumes :	7797	7797	0	0
Tetrahedrons :	7797	7797	0	
Hexahedrons :	0	0	0	0
Pyramids :	0	0	0	
Prisms :	0	0	0	
Hexagonal prisms :	0			
Polyhedrons :	0			

Close

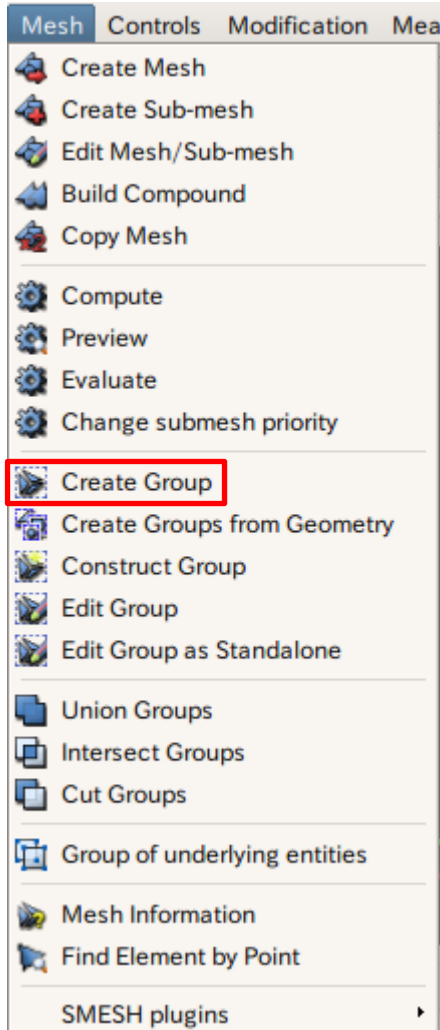
- Mesh
  - Hypotheses
    - NETGEN 3D Parameters
  - Algorithms
    - NETGEN\_2D3D
  - Mesh\_1
    - \* Cut\_1
      - \* Applied hypotheses
        - \* NETGEN 3D Parameters
      - \* Applied algorithms
        - \* NETGEN\_2D3D



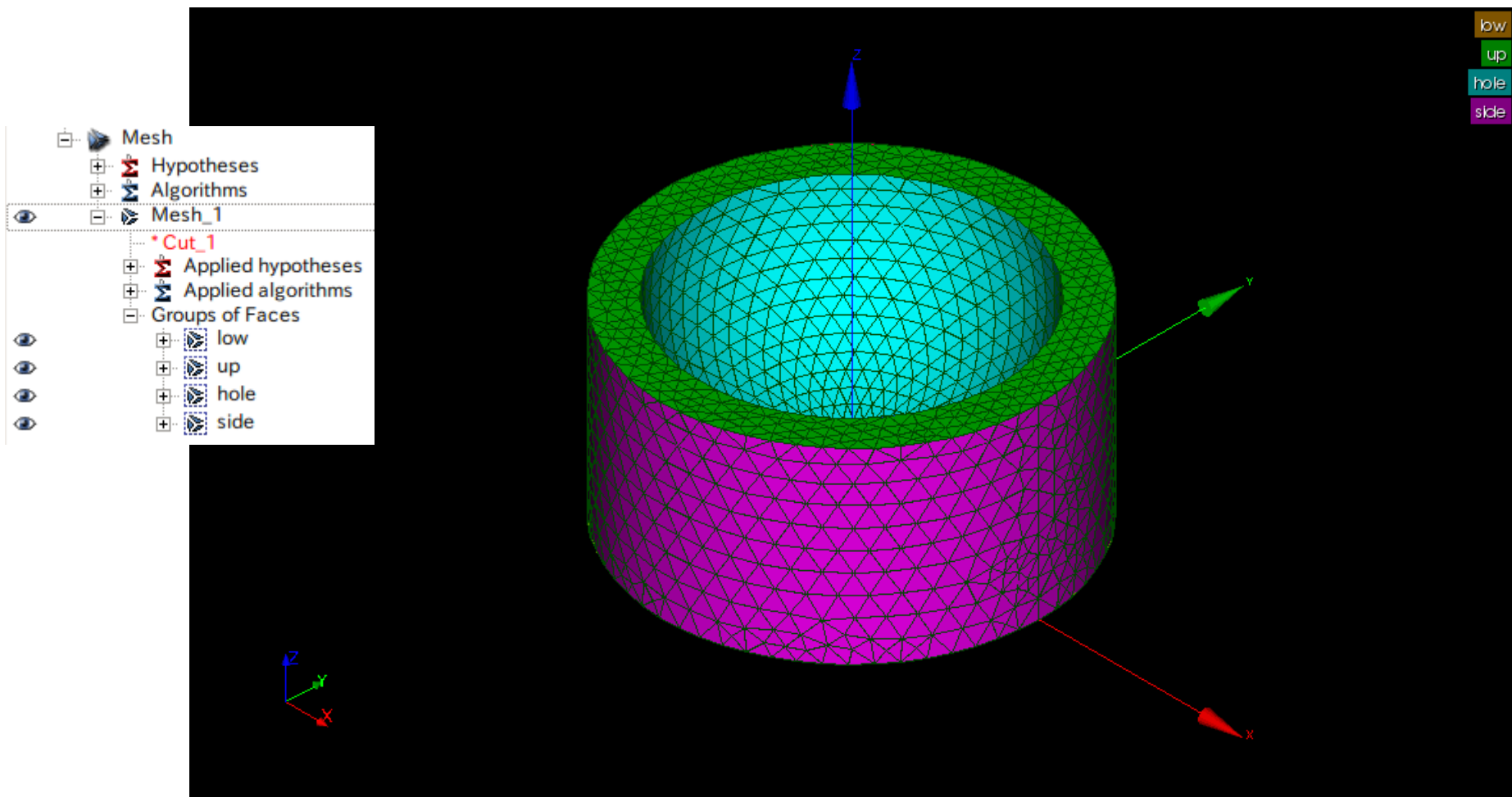
# 演習1 メッシュのグループ化

グループの作成

Mesh>Create Group

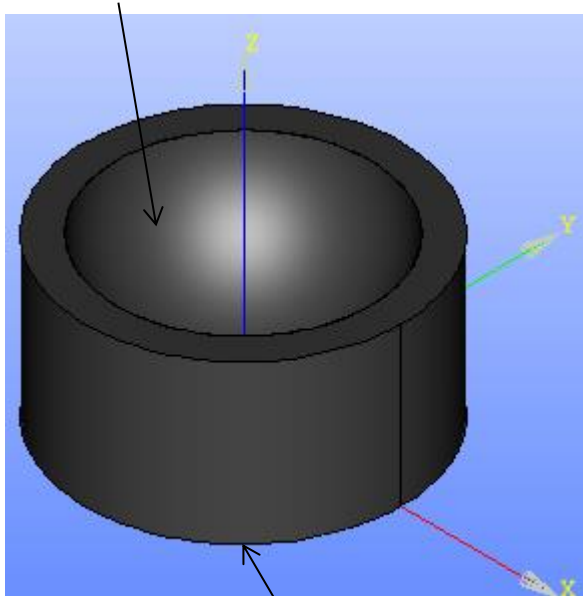


# 演習1 メッシュのグループ化



# 演習1 構造解析設定条件

圧力: 1MPa (hole)



ヤング率: 210000MPa  
ポアソン比: 0.3

完全拘束 (low)

# 単位系

	質量	長さ	時間	速度	加速度	質量密度	圧力・応力	力
次元	M	L	T	$LT^{-1}$	$LT^{-2}$	$L^{-3}M$	$L^{-1}MT^{-2}$	$LMT^{-2}$
SI単位	kg	m	s	m/s	m/s <sup>2</sup>	kg/m <sup>3</sup>	Pa	N
SI単位	ton	mm	s	mm/s	mm/s <sup>2</sup>	ton/mm <sup>3</sup>	Mpa	N
工学単位	kgf·s <sup>2</sup> /mm	mm	s	mm/s	mm/s <sup>2</sup>	kgf·s <sup>2</sup> /mm <sup>4</sup>	kgf/mm <sup>2</sup>	kgf

一般的に解析ソフトは次元をもたない→ユーザーが任意に決める

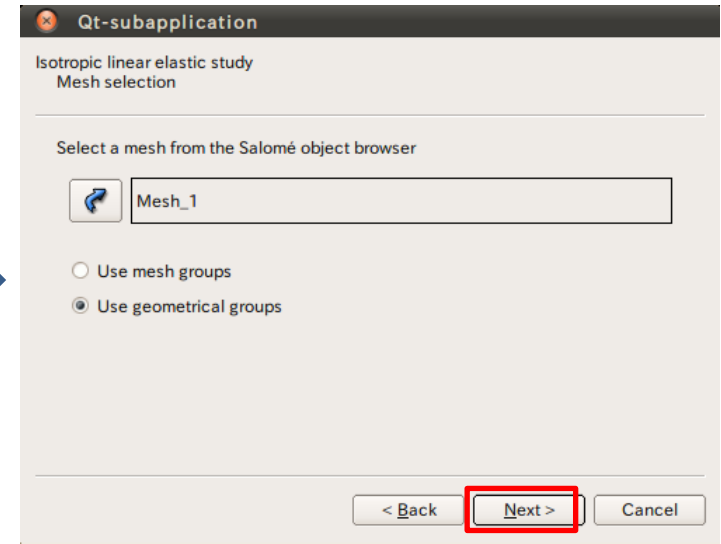
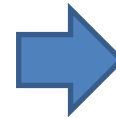
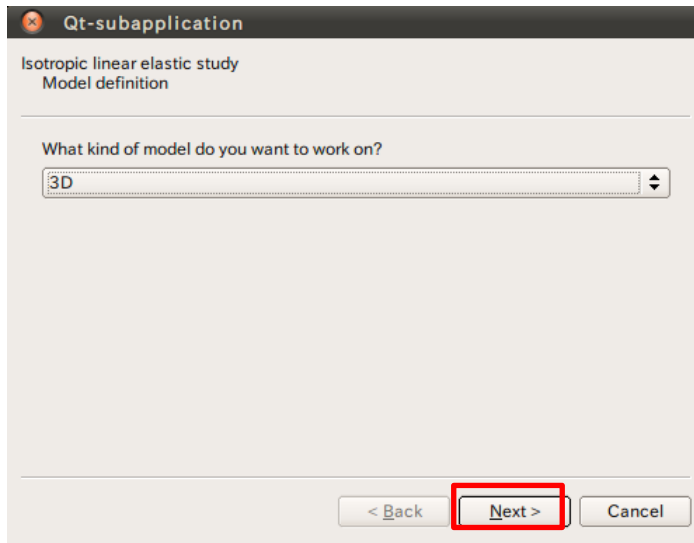
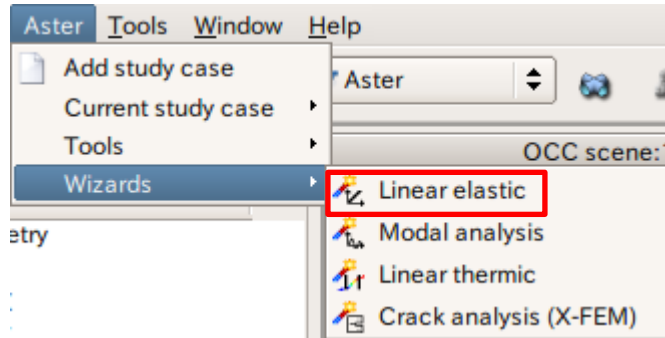
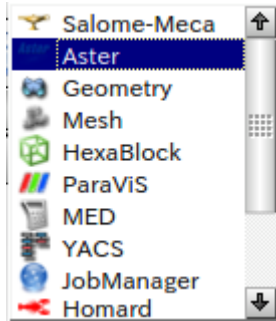
構造解析では一般的にモデルをmmで作成する  
流体解析では一般的にモデルをmで作成する



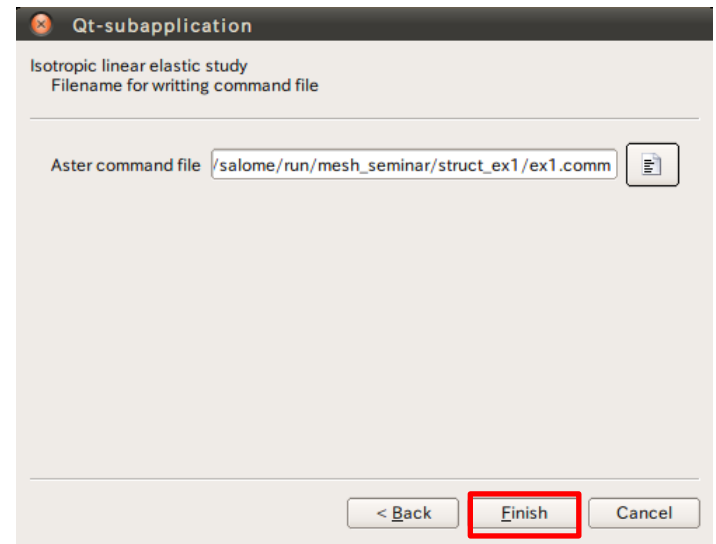
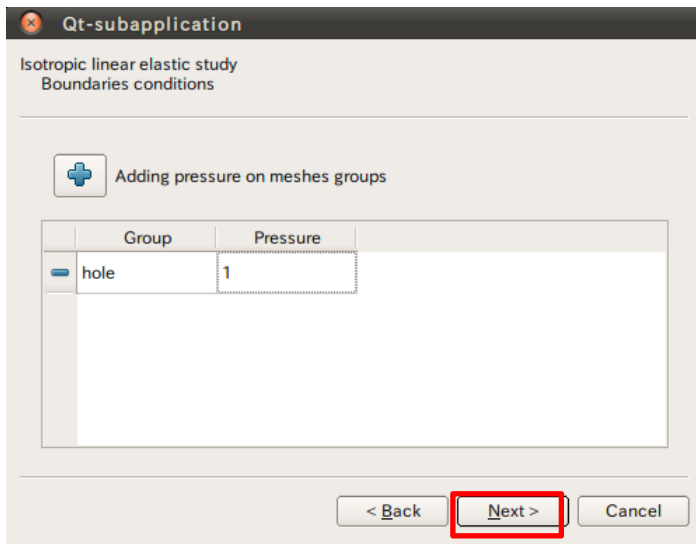
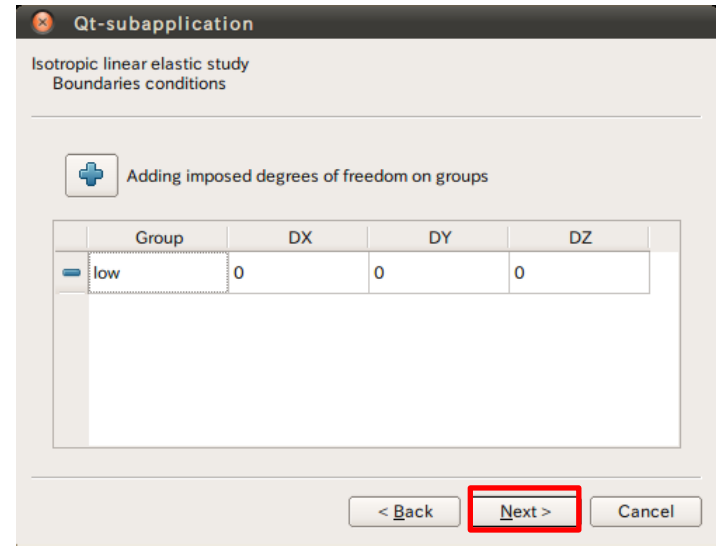
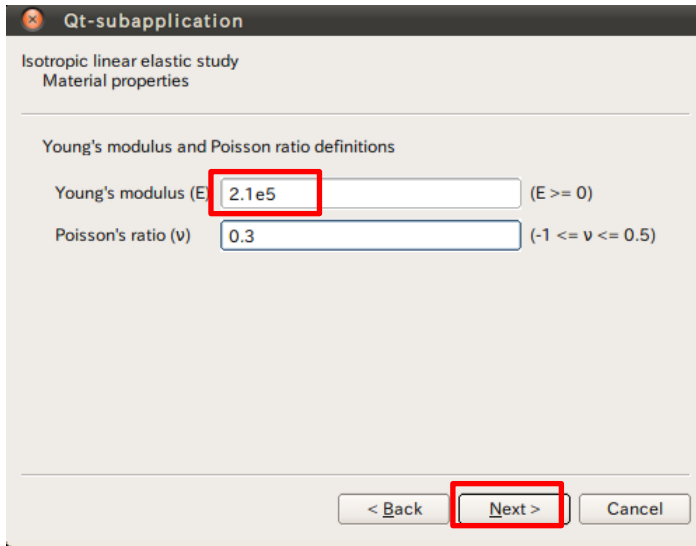
# 演習1 Asterモジュールの起動

## ウィザード

Aster>Wizards>Linear elastic



# 演習1 wizardの設定



# 演習1 wizardの設定

Aster  
linear-static 右クリック

- Data
  - ex1.comm
  - \*Mesh\_1
  - interactiv-follow-up
  - has-base-result
- Astk parameters
  - astk-action
  - aster-version
  - name
  - debug
  - mode
  - proc-nb
  - memory
  - time
  - login
  - server
  - aster\_root
  - protocol\_exec
  - protocol\_copyto
  - protocol\_copyfrom
  - proxy\_dir
  - build-script
  - submit-script
  - origin

- Update mesh
- Run
- Status
- Stop
- Edit
- Copy
  - Rename F2
  - Delete Del
- Export to ASTK
  - Refresh F5
  - Collapse All
  - Find Ctrl+F



Qt-subapplication

Study case definition

Name: liner

Command file: from disk | run/toyama/26/liner/liner.comm

Mesh: from object browser | Mesh\_1

ASTK services

Server: localhost | Aster version: stable | Refresh servers

Execution mode: interactif | Interactive follow up:

Solver parameters

Total memory (MB): 2048 | Time (s): 6000

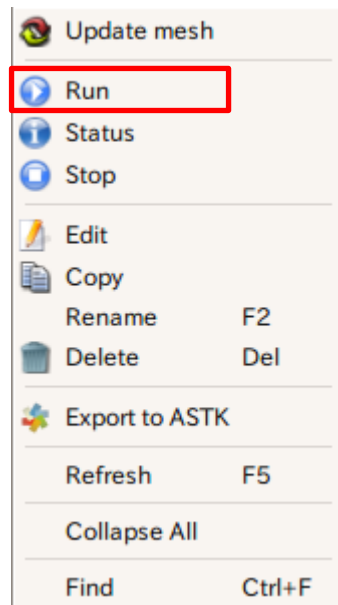
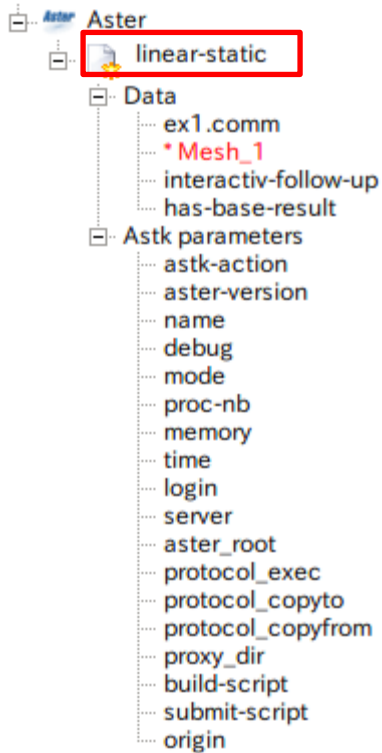
CPU number: 1 | Save result database:

Cancel OK

デフォルトの設定でも解析可能

# 演習1 解析の実行

解析実行中



```
bash

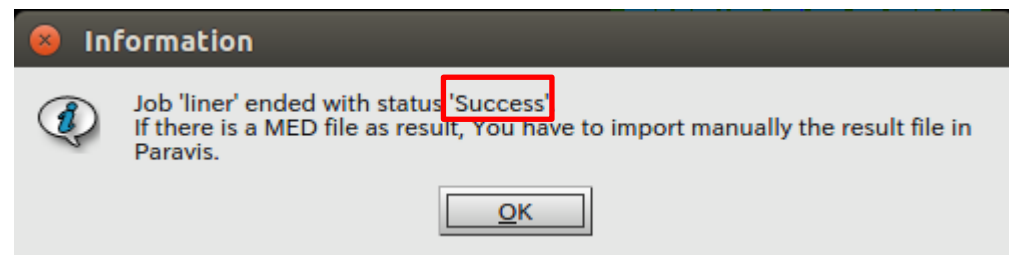
-----
Content of /tmp/akiyama-akiyama-desktop-interactif.0001-3566-akiyama-desktop before execu
tion

合計 18180
drwx----- 5 akiyama akiyama 4096 2013-07-05 02:02 .
drwxrwxrwt 21 root root 4096 2013-07-05 02:02 ..
-rw-r--r-- 1 akiyama akiyama 1240 2013-07-05 02:02 0001-3566-akiyama-desktop.export
-rw-r--r-- 1 akiyama akiyama 48 2013-07-05 02:02 0001-3566-akiyama-desktop.para
drwxr-xr-x 22 akiyama akiyama 4096 2013-07-05 02:02 Python
drwxr-xr-x 2 akiyama akiyama 4096 2013-07-05 02:02 REPE_OUT
drwxr-xr-x 2 akiyama akiyama 4096 2013-07-05 02:02 RESU_ENSIGHT
lrwxrwxrwx 1 akiyama akiyama 98 2013-07-05 02:02 asteru -> /home/akiyama/salome/SAL
OME-MECA-2013,1-LGPL/tools/Code_aster_standalone_20131_public/STA10/asteru
-rw-r--r-- 1 akiyama akiyama 1624 2013-07-05 02:02 config.txt
-rw-r--r-- 1 akiyama akiyama 18022408 2013-07-05 02:02 elem.1
-rw-r--r-- 1 akiyama akiyama 1581 2013-07-05 02:02 fort.1.1
-rw-r--r-- 1 akiyama akiyama 546994 2013-07-05 02:02 fort.20

-----
Code_Aster run

<INFO> Command line 1 :
<INFO> ./asteru Python/Execution/E_SUPERV.py -eficas_path ./Python -commandes fort,1 -num
_job 0001-3566-akiyama-desktop -mode interactif -rep_outils /home/akiyama/salome/SALOME-ME
CA-2013,1-LGPL/tools/Code_aster_standalone_20131_public/outils -rep_mat /home/akiyama/salo
me/SALOME-MECA-2013,1-LGPL/tools/Code_aster_standalone_20131_public/STA10/materiau -rep_de
x /home/akiyama/salome/SALOME-MECA-2013,1-LGPL/tools/Code_aster_standalone_20131_public/ST
A10/datg -suivi_batch -memjeveux 32,0 -tpmax 120
```

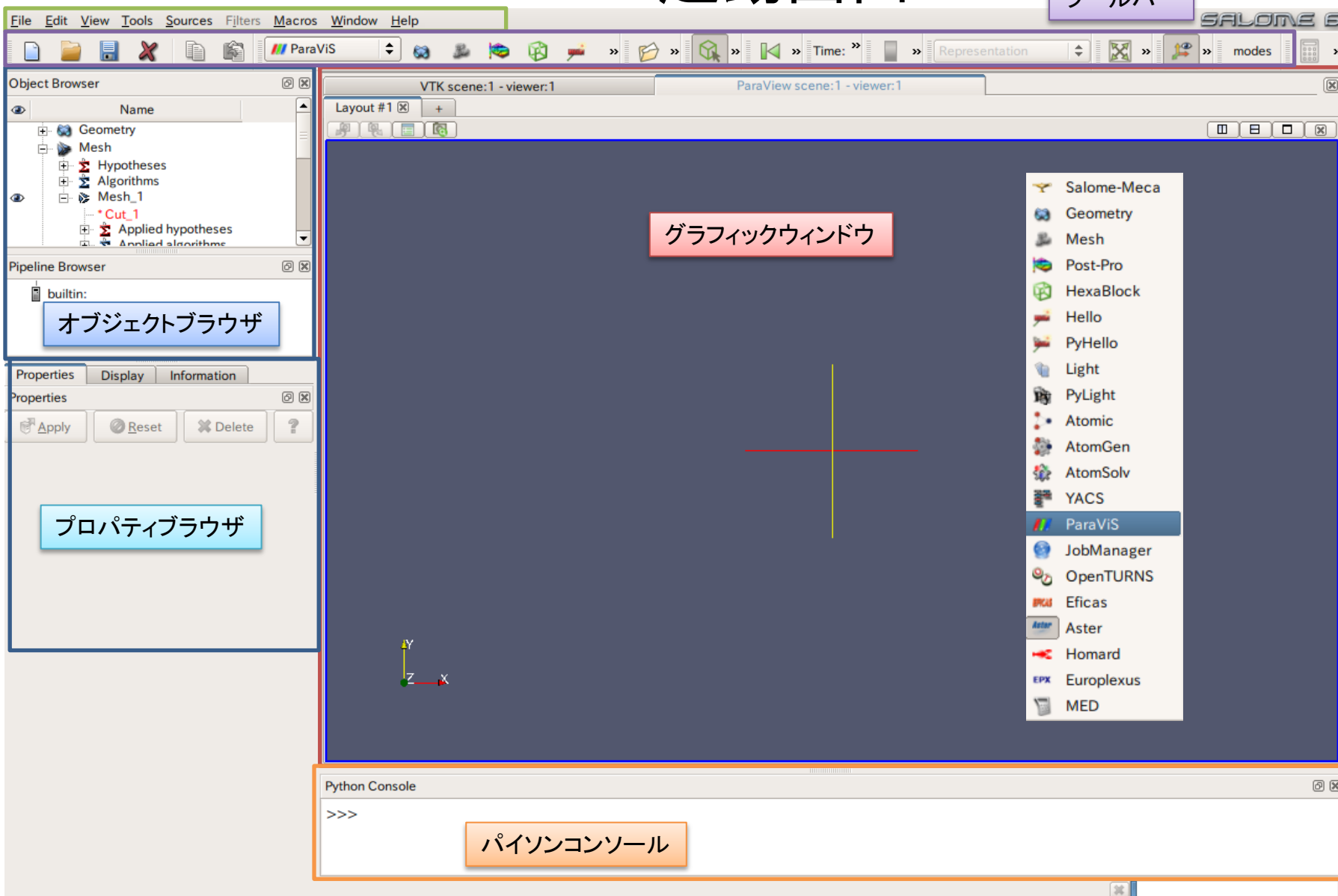
'Success'と出れば正常終了



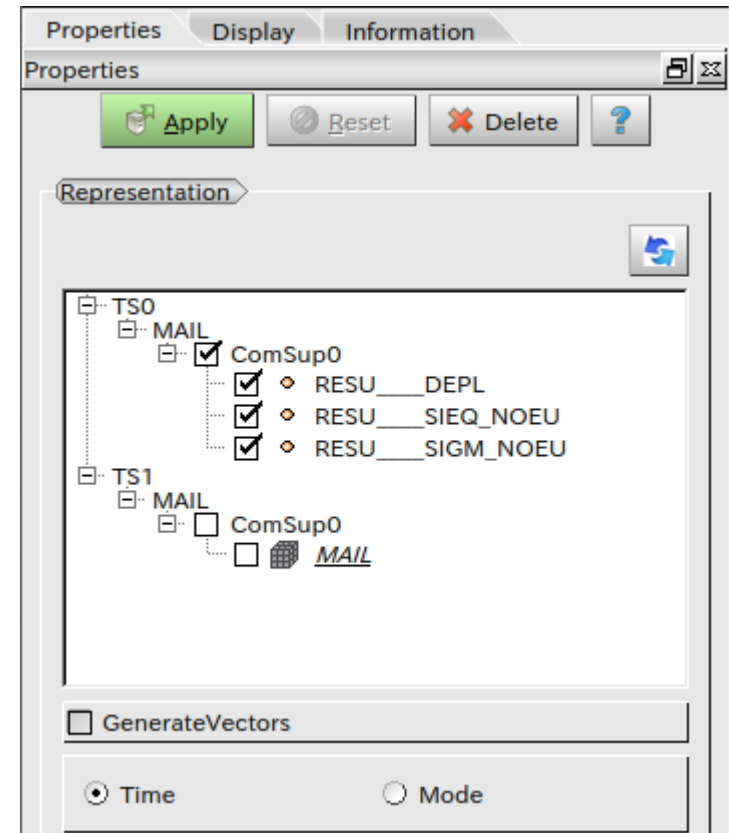
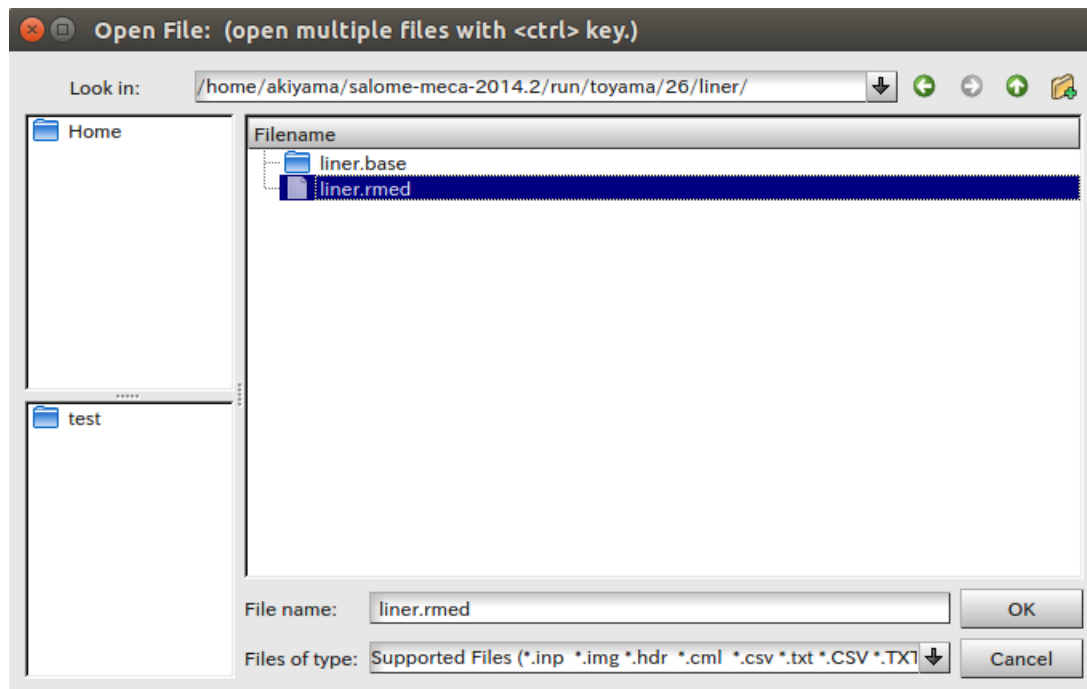
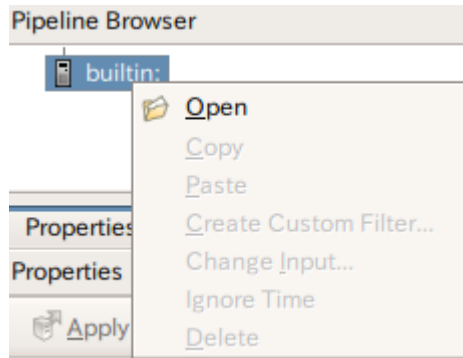
メニューバー

# ParaViS起動画面

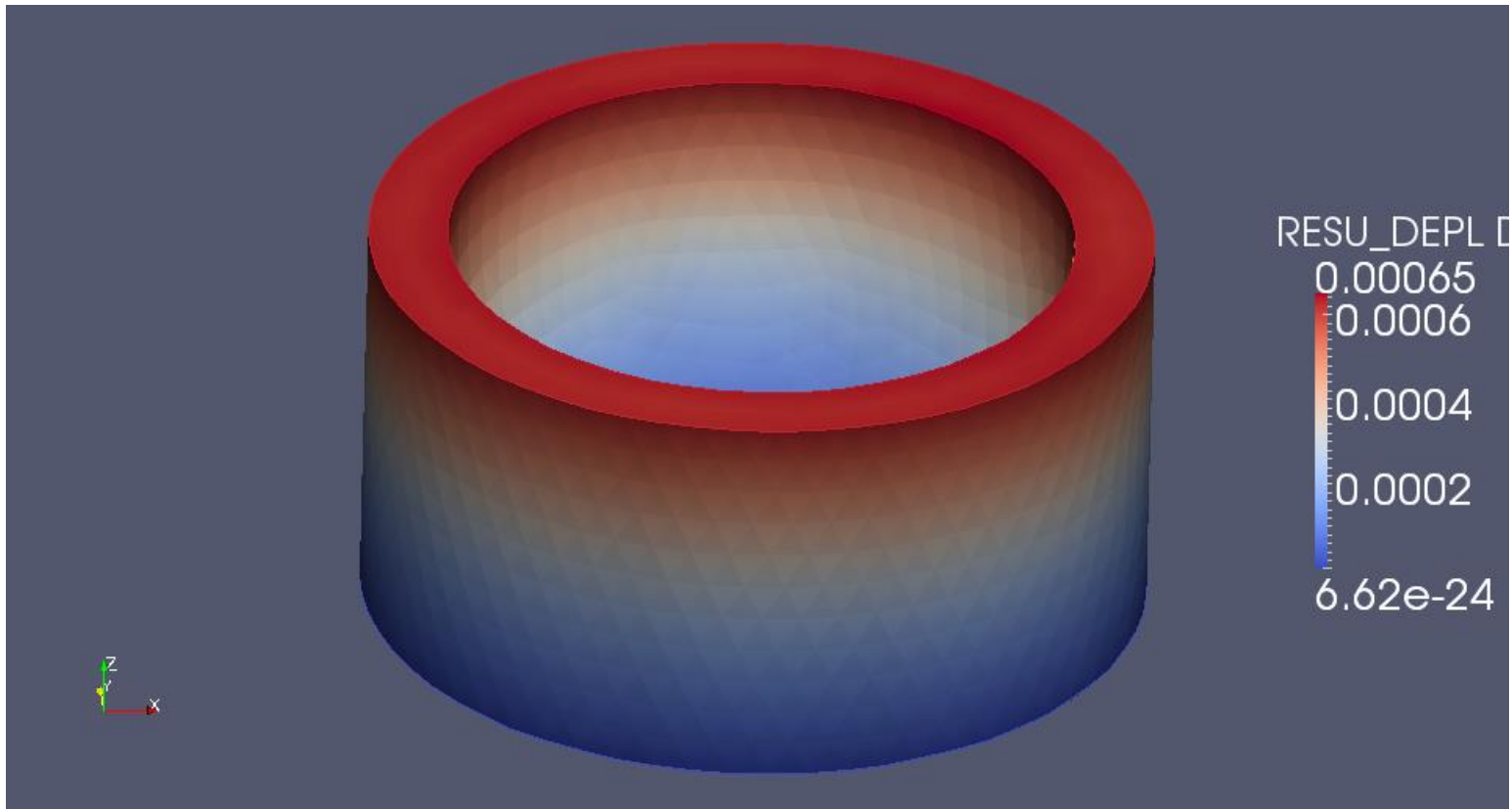
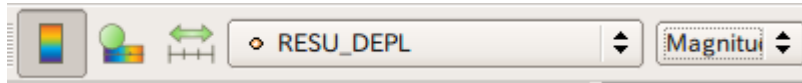
ツールバー



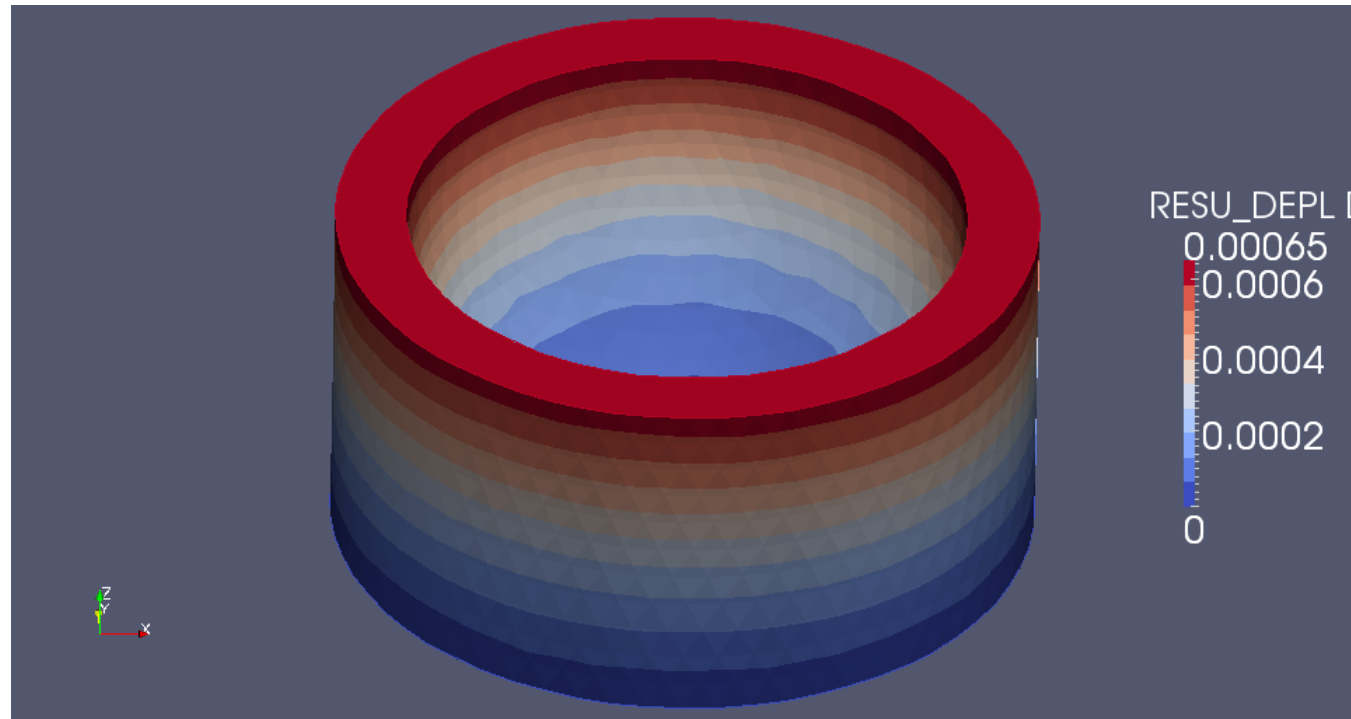
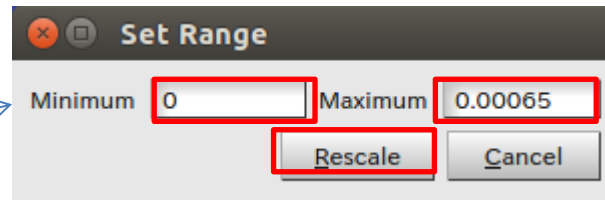
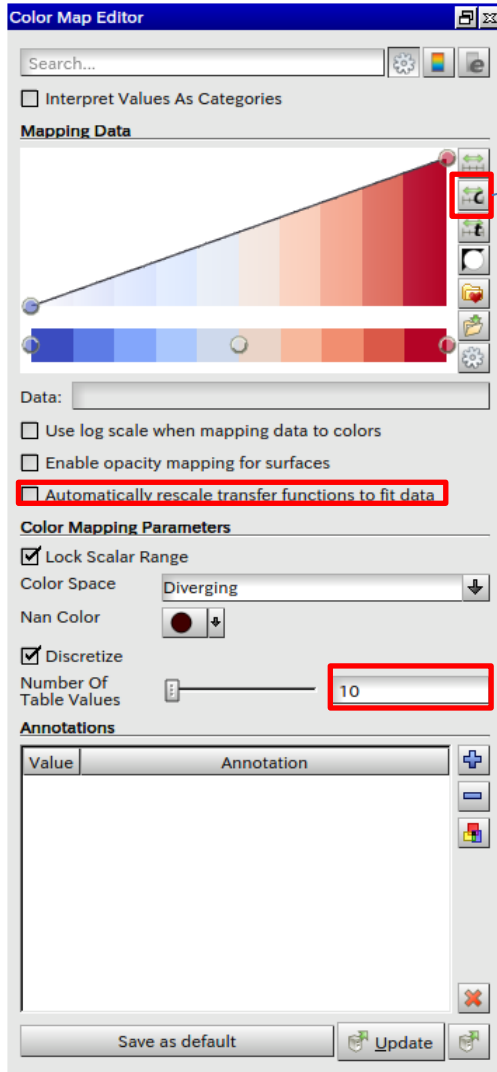
# 演習1 解析結果の表示



# 演習1 解析結果の表示(変位)

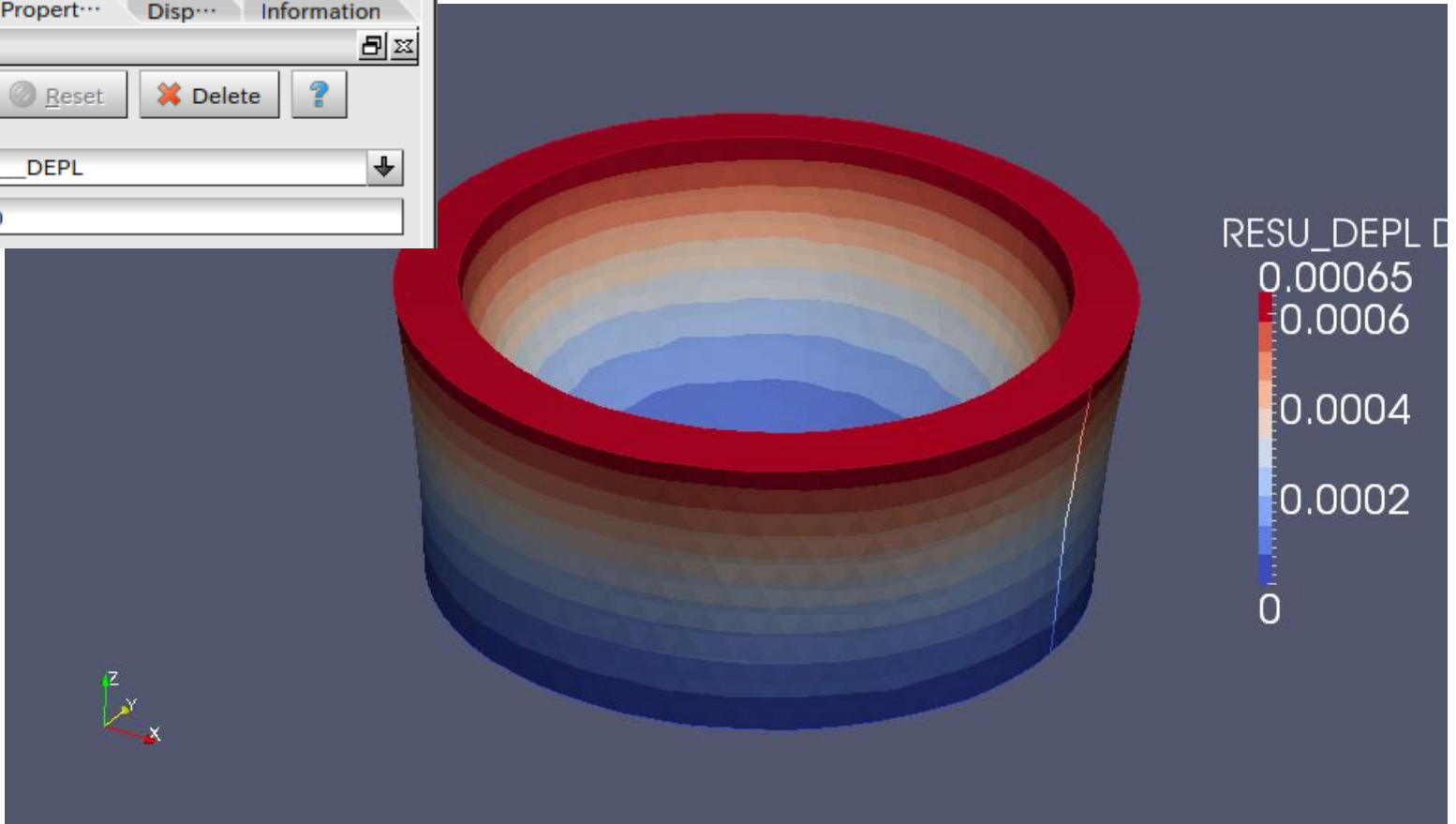
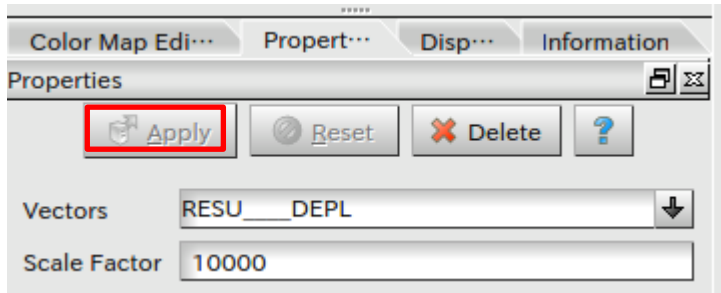
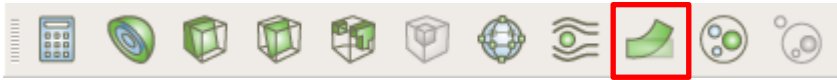


# 演習1 解析結果の表示(レンジの変更)

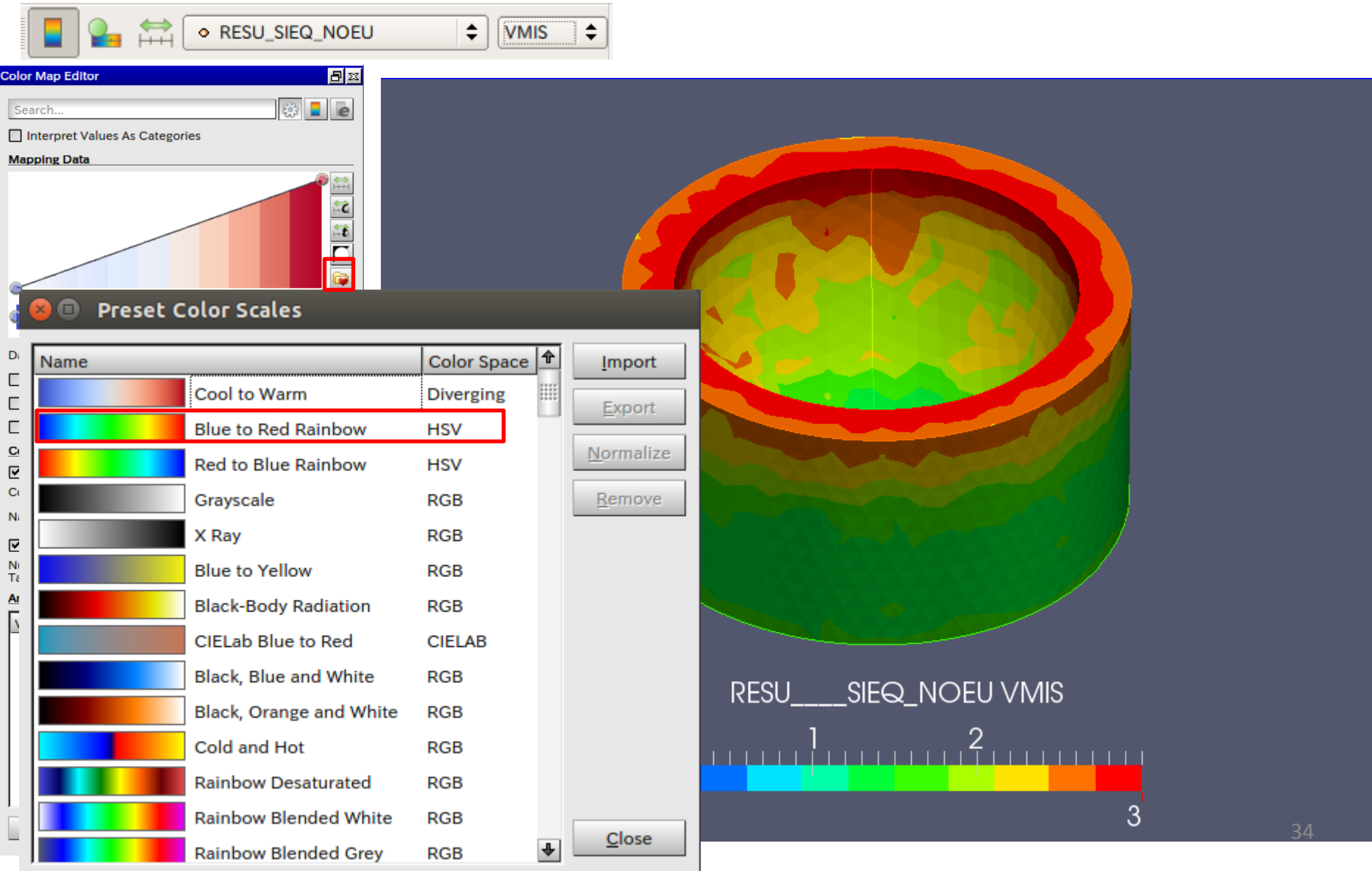




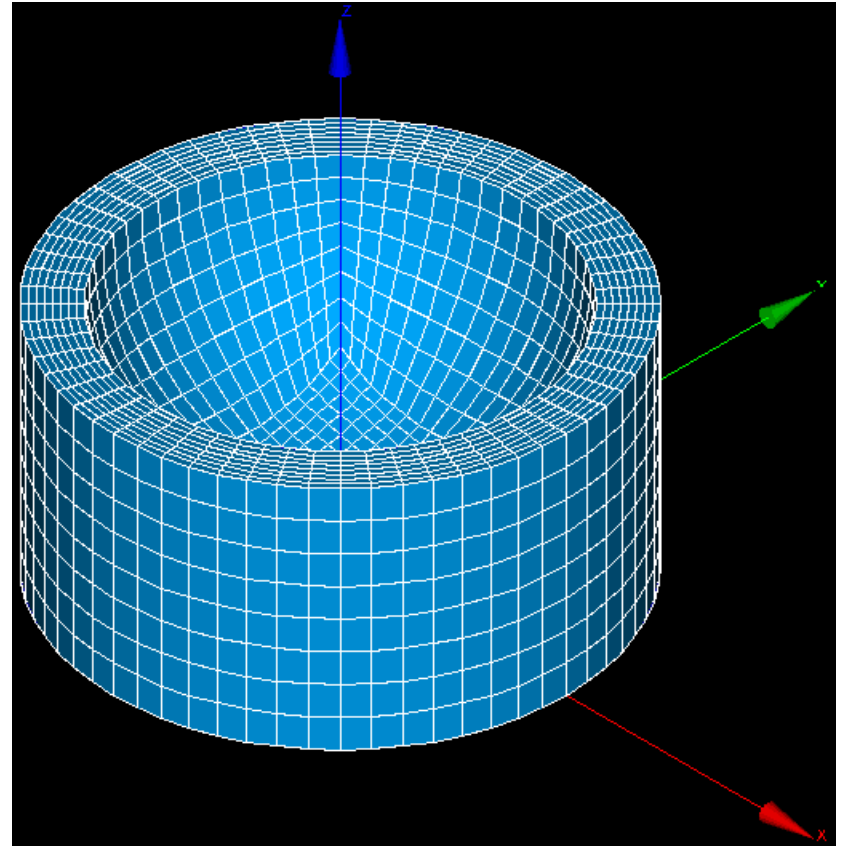
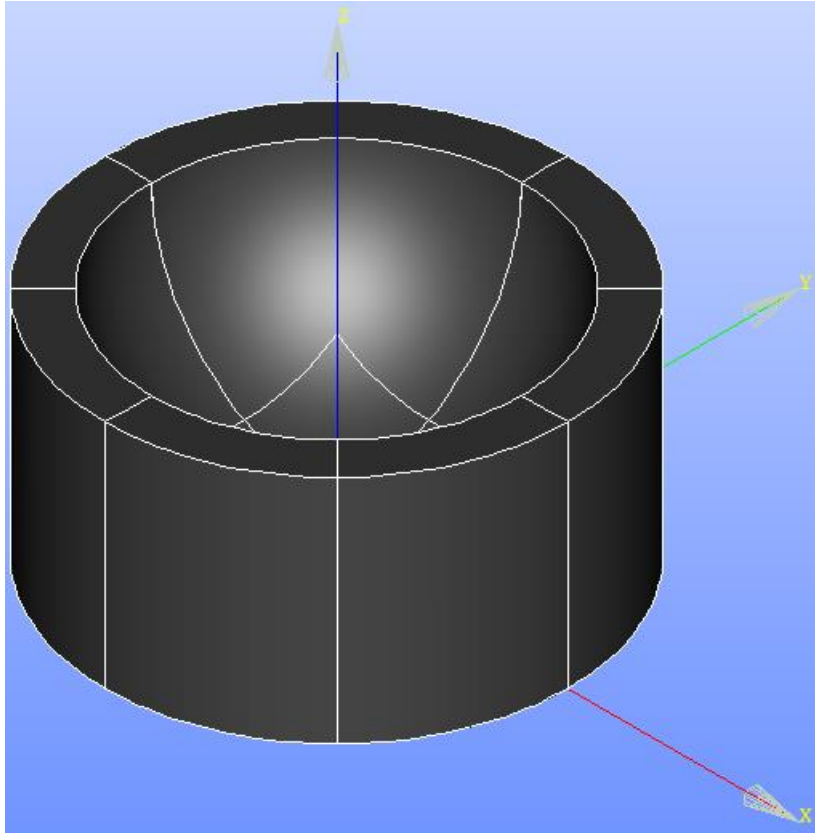
# 演習1 解析結果の表示(変形)



# 演習1 解析結果の表示(応力)

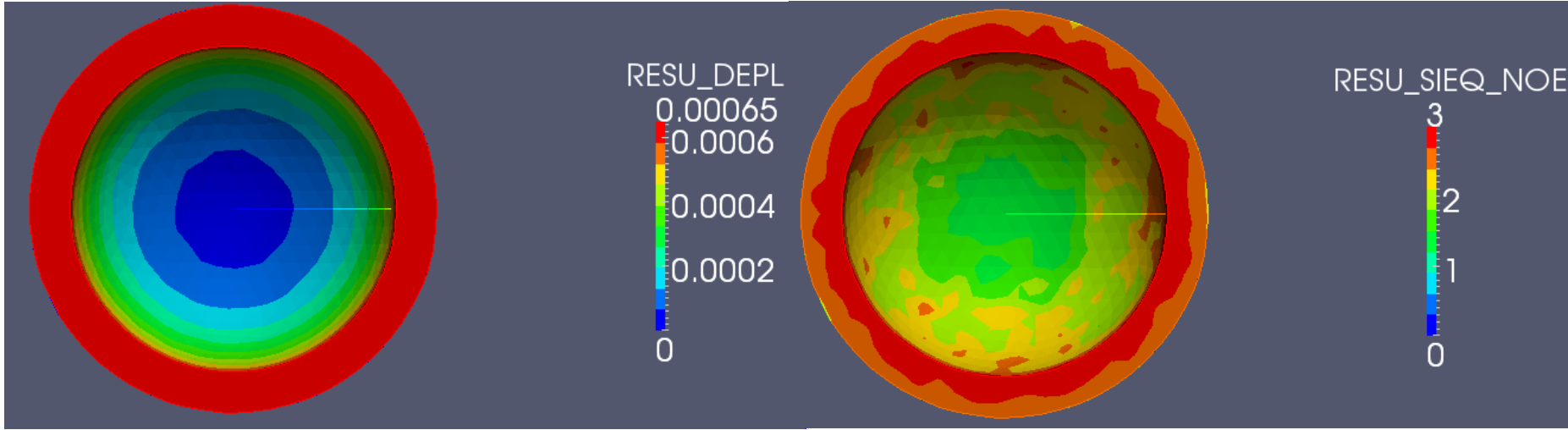


# HexaMeshによる解析

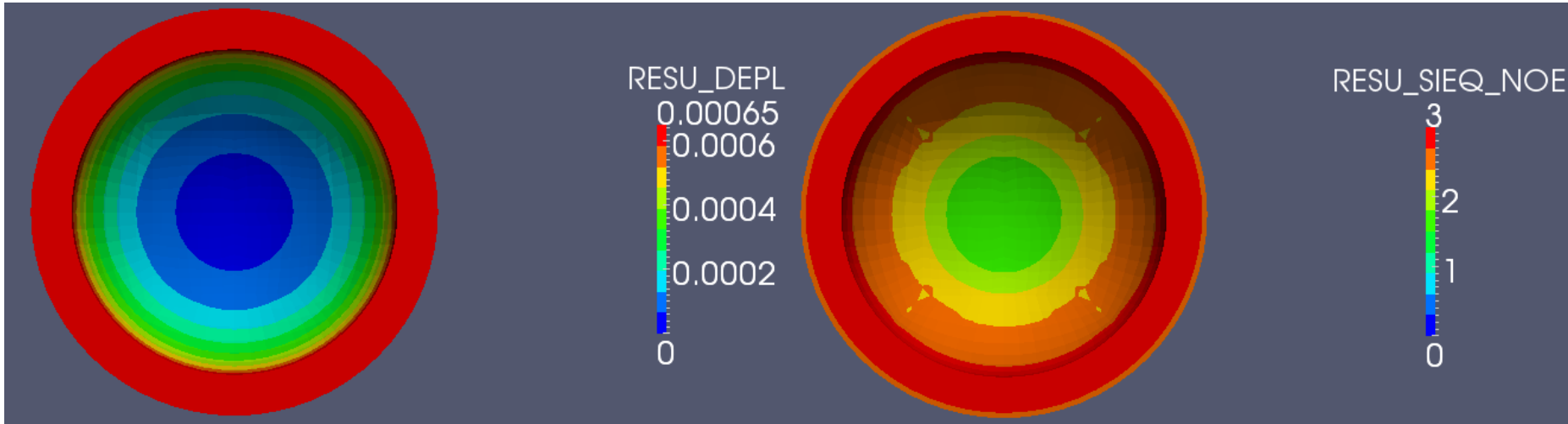


# 解析結果比較

テトラメッシュ



ヘキサメッシュ

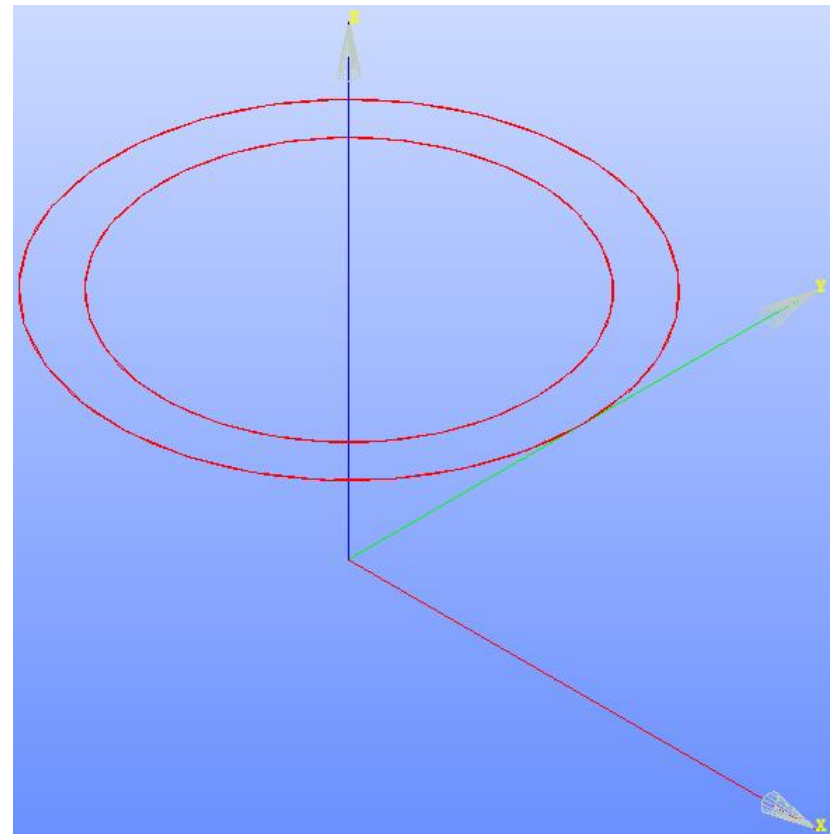
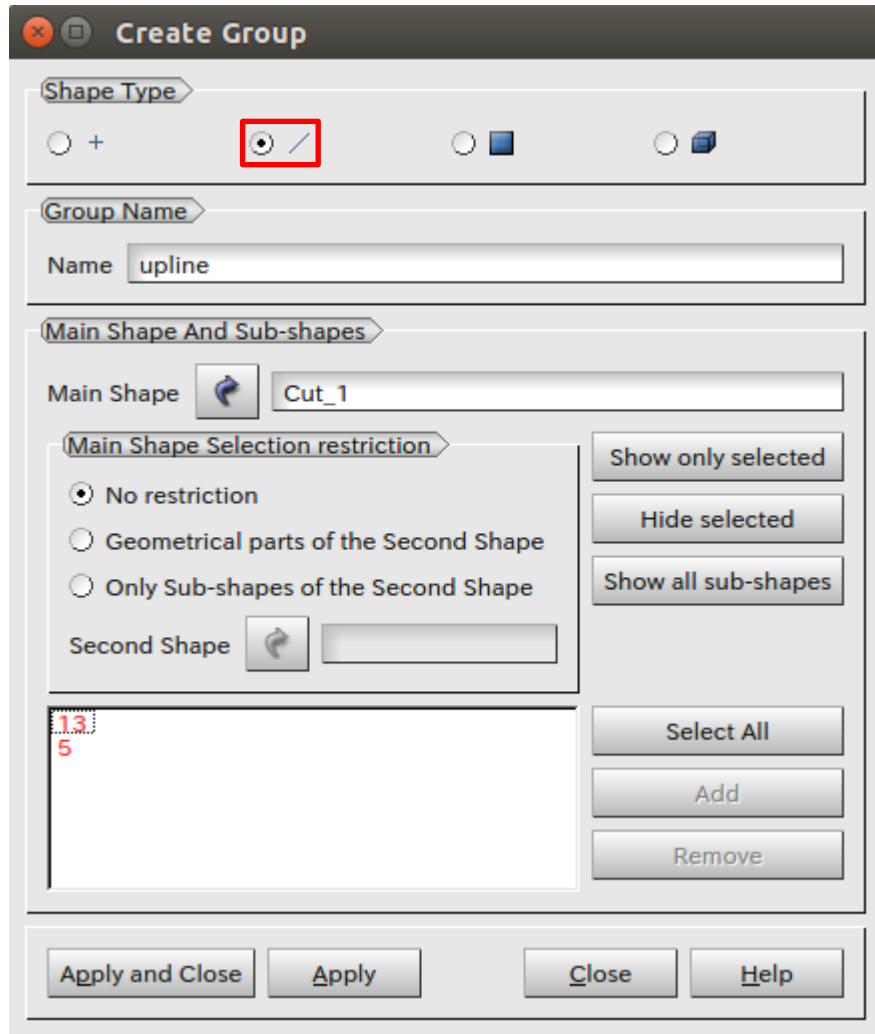


変位

応力

# 演習4 面荷重、線荷重、点荷重による解析

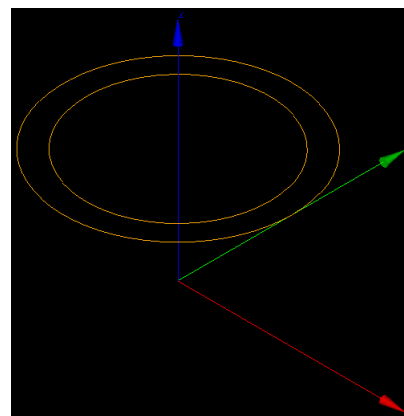
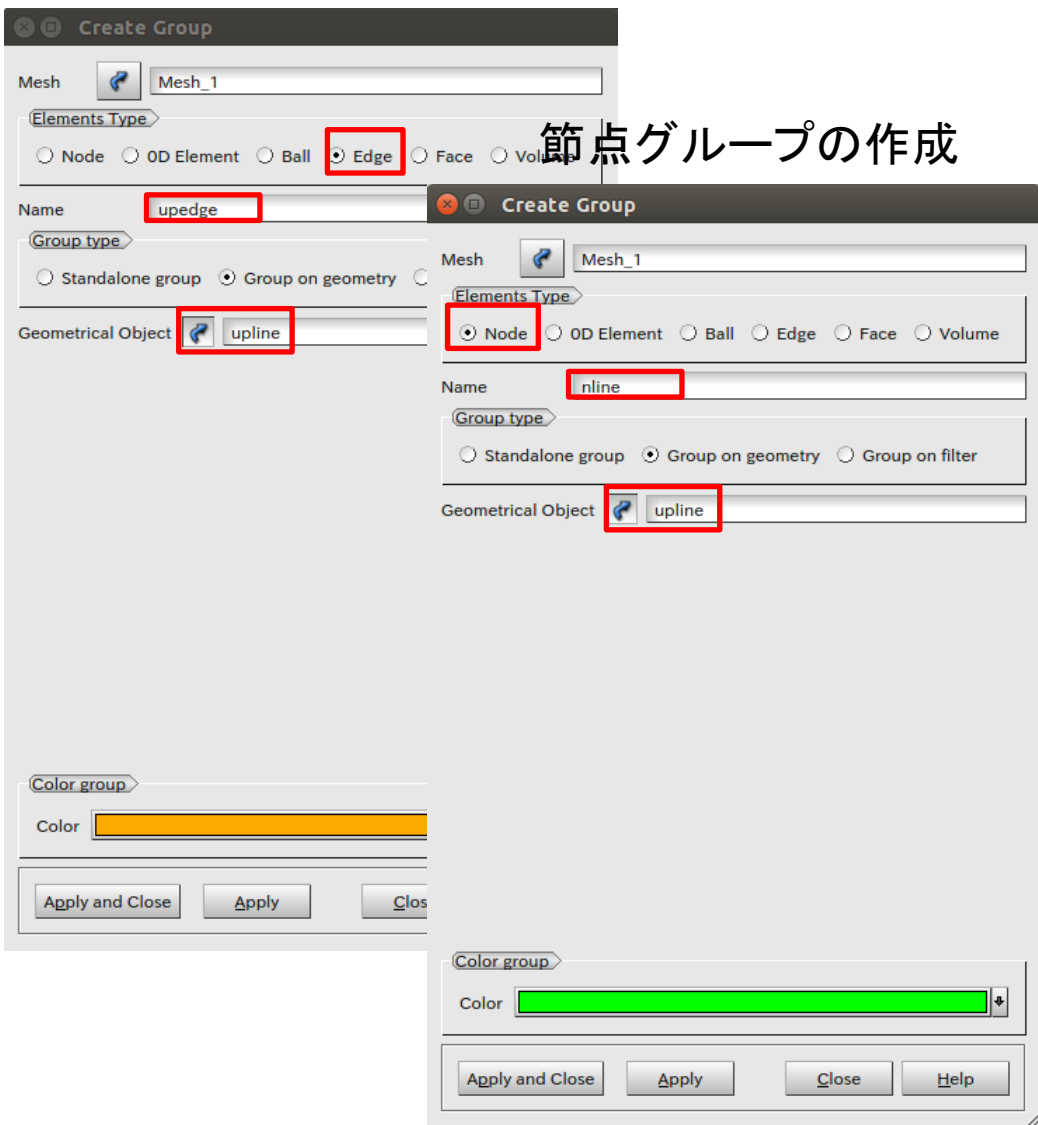
## ライングループの作成



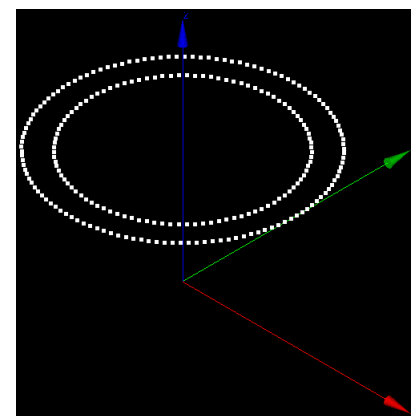
# 演習4 メッシュACグループの作成

## エッジグループの作成

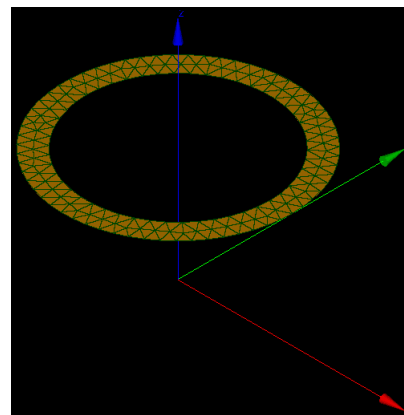
### 節点グループの作成



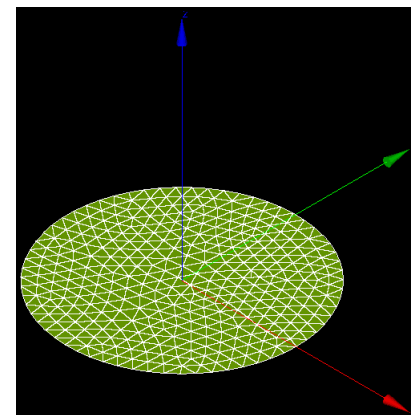
upedge



nline



up

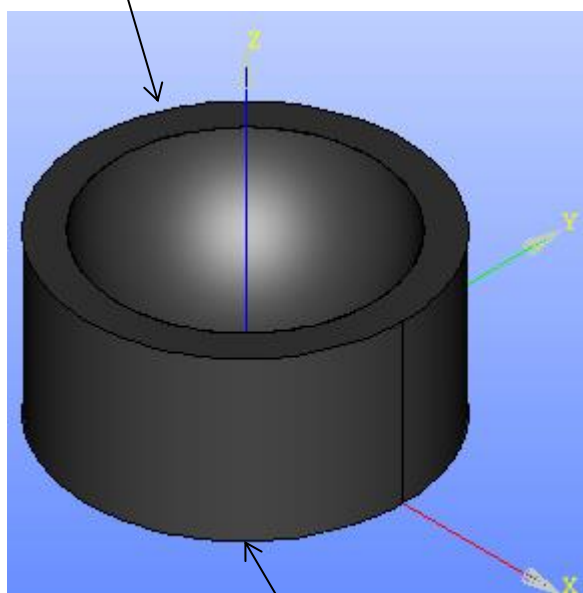


low

# 演習4 面荷重、線荷重、点荷重による解析

面荷重: -Z方向に1N(up)  
線荷重: -Z方向に1N(uedge)  
点荷重: -Z方向に1N(nline)

ヤング率: 210000MPa  
ポアソン比: 0.3

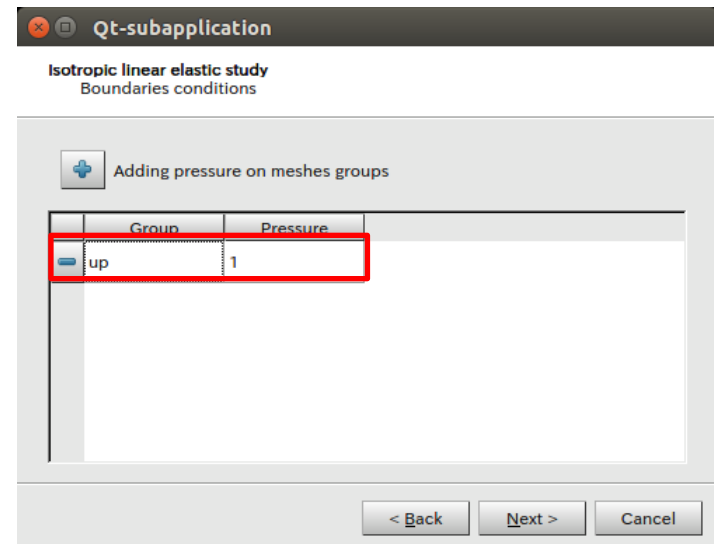
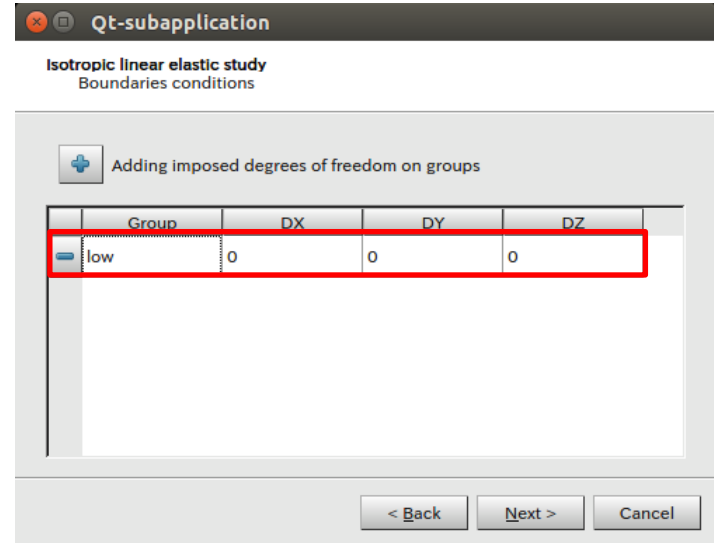
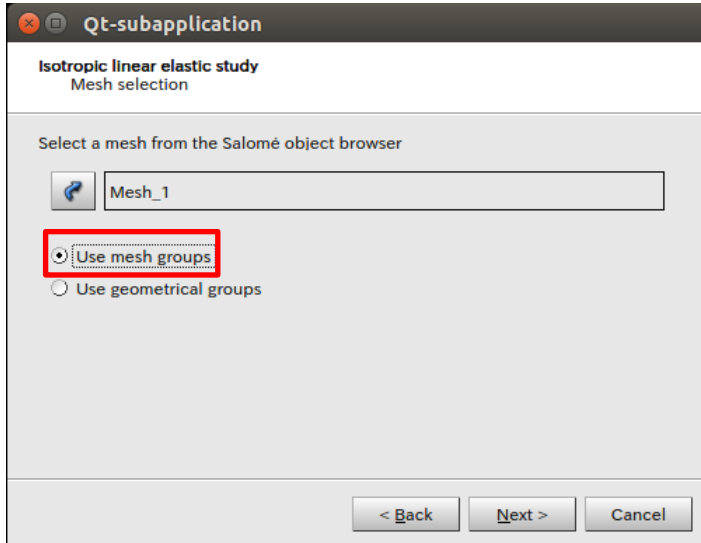


完全拘束 (low)

キーワード

面荷重: FORCE\_FACE  
線荷重: FORCE\_ARETE  
点荷重: FORCE\_NODALE

# 演習4 wizardの設定

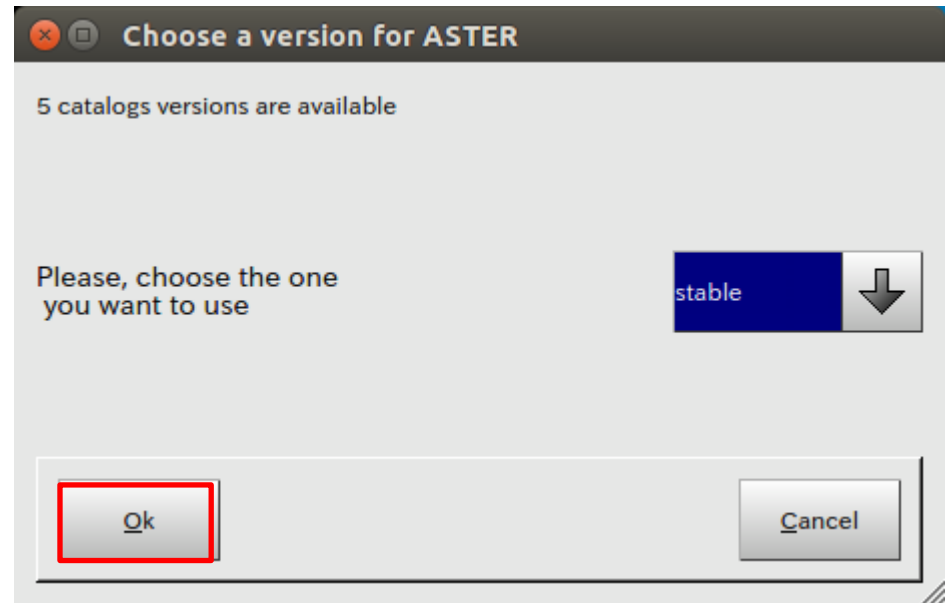
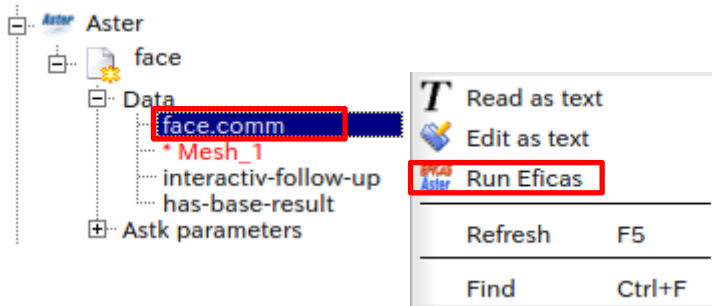


荷重を与えるグループを圧力で指定  
→後にEficasで修正する



# 演習4 Eficasによるコマンドファイルの修正

## Eficasの起動



# 演習4 Eficasによるコマンドファイルの修正

選択できるキーワード

設定したコマンド

face.comm

Command	Concept/Val
DEBUT :	MA
DEFI_MATERIAU :	MAIL
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MODE
AFFE_MODELE :	MATE
AFFE_MATERIAU :	CHAR
AFFE_CHAR_MECA :	RESU
MECA_STATIQUE :	
CALC_CHAMP :	
IMPR_RESU :	
FIN :	

Commands :

alphabetic  by group

Filter  Next

Commands list (partially visible):

- AFFE CARA ELEM
- AFFE CHAR ACOU
- AFFE CHAR CINE
- AFFE CHAR CINE F
- AFFE CHAR MECA
- AFFE CHAR MECA C
- AFFE CHAR MECA F
- AFFE CHAR THER
- AFFE CHAR THER F
- AFFE MATERIAU
- AFFE MODELE
- APPL CINE MATR
- APPL CINE SCMB
- ASSEMBLAGE
- ASSE ELEM SSD
- ASSE MALLAGE
- ASSE MATRICE
- ASSE MATR GENE
- ASSE VECTEUR
- ASSE VECT GENE
- CALCUL
- CALC AMOR MODAL
- CALC CHAMP
- CALC CHAM ELEM
- CALC CHAR CINE
- CALC CHAR SEISME
- CALC CORR SSD
- CALC ECREVISSE
- CALC ERREUR
- CALC ESSAI
- CALC ESSAI GEOMECA
- CALC EUROPLEXUS
- CALC FATIGUE
- CALC FERRAILLAGE
- CALC FLUI STRU
- CALC FONCTION
- CALC FONC INTERP
- CALC FORC AJOU
- CALC FORC NONL
- CALC G
- CALC GP
- CALC IFS DNL
- CALC INTE SPEC
- CALC MAC3COEUR
- CALC MATR AJOU
- CALC MATR ELEM
- CALC META
- CALC MISS
- CALC MODAL
- CALC MODE ROTATION
- CALC POINT MAT
- CALC PRECONT

Rules :

Regle A CLASSER :

D'abord :  
DEBUT ou POURSUITE

Ensuite :  
FIN

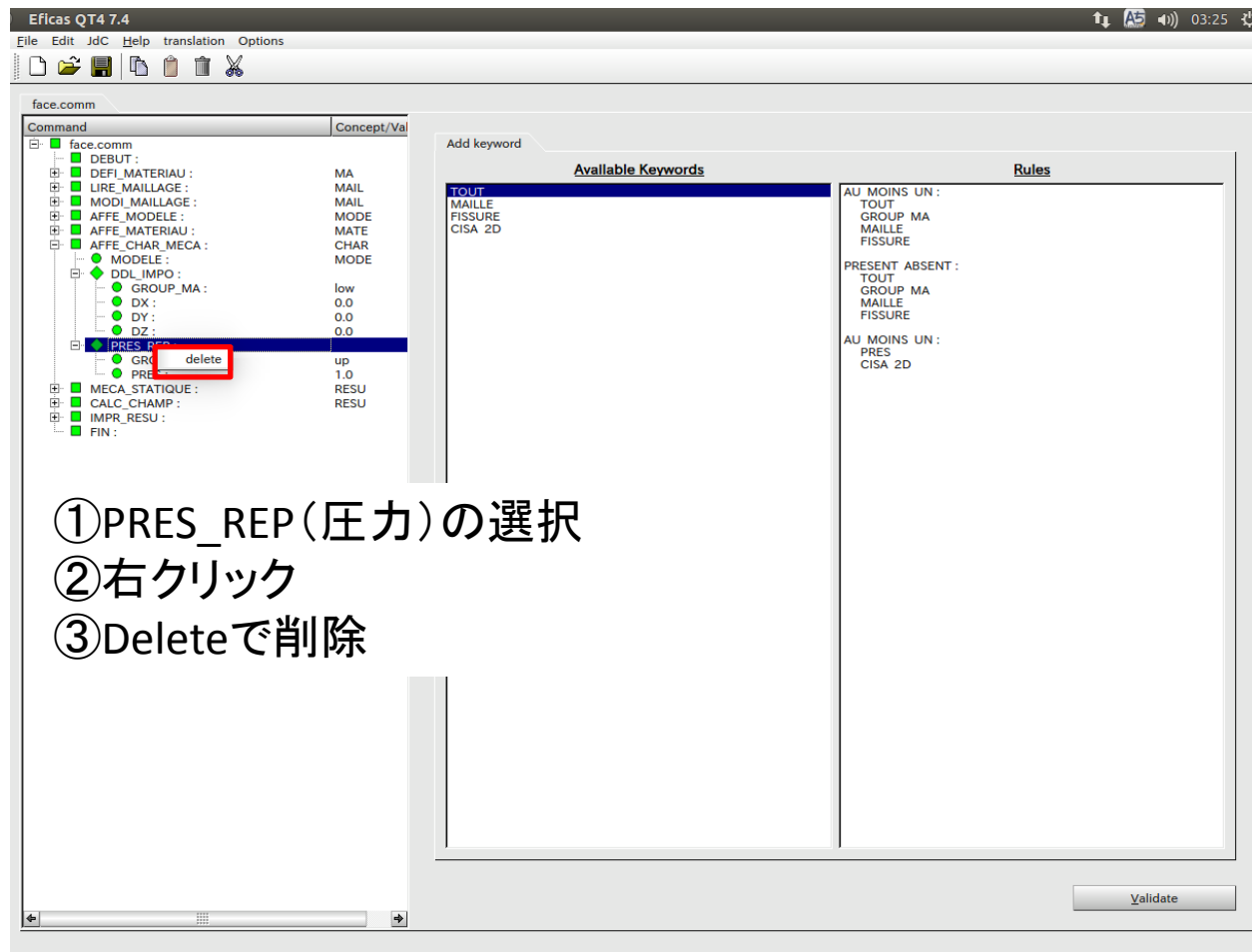
Validate

# 演習4 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. On the left, a tree view under 'face.comm' shows a hierarchy of commands. A red box highlights the 'AFFE\_CHAR\_MECA' node and its sub-nodes: 'MODELE', 'DDL\_IMPO', 'GROUP\_MA', 'DX', 'DY', and 'DZ'. The main window displays a list of commands and rules. The 'Commands' section is sorted alphabetically and includes a 'Filter' field and a 'Next' button. The 'Rules' section shows a list of rules, including 'AU MOINS UN', 'Regle A CLASSER', and 'D'abord'. A 'Validate' button is at the bottom right.

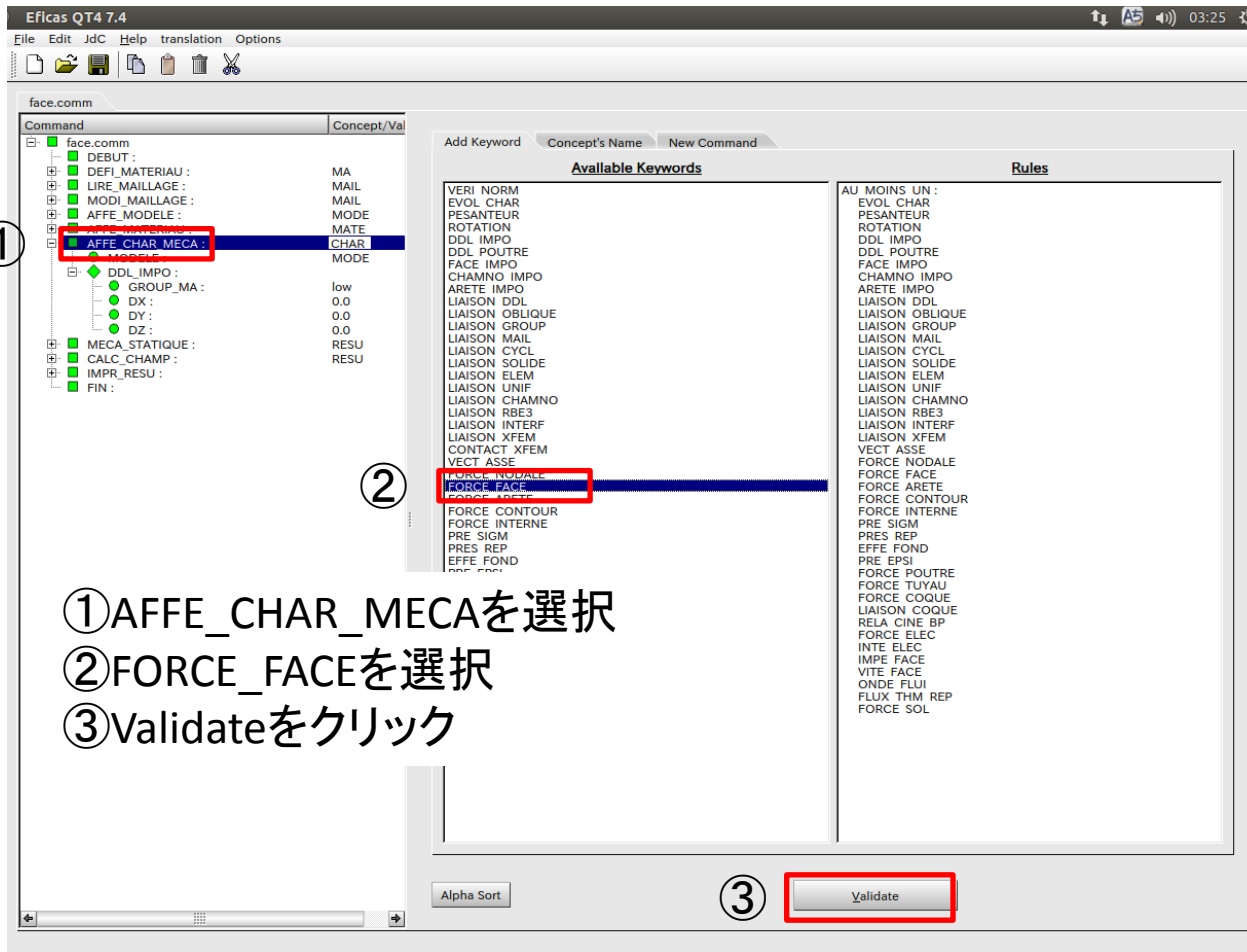
**AFFE\_CHAR\_MECA (境界条件の設定) を展開**

# 演習4 Eficasによるコマンドファイルの修正



- ①PRES\_REP(圧力)の選択
- ②右クリック
- ③Deleteで削除

# 演習4 Eficasによるコマンドファイルの修正

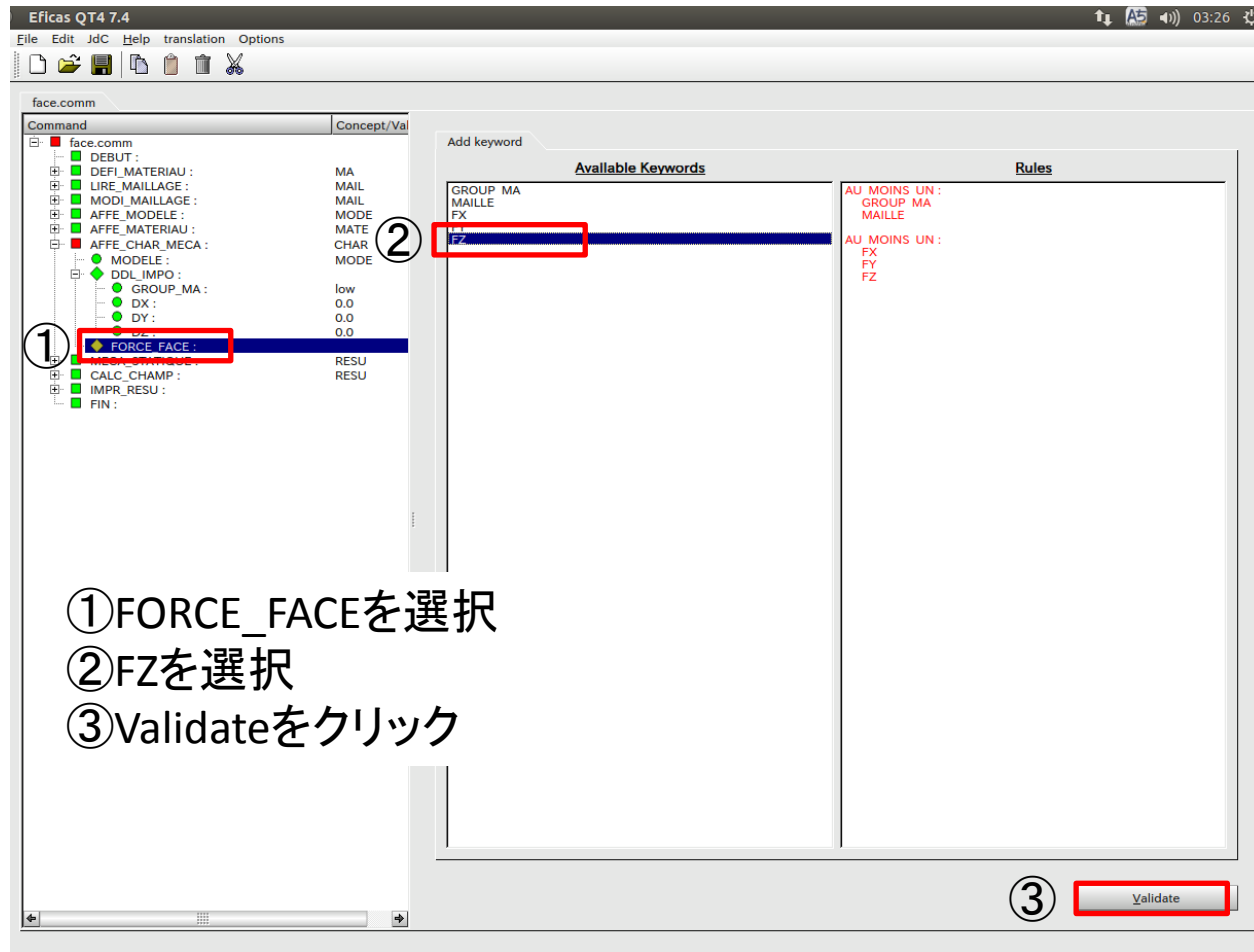


- ①AFFE\_CHAR\_MECAを選択
- ②FORCE\_FACEを選択
- ③Validateをクリック

コマンドを下記に変更することでそれぞれの荷重設定が可能

面荷重:FORCE\_FACE  
線荷重:FORCE\_ARETE  
点荷重:FORCE\_NODALE

# 演習4 Eficasによるコマンドファイルの修正



# 演習4 Eficasによるコマンドファイルの修正

The screenshot shows the Eficac QT4 7.4 interface. On the left, a tree view under 'face.comm' shows a list of commands. The 'FZ' command is selected and highlighted with a blue bar and a red box, with a circled '1' next to it. In the center, the 'Enter Value' field contains the text '-1', which is also enclosed in a red box with a circled '2'. At the bottom right, the 'Validate' button is highlighted with a red box and a circled '3'. A 'Parameters' button is visible in the middle of the main workspace.

Command	Concept/Val
face.comm	
DEBUT :	MA
DEFI_MATERIAU :	MAIL
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MODE
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MODELE :	MODE
DDL_IMPO :	
GROUP_MA :	low
DX :	0.0
DY :	0.0
DZ :	0.0
<b>FZ :</b>	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

① FZを選択  
② 荷重を入力  
③ Validateをクリック

# 演習4 Eficasによるコマンドファイルの修正

The screenshot shows the Eficac QT4 7.4 interface with the following components:

- Command List:** A tree view on the left with 'face.comm' expanded. 'FORCE\_FACE:' is selected and highlighted with a red box and circled '1'.
- Concept/Val Table:** A table in the center with columns 'Command' and 'Concept/Val'. 'GROUP\_MA' is selected and highlighted with a red box and circled '2'.

Command	Concept/Val
DEBUT :	MA
DEFI_MATERIAU :	MAIL
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MODE
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MODELE :	MODE
DDL_IMPO :	
GROUP_MA :	low
DX :	0.0
DY :	0.0
DZ :	0.0
FORCE_FACE :	-1
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	
- Available Keywords:** A list on the right containing 'GROUP\_MA' and 'MAILLE', with 'GROUP\_MA' selected and highlighted with a red box and circled '2'.
- Rules:** A text area on the right containing the text 'AU MOINS UN : GROUP MA MAILLE' and 'AU MOINS UN : FX FY FZ'.
- Validate Button:** A button at the bottom right labeled 'Validate', highlighted with a red box and circled '3'.

- ①FORCE\_FACEを選択
- ②GROUP\_MAを選択
- ③Validateをクリック



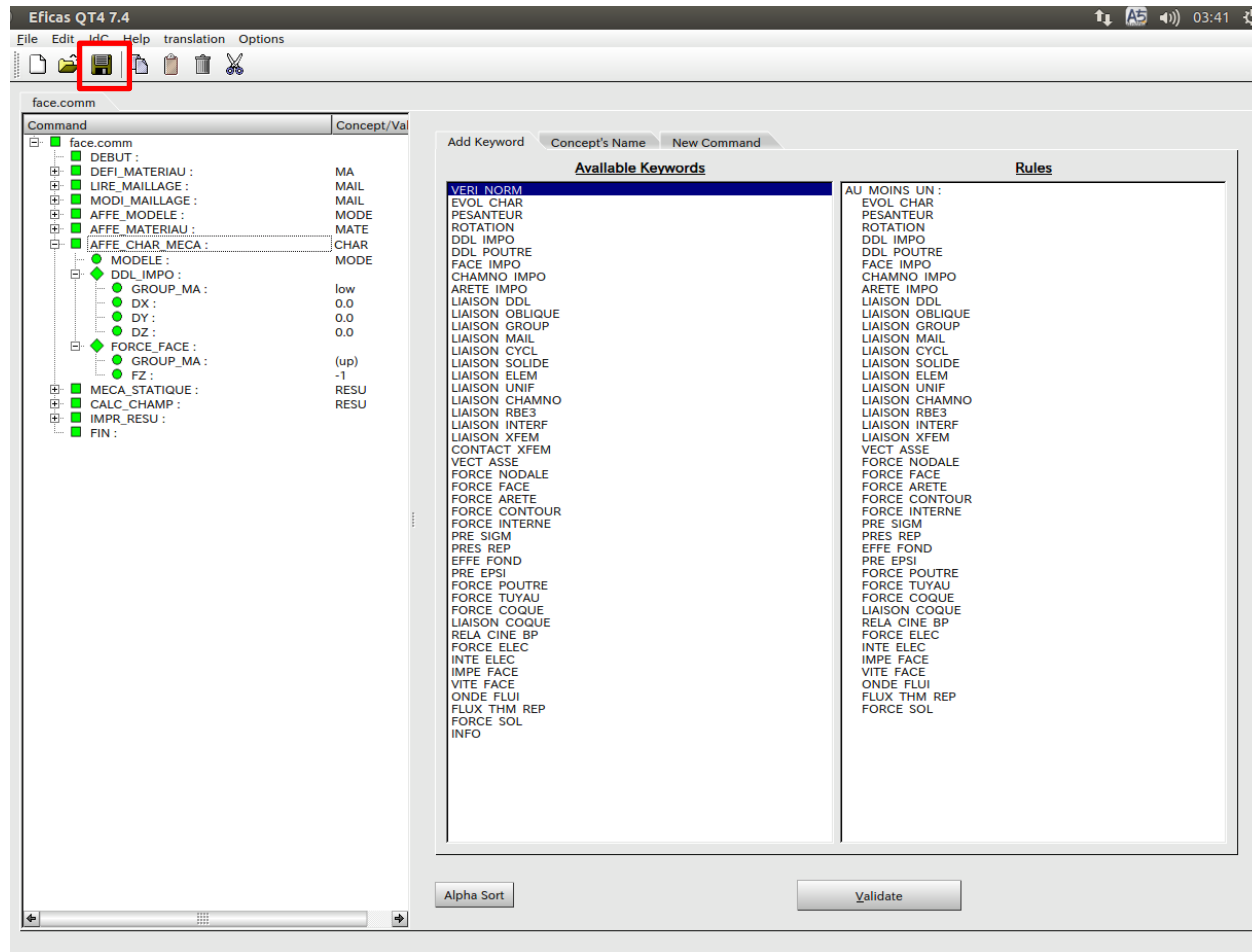
# 演習4 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. On the left, a tree view under 'face.comm' lists various commands. 'GROUP\_MA' is selected and highlighted with a red box and circled number 1. The central panel, titled 'Enter value', shows 'Actual value(s)' and a 'Value' field containing 'up', with a circled number 2. A circled number 3 points to the 'up' icon button. At the bottom right, a circled number 3 points to the 'Validate' button. Below the screenshot, four numbered steps describe the process.

- ① GROUP\_MAを選択
- ② グループ名を入力
- ③ 指アイコンをクリック
- ④ Validateをクリック

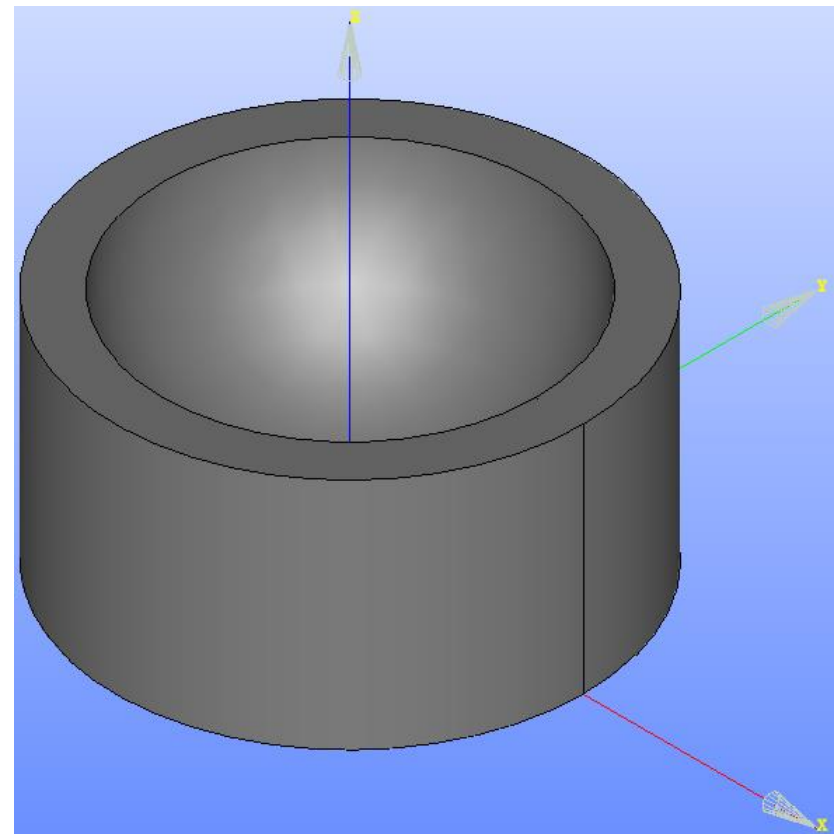
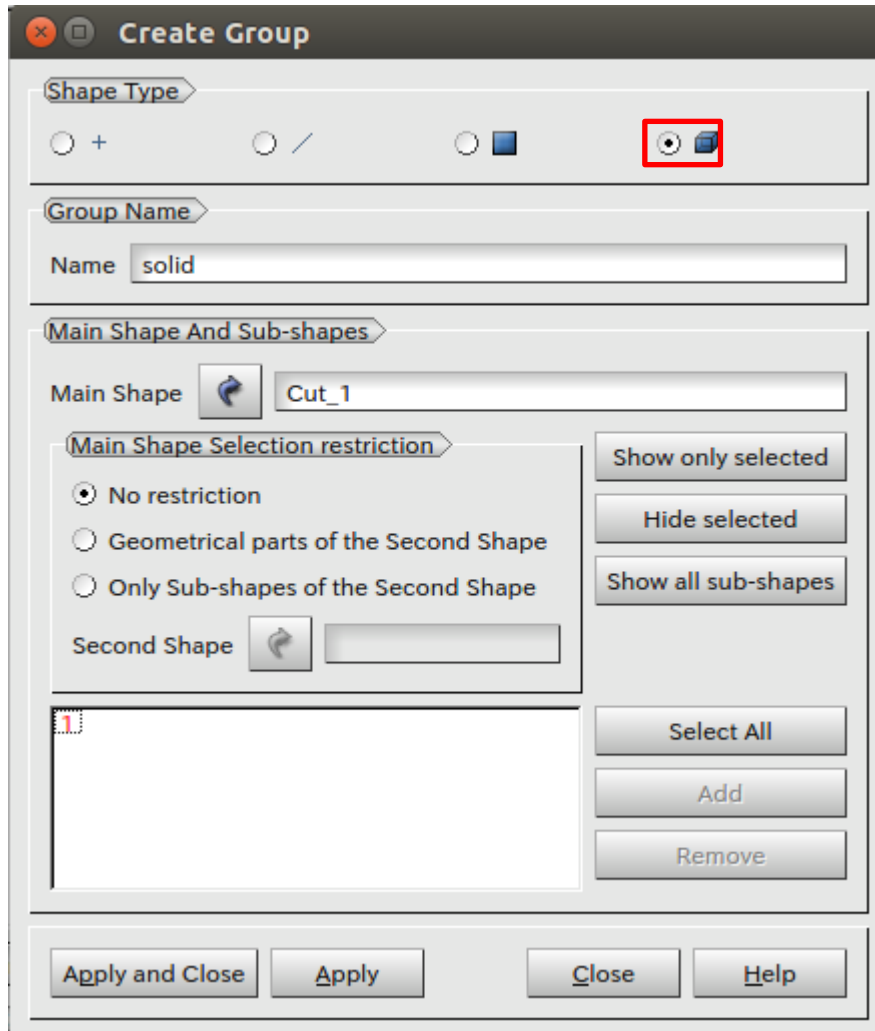
# 演習4 Eficasによるコマンドファイルの修正

保存

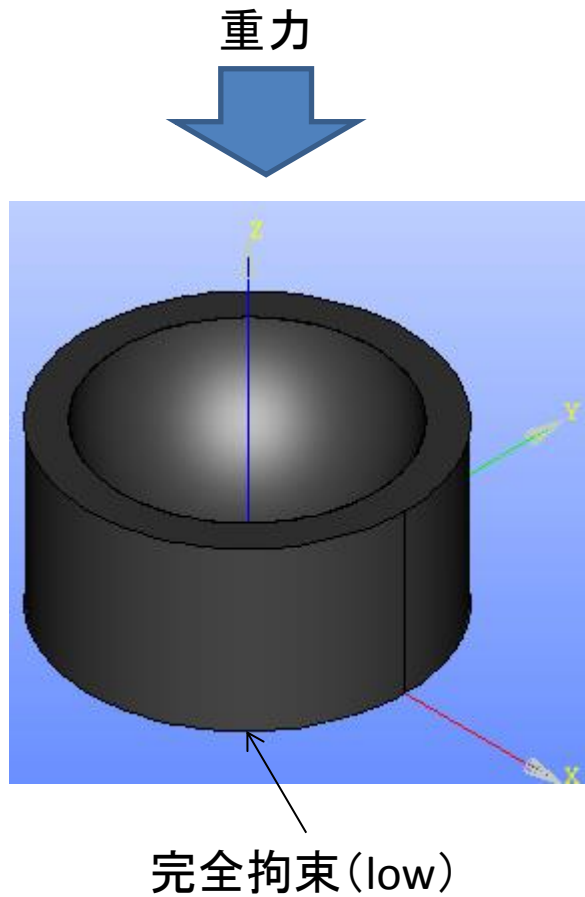


# 演習5 重力による解析

## ソリッドグループの作成



# 演習5 重力による解析



ヤング率: 210000MPa  
ポアソン比: 0.3  
質量密度: 7.87e-9ton/mm<sup>3</sup>

キーワード  
重力: PESANTEUR

# 演習5 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. The 'Command' panel on the left contains a tree view with 'DEFI\_MATERIAU' expanded and 'ELAS' selected. The 'Available Keywords' panel on the right shows 'RHO' selected. The 'Validate' button is highlighted at the bottom right.

Command	Concept/Val
DEFI_MATERIAU :	MA
ELAS :	210000.0
NU :	0.3
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

Available Keywords:

- RHO
- AMOR ALPHA
- AMOR BETA
- AMOR HYST

Rules:

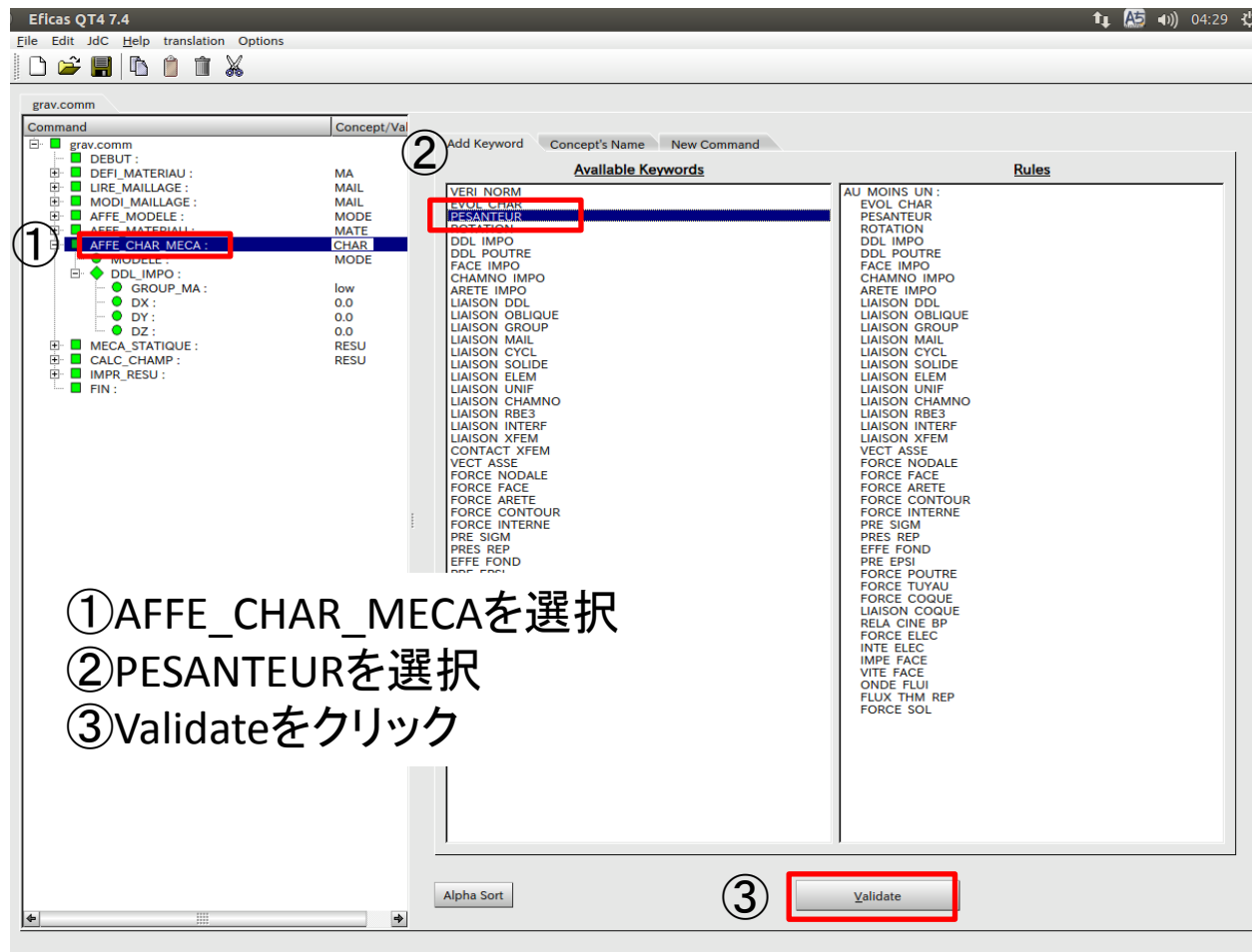
Validate

- ① DEFI\_MATERIAUを展開、ELASを選択
- ② RHOを選択
- ③ Validateをクリック

# 演習5 Eficasによるコマンドファイルの修正

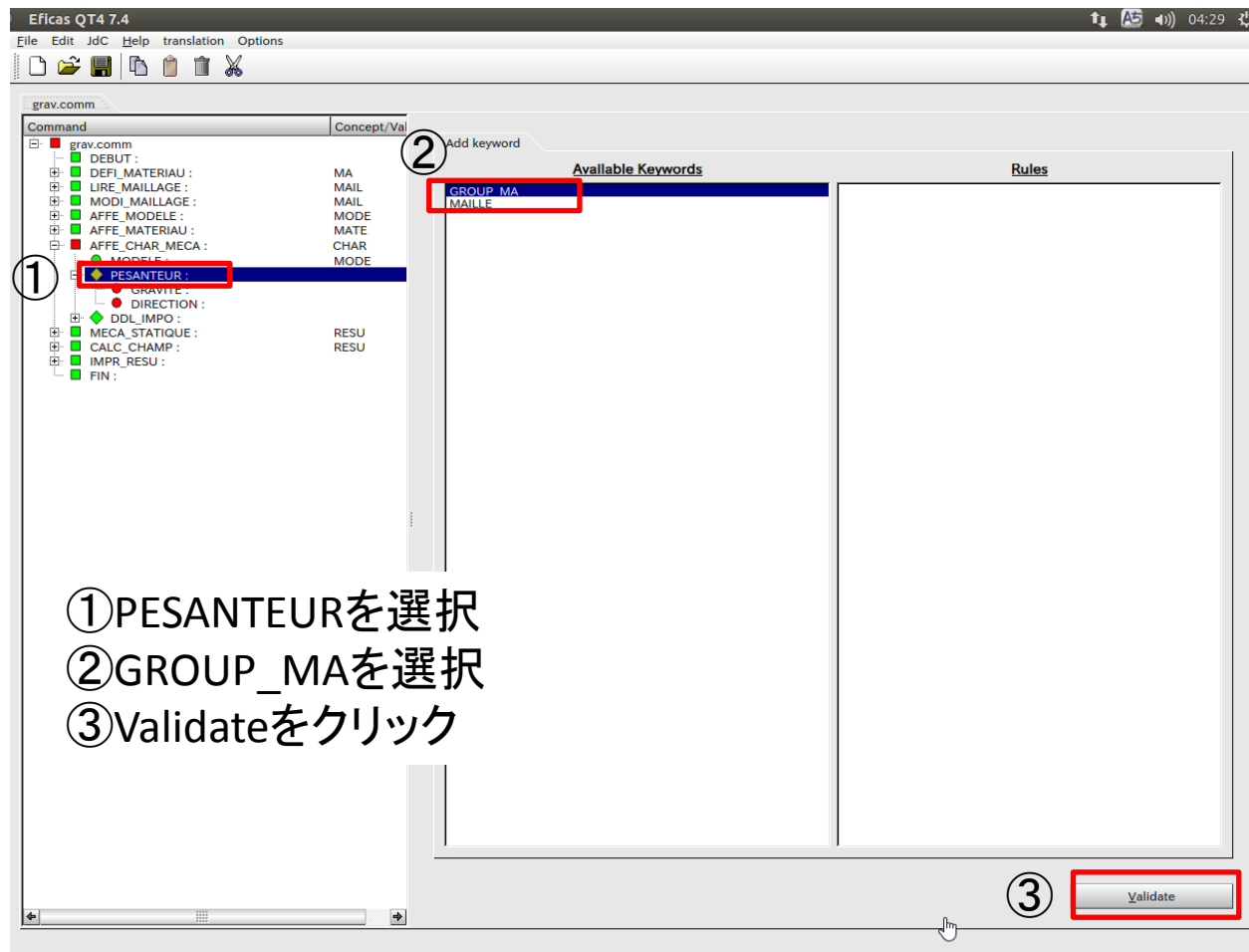
① RHOを選択  
② 質量密度を入力  
③ Validateをクリック

# 演習5 Efficasによるコマンドファイルの修正



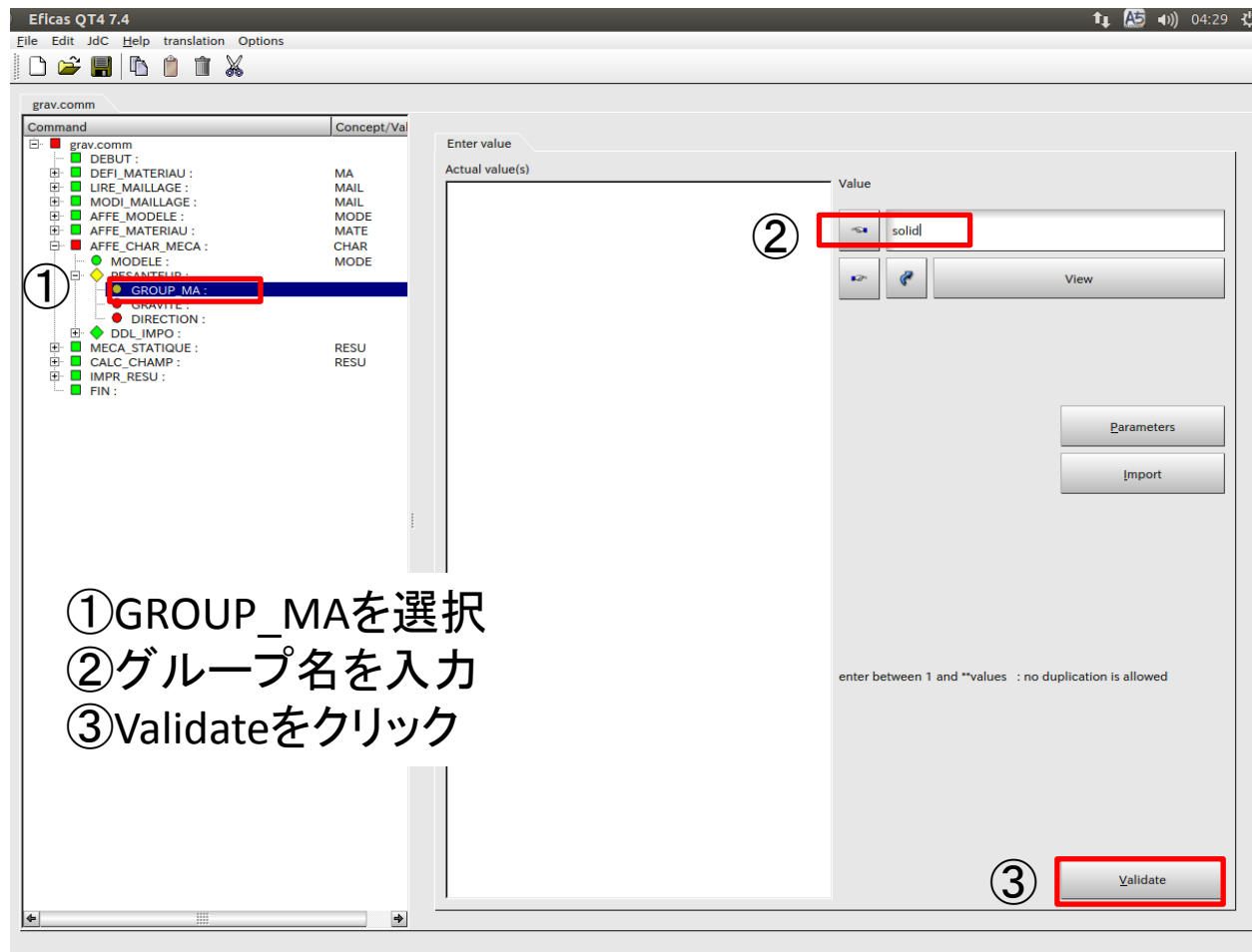
- ①AFFE\_CHAR\_MECAを選択
- ②PESANTEURを選択
- ③Validateをクリック

# 演習5 Eficasによるコマンドファイルの修正

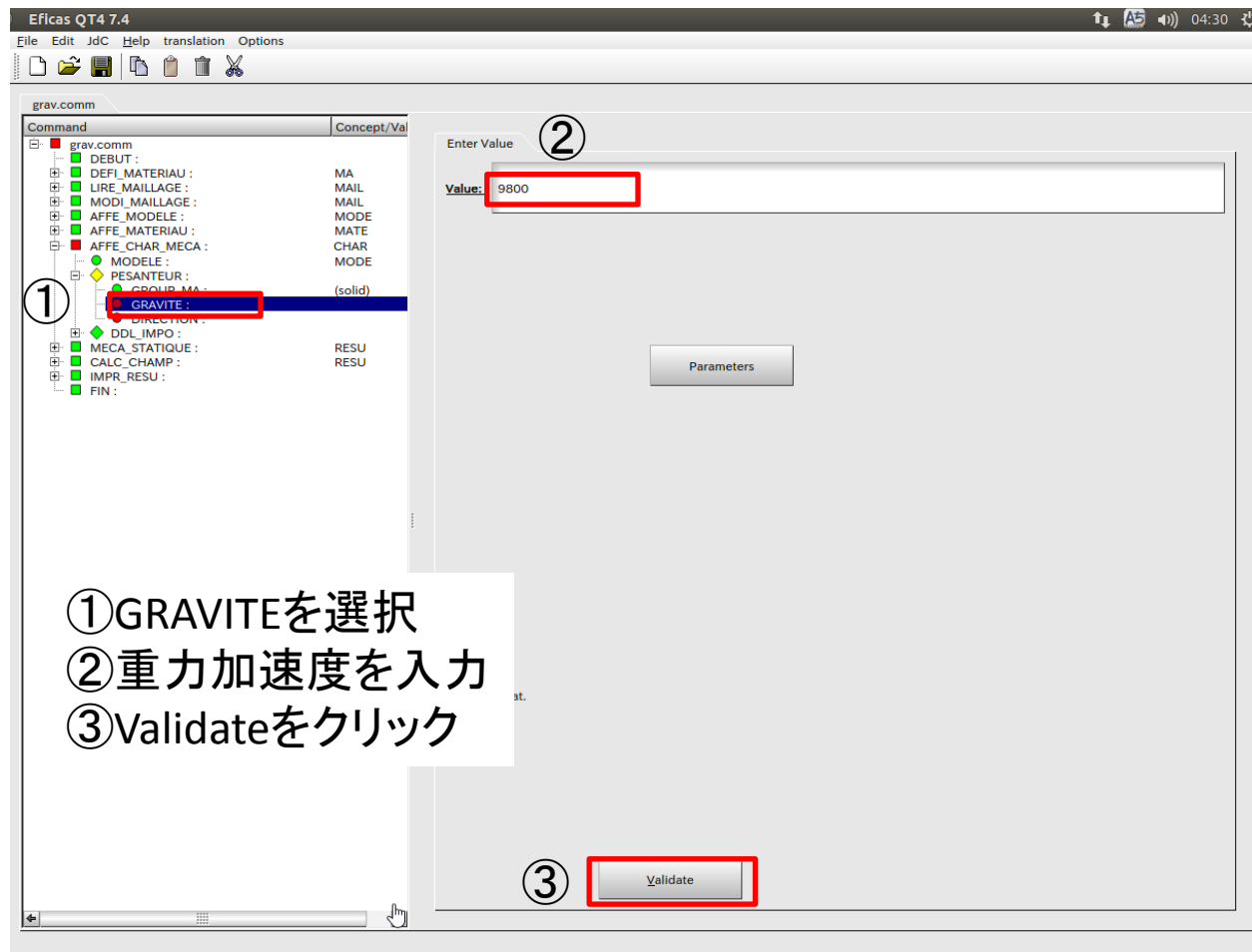




# 演習5 Eficasによるコマンドファイルの修正

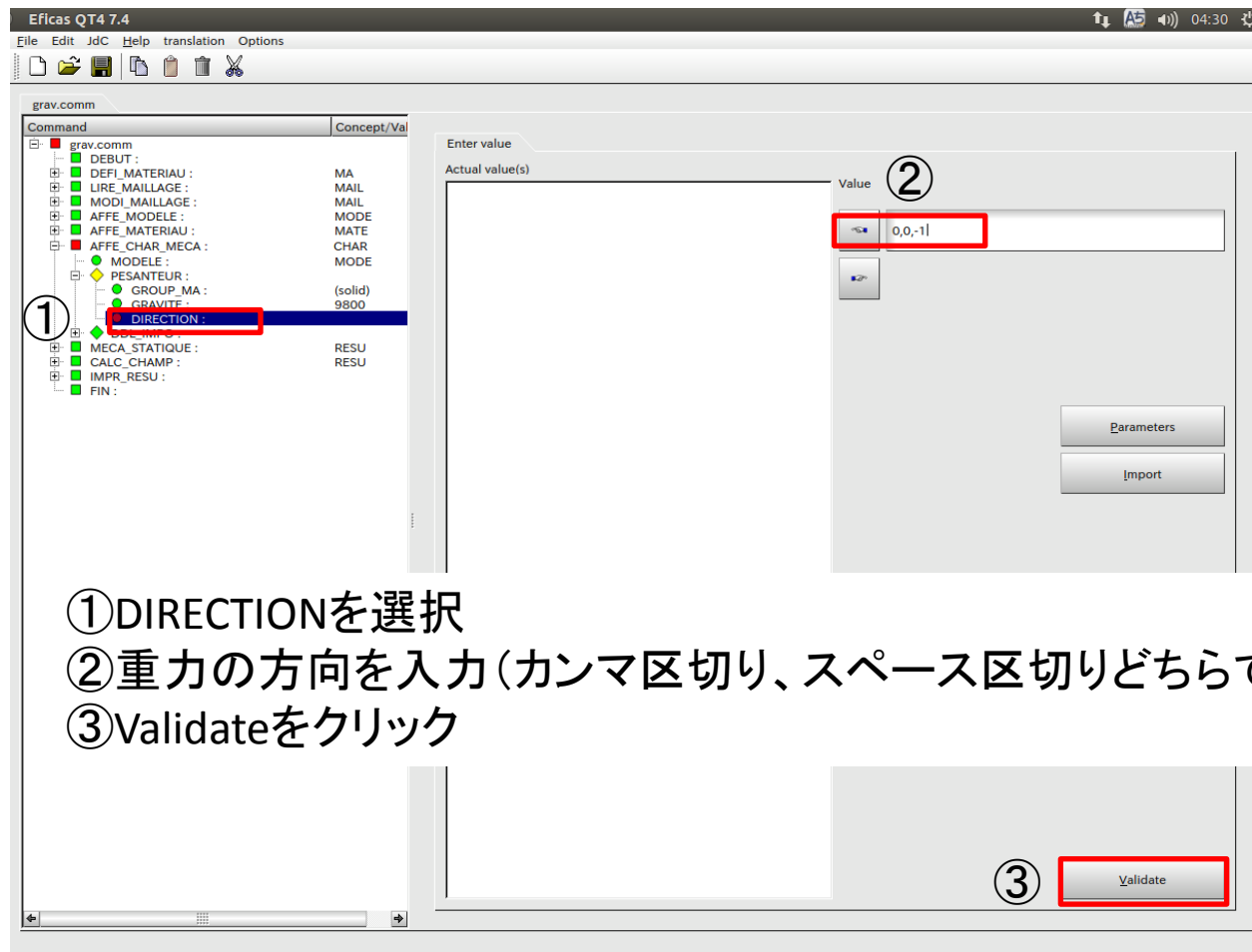


# 演習5 Eficasによるコマンドファイルの修正



- ①GRAVITEを選択
- ②重力加速度を入力
- ③Validateをクリック

# 演習5 Eficasによるコマンドファイルの修正



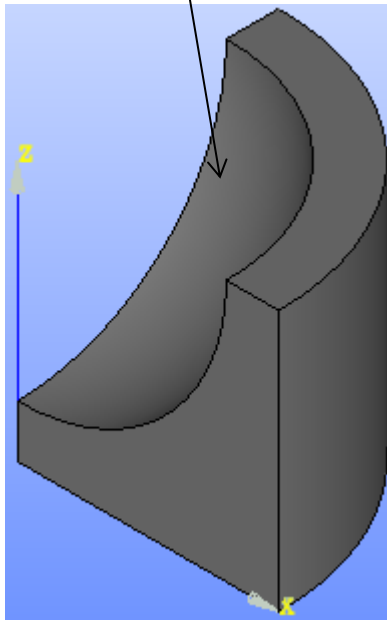
① DIRECTIONを選択

② 重力の方向を入力 (カンマ区切り、スペース区切りどちらでも可)

③ Validateをクリック

# 演習6 対称条件による解析

圧力: 1MPa (hole)



1/4モデルで解析

ヤング率: 210000MPa

ポアソン比: 0.3

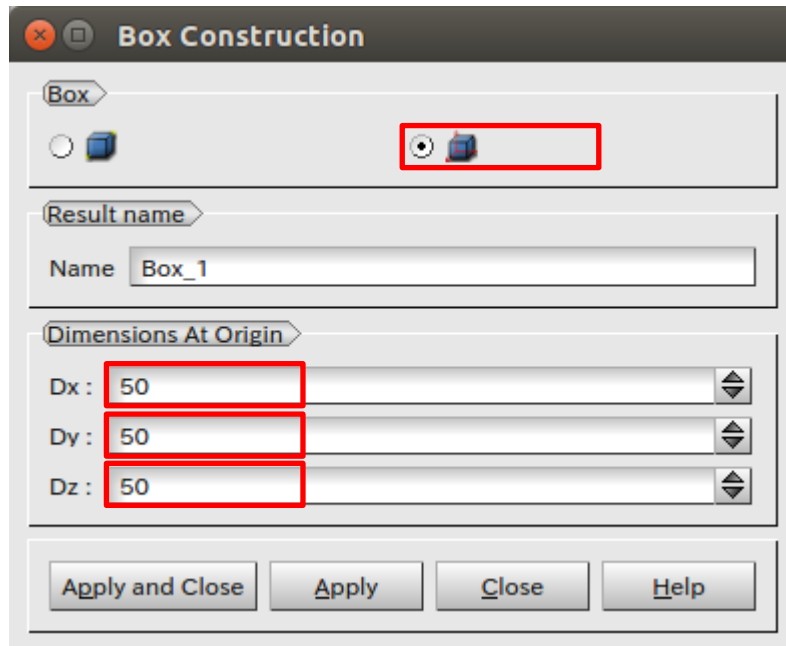
演習1と同等の解析を行うための拘束条件を設定する

# 演習6 対称条件による解析

1/4モデルの作成

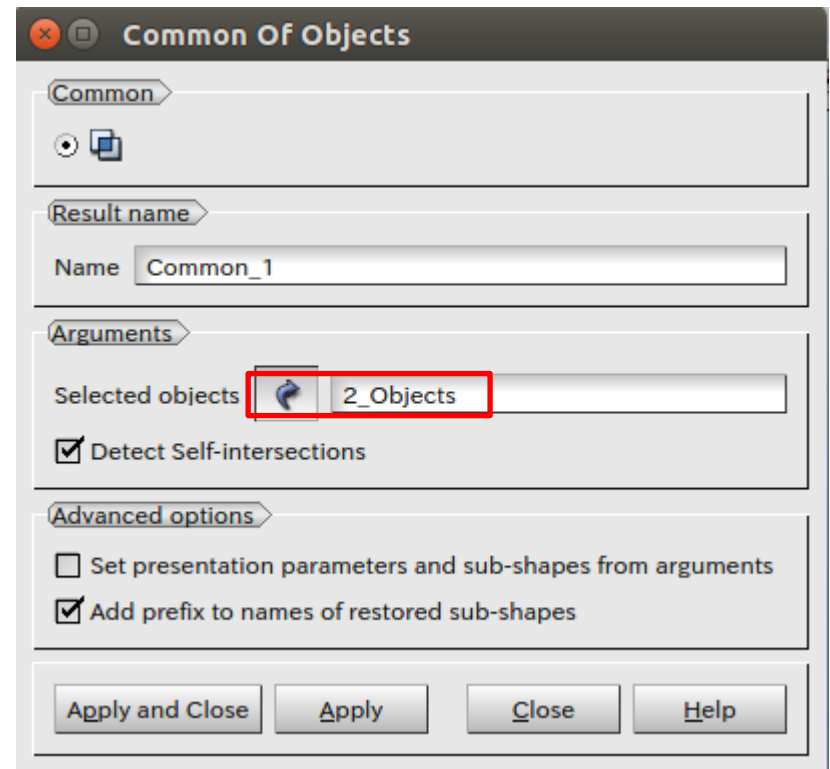
角柱の作成

New Entity>Primitives>Box

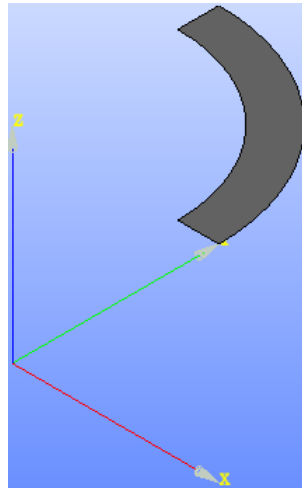
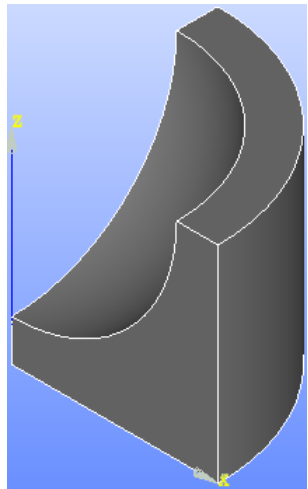


ブーリアン

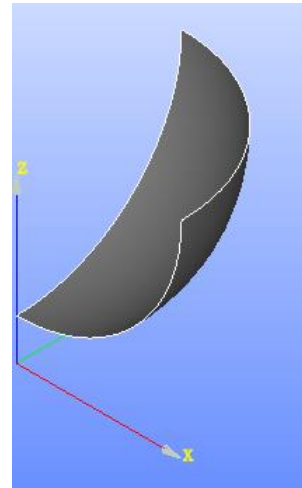
Operations>Boolean>Common



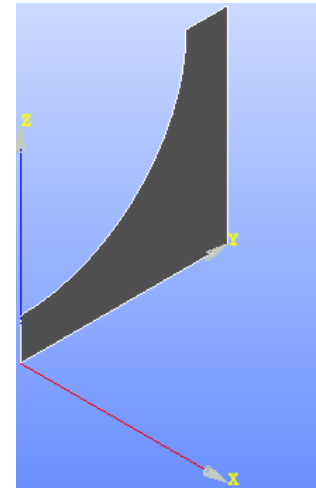
# 演習6 グループの作成



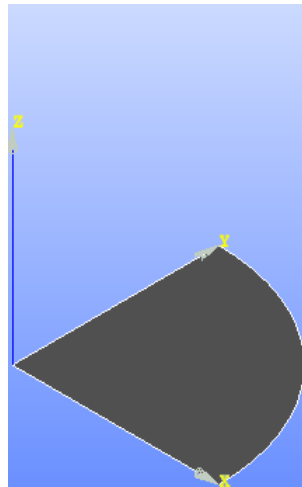
up



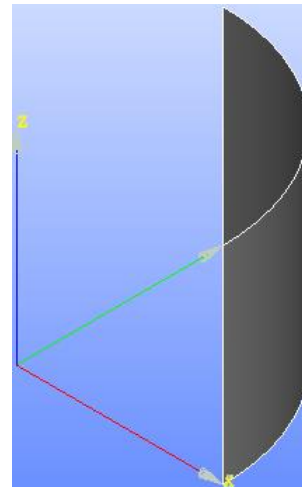
hole



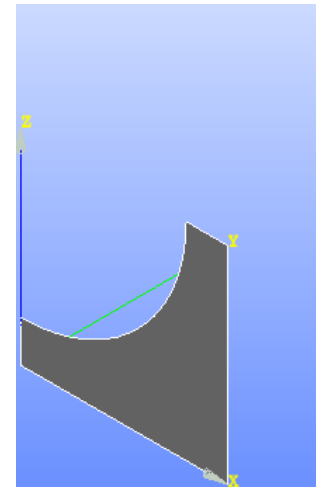
Xsym



low



side



Ysym

# 演習6 メッシュの作成

Netgen 1D-2D-3D

NETGENE 3D Parameters

Mesh computation succeed

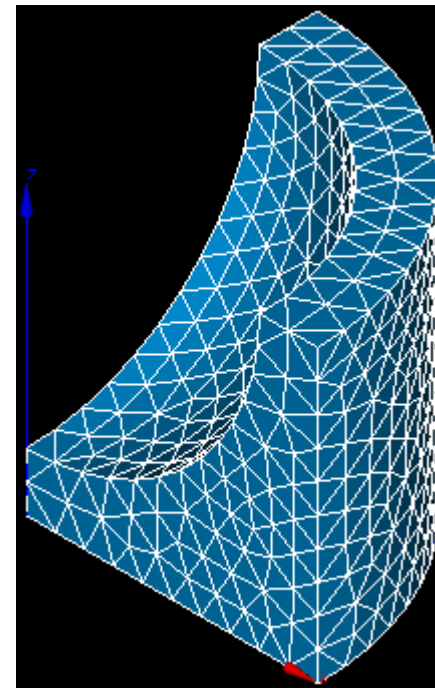
Compute mesh

Mesh 1

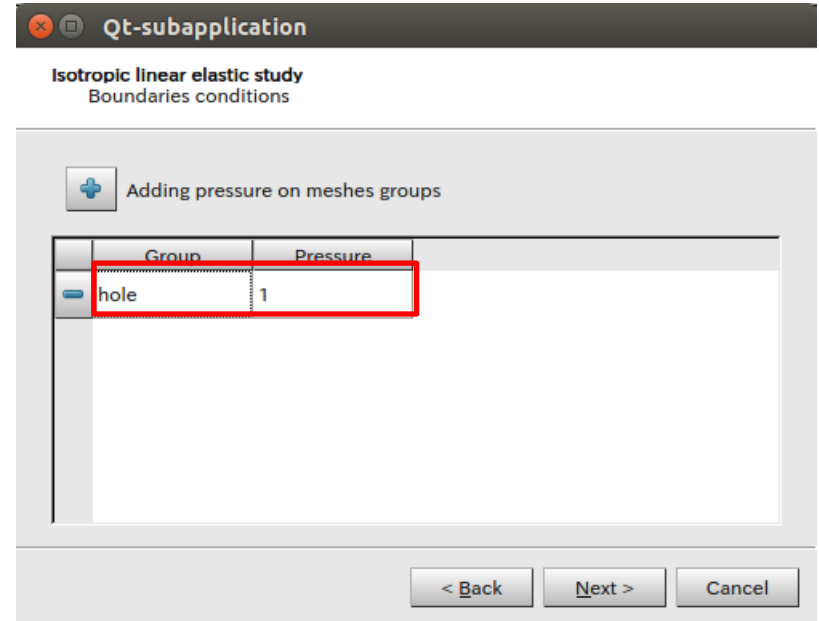
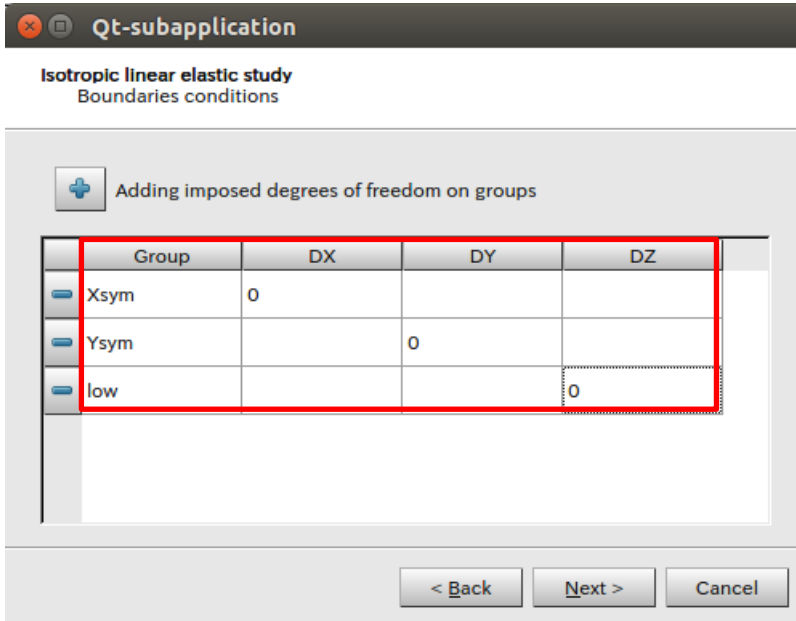
Mesh Infos

	Total	Linear	Quadratic	Bi-Quadratic
<b>Nodes :</b>	604			
<b>OD Elements :</b>	0			
<b>Balls :</b>	0			
<b>Edges :</b>	117	117	0	
<b>Faces :</b>	1012	1012	0	0
Triangles :	1012	1012	0	0
Quadrangles :	0	0	0	0
Polygons :	0			
<b>Volumes :</b>	1894	1894	0	0
Tetrahedrons :	1894	1894	0	0
Hexahedrons :	0	0	0	0
Pyramids :	0	0	0	0
Prisms :	0	0	0	0
Hexagonal prisms :	0			
Polyhedrons :	0			

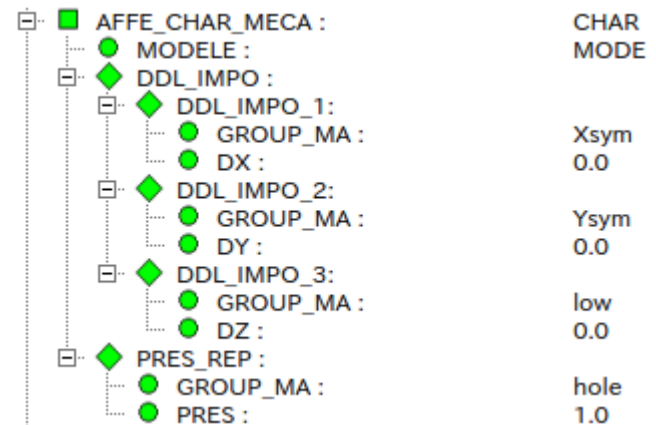
Close



# 演習6 wizardの設定



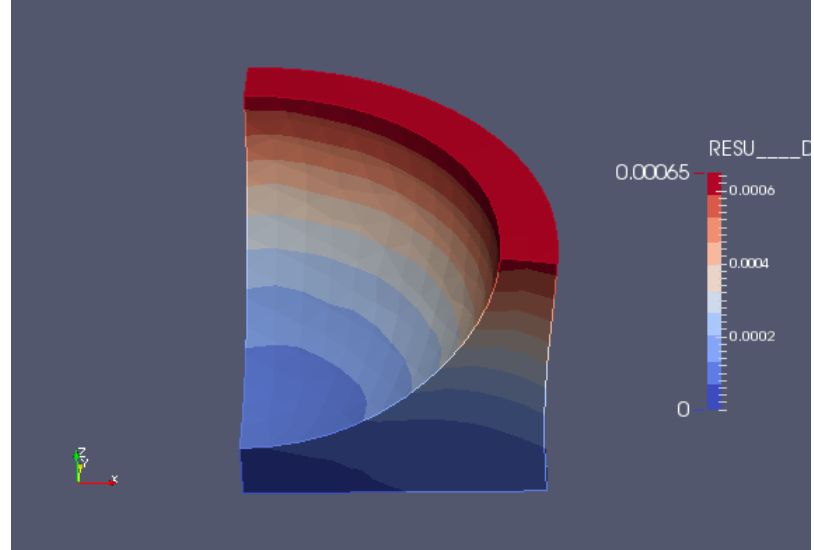
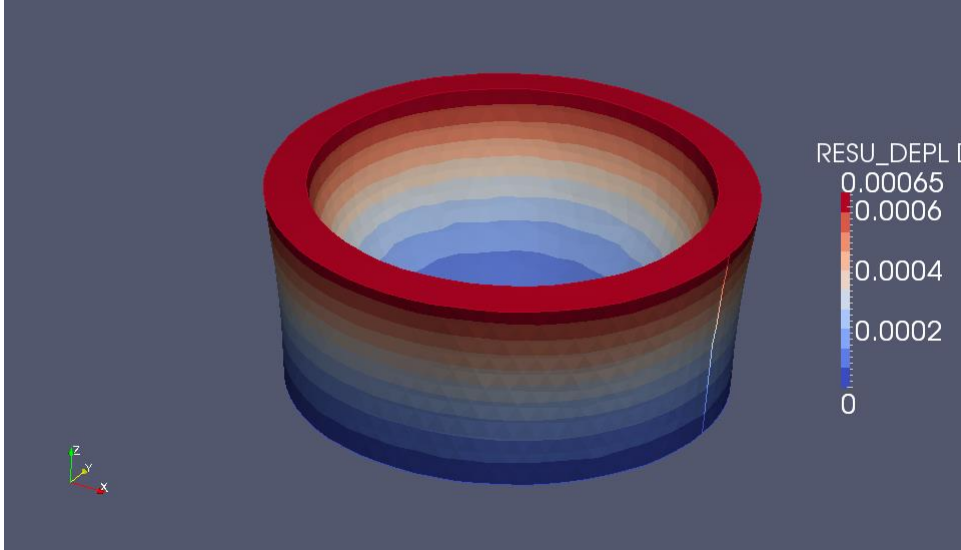
Eficasのコマンド



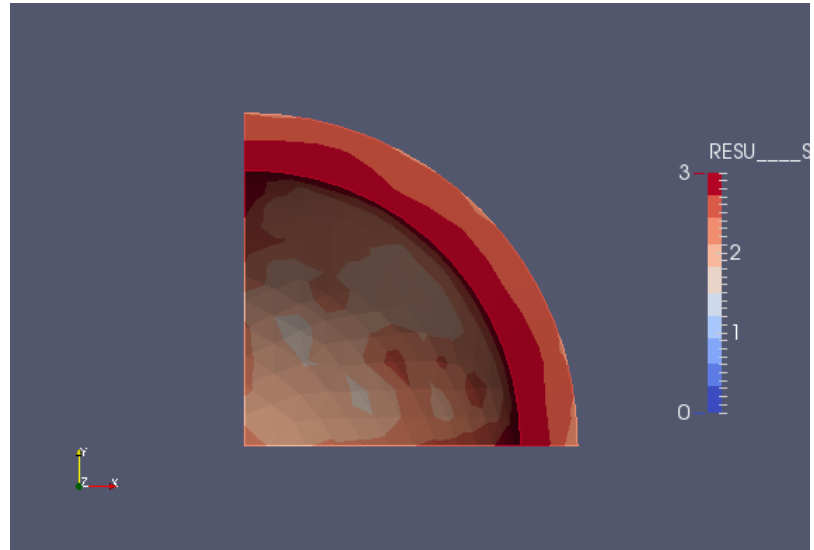
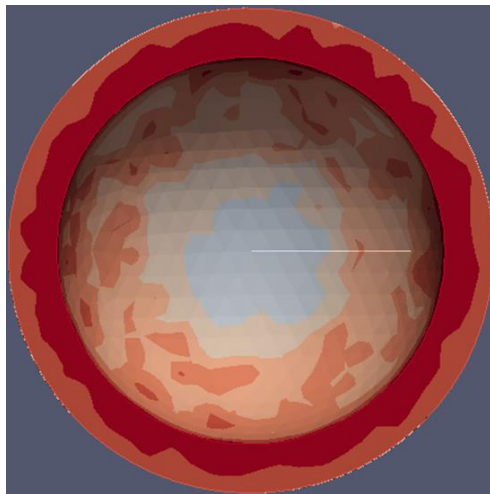


# 演習6 解析結果

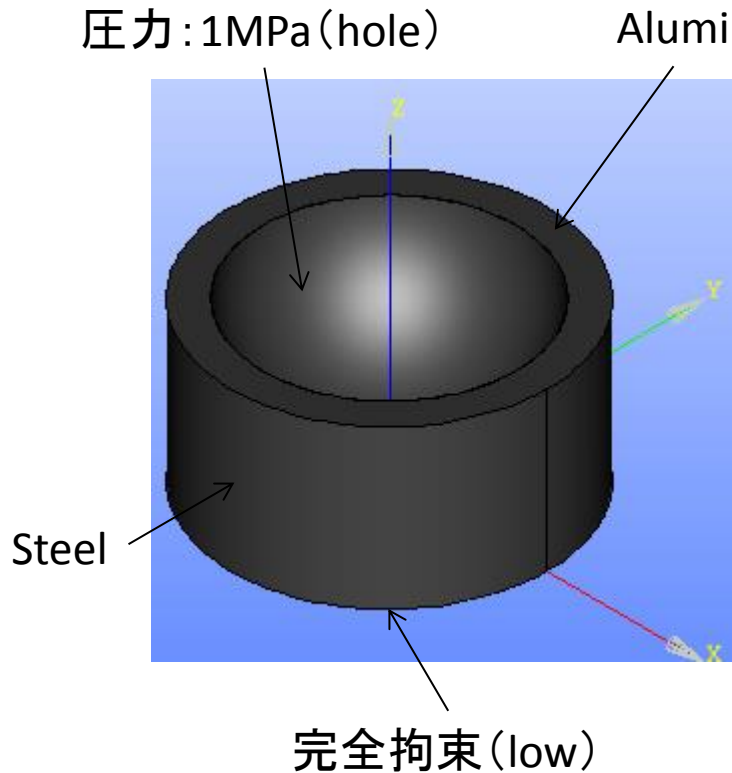
変位



応力



# 演習7 二種材料による解析



片側ずつ材料が異なる

Steel

ヤング率: 210000MPa

ポアソン比: 0.3

alumi

ヤング率: 70600MPa

ポアソン比: 0.345

# 演習7 二種材料による解析

## 平面の作成

New Entity>Primitives>Reactangle

Rectangle Construction

Rectangle

Result name

Name Face\_1

Dimensions At Origin

Height : 100

Width : 100

Orientation

OXY  OYZ  OZX

Apply and Close Apply Close Help

## Operations>Partition

Partition Of Object With Tool

Partition

Result name

Name Partition\_1

Partition

Objects Cut\_1

Tool Objects Face\_1

Resulting Type Solid

Keep shapes of lower type

No sub-shapes intersection (Compounds only)

Detect Self-intersections

Advanced options

Set presentation parameters and sub-shapes from arguments

Add prefix to names of restored sub-shapes

Apply and Close Apply Close Help

# 演習7 グループの作成

## フェースグループ

The 'Create Group' dialog box for a face group has the following configuration:

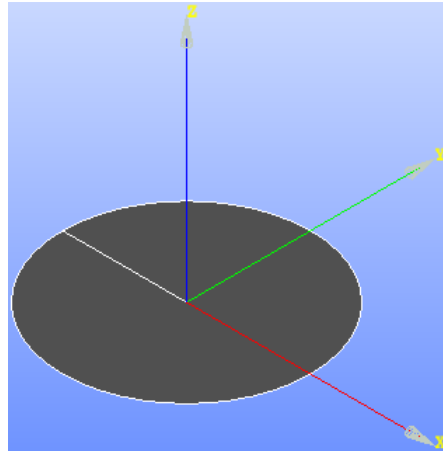
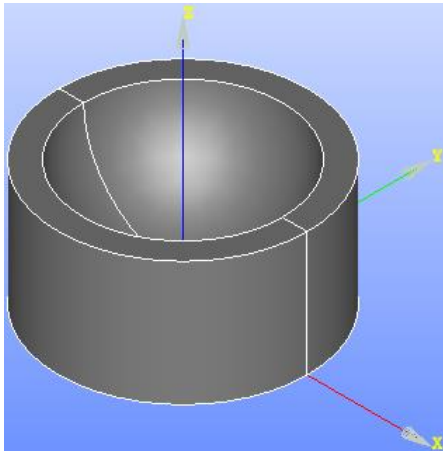
- Shape Type:** The 'Face' icon (a square with a dot) is selected.
- Group Name:** The 'Name' field contains the text 'low'.
- Main Shape And Sub-shapes:** The 'Main Shape' field contains 'Partition\_1'.
- Main Shape Selection restriction:** The 'No restriction' radio button is selected.
- Second Shape:** The 'Second Shape' field is empty.
- Buttons:** 'Show only selected', 'Hide selected', and 'Show all sub-shapes' are visible. The 'List' area contains two items: '24' and '41'. 'Select All', 'Add', and 'Remove' buttons are also present.
- Footer:** 'Apply and Close', 'Apply', 'Close', and 'Help' buttons are at the bottom.

## ソリッドグループ

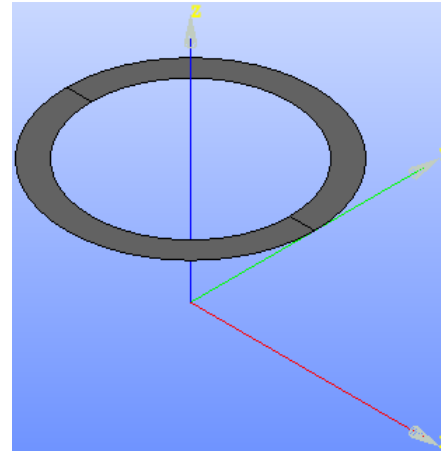
The 'Create Group' dialog box for a solid group has the following configuration:

- Shape Type:** The 'Solid' icon (a square with a dot and a blue square) is selected.
- Group Name:** The 'Name' field contains the text 'steel'.
- Main Shape And Sub-shapes:** The 'Main Shape' field contains 'Partition\_1'.
- Main Shape Selection restriction:** The 'No restriction' radio button is selected.
- Second Shape:** The 'Second Shape' field is empty.
- Buttons:** 'Show only selected', 'Hide selected', and 'Show all sub-shapes' are visible. The 'List' area contains one item: '32'. 'Select All', 'Add', and 'Remove' buttons are also present.
- Footer:** 'Apply and Close', 'Apply', 'Close', and 'Help' buttons are at the bottom.

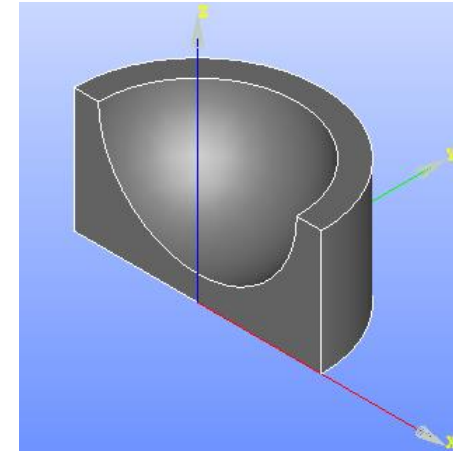
# 演習7 グループの作成



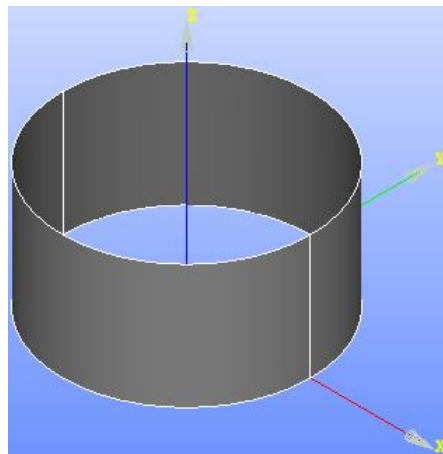
low



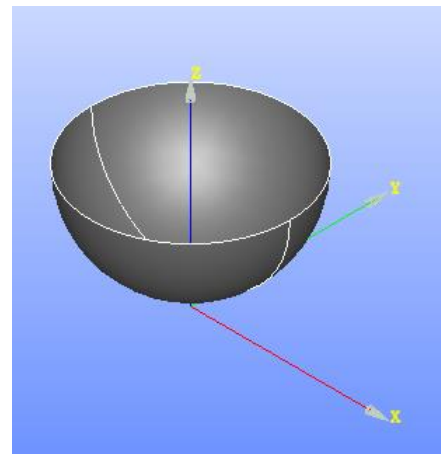
up



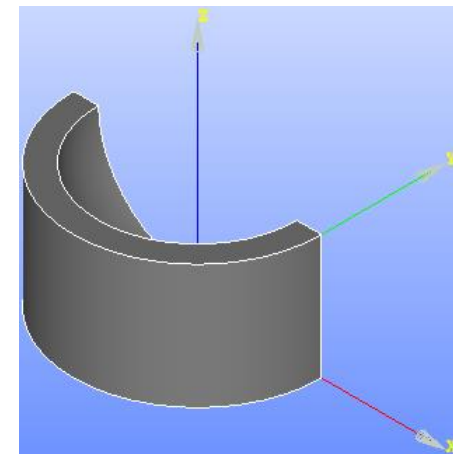
alumi



side



hole



steel

# 演習7 メッシュの作成

Netgen 1D-2D-3D

NETGENE 3D Parameters

Mesh computation succeed

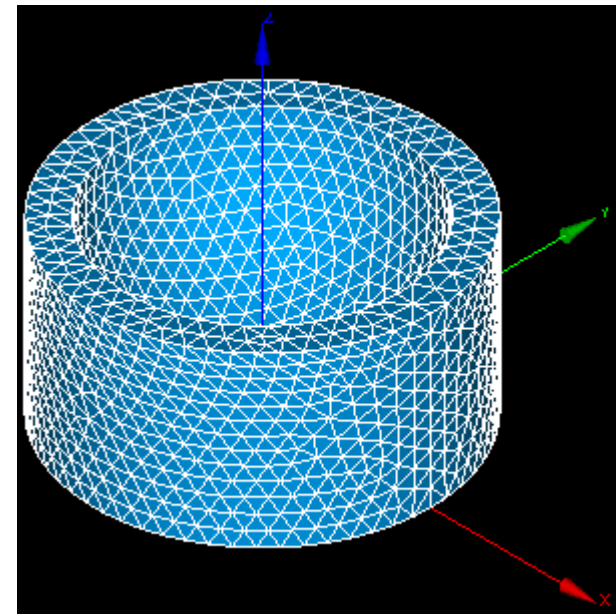
Compute mesh

Mesh 1

Mesh Infos

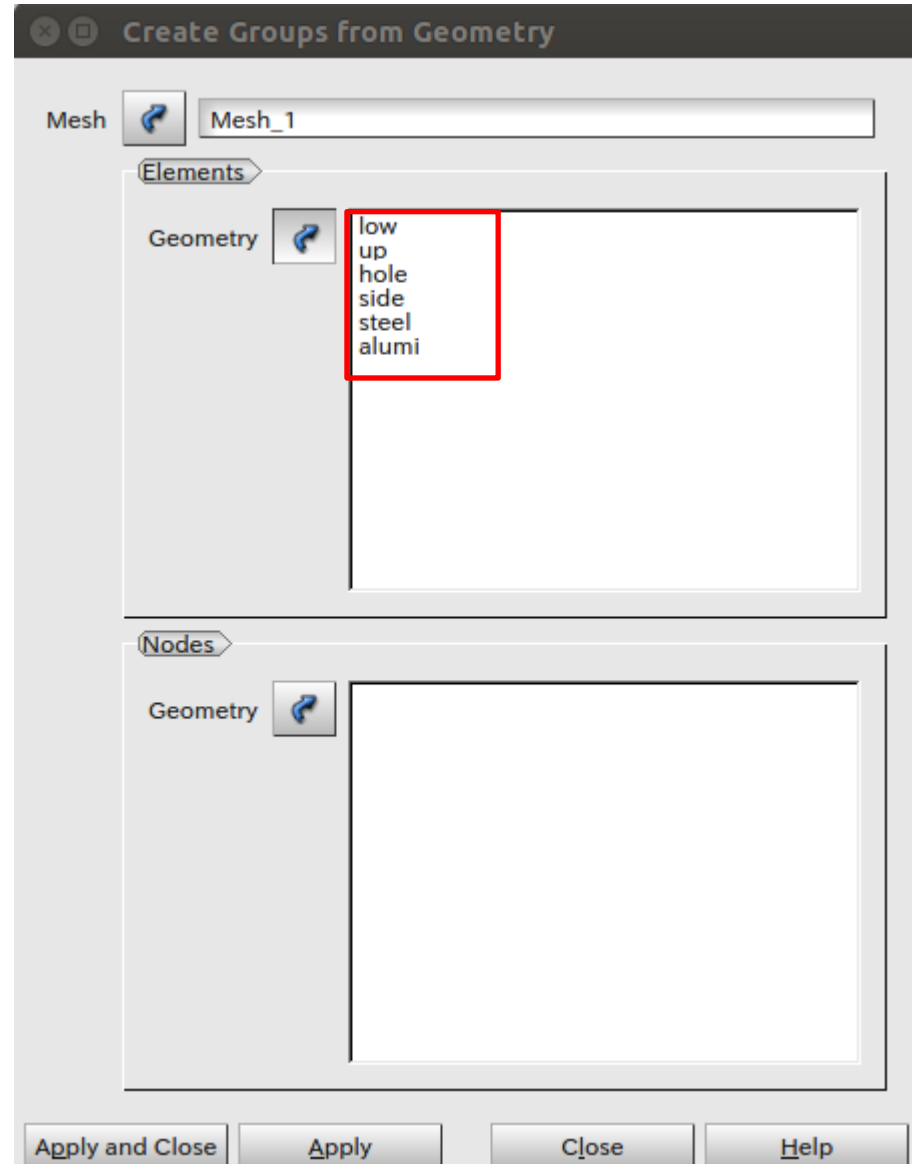
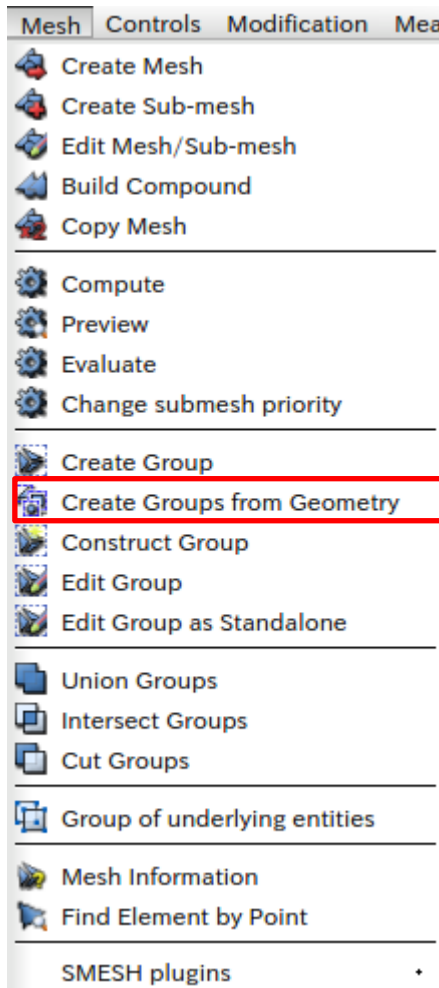
	Total	Linear	Quadratic	Bi-Quadratic
<b>Nodes :</b>	2179			
<b>OD Elements :</b>	0			
<b>Balls :</b>	0			
<b>Edges :</b>	244	244	0	
<b>Faces :</b>	3522	3522	0	0
Triangles :	3522	3522	0	0
Quadrangles :	0	0	0	0
Polygons :	0			
<b>Volumes :</b>	7757	7757	0	0
Tetrahedrons :	7757	7757	0	
Hexahedrons :	0	0	0	0
Pyramids :	0	0	0	
Prisms :	0	0	0	
Hexagonal prisms :	0			
Polyhedrons :	0			

Close

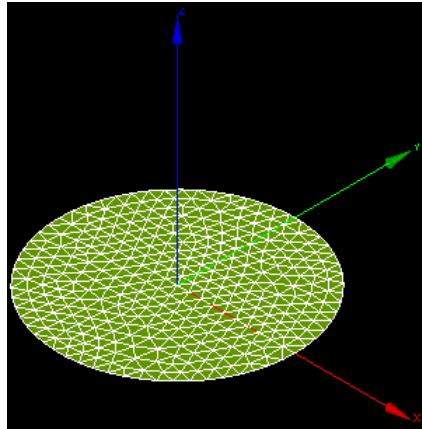
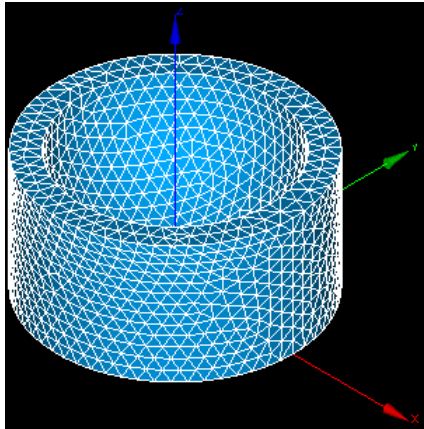


# 演習7 要素グループの作成

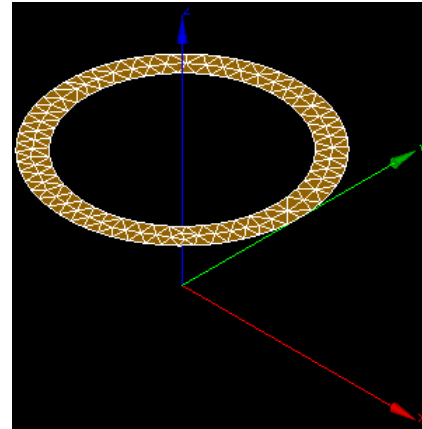
Mesh>Create Groups from Geometry



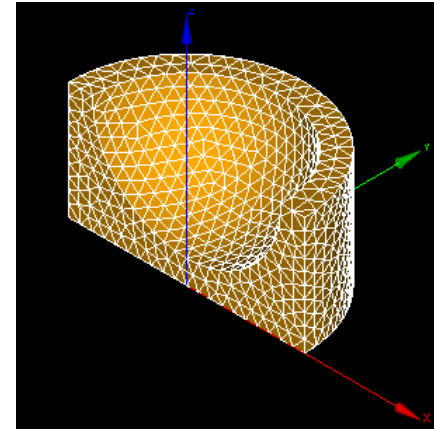
# 演習7 要素メッシュの作成



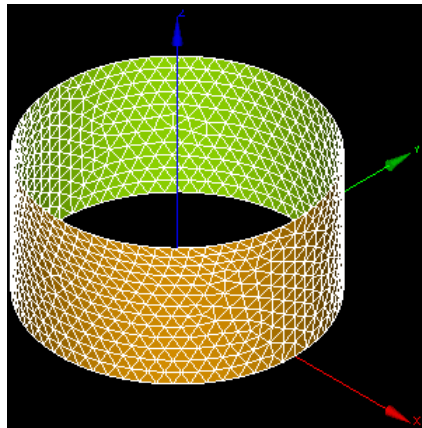
low



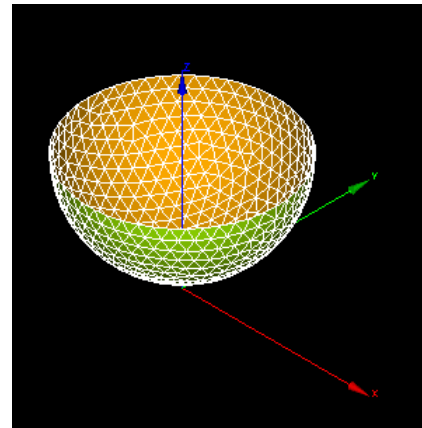
up



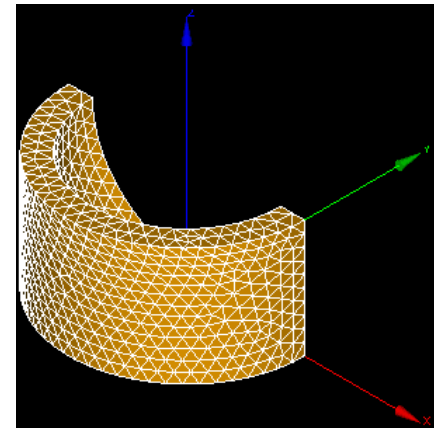
alumi



side



hole

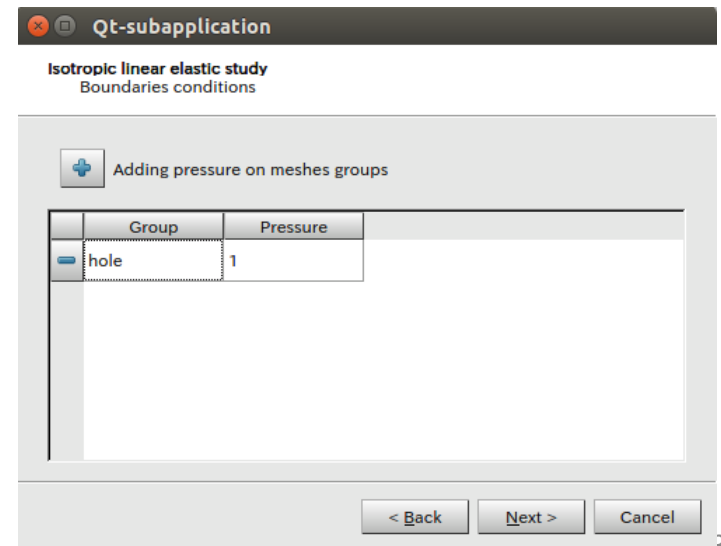
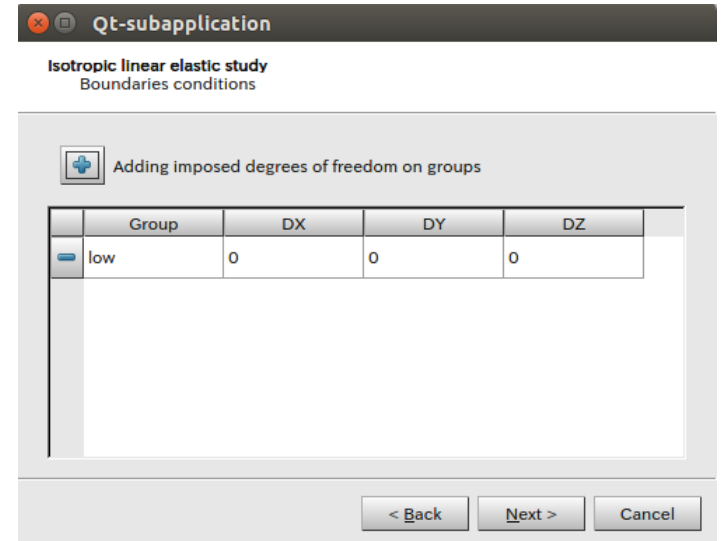
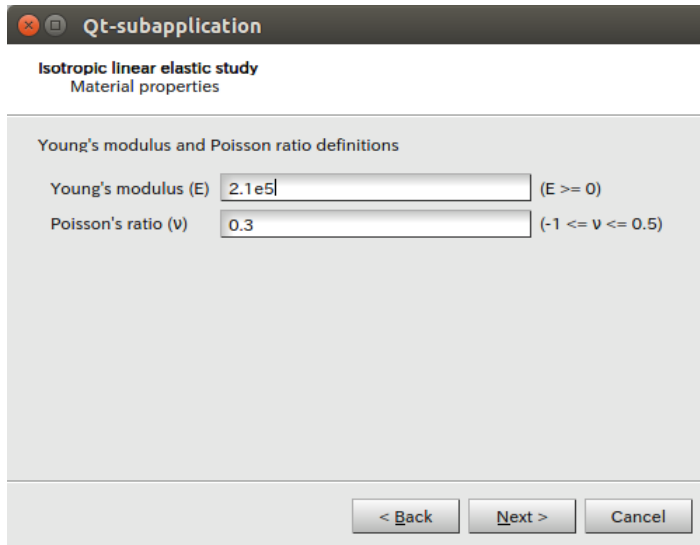


steel



# 演習7 wizardの設定

Wizardで仮設定を行う



# 演習7 Eficasによるコマンドファイルの修正

① DEFI\_MATERIAUを選択

② New Commandを選択

③ DEFI\_MATERIAUを選択

④ Validateをクリック

new command will be added AFTER current command

# 演習7 Eficasによるコマンドファイルの修正

mat.comm

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
DEFI_MATERIAU :	
LIRE_MAILLAGE :	MAIL
MODI_MAILLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

Available Keywords

ELAS

Rules

EXCLUS :  
ELAS  
ELAS FO  
ELAS FLUI  
ELAS ISTR  
ELAS ISTR FO  
ELAS ORTH  
ELAS ORTH FO  
ELAS COQUE  
ELAS COQUE FO  
ELAS HYPER  
ELAS 2NDG

EXCLUS :  
THER  
THER FO  
THER ORTH  
THER NL

EXCLUS :  
ECRO LINE  
ECRO LINE FO  
ECRO PUIS  
ECRO COOK  
ECRO COOK FO

EXCLUS :  
ENDO HETEROGENE

EXCLUS :  
TAHERI  
TAHERI FO

Alpha Sort

Validate

Keyword VISC\_ENDO is deleted

- ①DEFI\_MATERIAUを選択
- ②ELASを選択
- ③Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

mat.comm

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	
ELAS :	
E :	
NU :	
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

Enter Value

Value: 70600

Parameters

Validate

- ① Eを選択
- ② alumiのヤング率70600を入力
- ③ Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. The main window displays a tree view of the 'mat.comm' file. The 'Command' list on the left is as follows:

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	
ELAS :	
E :	70600
NU :	
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

The 'Enter Value' dialog box is open, showing 'Value: 0.345'. The 'Validate' button is highlighted.

- ① NUを選択
- ② alumiのポアソン比0.345を入力
- ③ Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

mat.comm

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	
ELAS :	
E :	70600
NU :	0.345
LIRE_MALLAGE :	MAIL
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

① DEFI\_MATERIAUを選択

② Concept's Nameを選択

③ ALを入力

④ Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

The screenshot shows the Eficac QT4 7.4 interface. On the left, a tree view displays a list of commands under 'mat.comm'. The 'AFFE\_MATERIAU' command is expanded, and the 'TOUT' sub-command is selected. A red box highlights the 'TOUT' entry, and another red box highlights the 'delete' option in the context menu. A 'Validate' button is visible at the bottom right of the dialog.

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	AL
ELAS :	
E :	70600
NU :	0.345
LIRE_MALLAGE :	MAIL
FORMAT :	MED
b_format_med :	
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
MALLAGE :	MAIL
AFFE :	
TOUT :	OUI
MAT :	delete
MATE :	MA
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPP_DECI :	

① AFFE\_MATERIAUを展開  
② TOUTを選択  
③ 右クリック>deleteで削除

# 演習7 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. On the left, a tree view displays a list of commands and their values. The 'AFFE' command is highlighted with a red box and a circled '1'. In the center, a dialog box titled 'Add keyword' is open, showing 'Available Keywords' and 'Rules' sections. 'GROUP\_MA' is selected in the 'Available Keywords' list with a red box and a circled '2'. The 'Rules' section contains the text 'UN PARI : TOUT GROUP MA MAILLE'. At the bottom right, the 'Validate' button is highlighted with a red box and a circled '3'.

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	AL
ELAS :	
E :	70600
NU :	0.345
LIRE_MALLAGE :	MAIL
FORMAT :	MED
b_format_med :	
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
MALLAGE :	MAIL
AFFE :	
MATER :	MA
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	

①AFFEを選択  
②GROUP\_MAを選択  
③Validateをクリック



# 演習7 Eficasによるコマンドファイルの修正

Salome-Meca 2014.2\_LGPL - [Study1] 09:06

Eficac QT4 7.4

File Edit JdC Help translation Options

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	AL
ELAS :	
E :	70600
NU :	0.345
LIRE_MALLAGE :	MAIL
FORMAT :	MED
b_format_med	
MODI_MALLAGE :	MAIL
MODE	
MODELE :	MODE
AFFE_MATERIAU :	MATE
MAILLAGE :	MAIL
AFFE :	
GROUP_MA :	MA
MATER :	
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	

Enter value

Actual value(s)

Value ②

③

View

Parameters

Import

enter between 1 and \*\*values : no duplication is allowed

- ① GROUP\_MAを選択
- ② steelを入力
- ③ 手のマークをクリック

# 演習7 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. On the left, a tree view shows the command file structure. The 'AFFE\_MATERIAU' command is selected and highlighted with a red box and a circled '1'. In the center, a table lists the command's parameters and their values. The 'AFFE' parameter is selected and highlighted with a red box and a circled '2'. On the right, a list of 'Available Keywords' is shown, with 'AFFE' selected and highlighted with a red box. At the bottom right, the 'Validate' button is highlighted with a red box and a circled '3'.

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	AL
ELAS :	
E :	70600
NU :	0.345
LIRE_MAILLAGE :	MAIL
FORMAT :	MED
b_format_med	
MODI_MAILLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
MAILLAGE :	MAIL
AFFE :	
GROUP_MA :	(steel)
MATER :	MA
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU
IMPR_RESU :	
FIN :	

Available Keywords:

- MODELE
- AFFE
- AFFE\_COMFOR
- AFFE\_VARC
- VARC NEUT1
- VARC NEUT2
- VARC TEMP
- VARC GEOM
- VARC PTOT
- VARC SECH
- VARC HYDR
- VARC CORR
- VARC IRRRA
- VARC DIVU
- VARC EPSA
- VARC M ACIER
- VARC M ZIRC
- INFO

Buttons: Alpha Sort, Validate

- ① AFFE\_MATERIAUを選択
- ② AFFEを選択
- ③ Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. On the left, a tree view displays a hierarchy of commands under 'mat.comm'. The 'MATER' command is selected and highlighted with a red box and a circled '1'. The main window shows a dialog titled 'Enter a Value' with two sections: 'Actual Value(s)' and 'Valid Values'. The 'Valid Values' section contains a list with 'AL' selected and highlighted with a red box and a circled '2'. Below the list are two buttons, with the top one highlighted by a red box and a circled '3'. At the bottom of the dialog is a 'Validate' button highlighted with a red box and a circled '4'.

① MATERを選択  
② ALを選択  
③手のマークを選択  
④ Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

The screenshot shows the Eficas QT4 7.4 interface. On the left, a tree view displays a list of commands and their values. The 'AFFE\_2' command is highlighted with a red box and a circled '1'. In the center, a dialog box titled 'Add keyword' is open. It has two panes: 'Available Keywords' and 'Rules'. In the 'Available Keywords' pane, 'GROUP\_MA' is selected and highlighted with a red box and a circled '2'. In the 'Rules' pane, the text 'UN PARI: TOUT GROUP MA MAILLE' is visible. At the bottom right of the dialog, a 'Validate' button is highlighted with a red box and a circled '3'.

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	AL
ELAS :	
E :	70600
NU :	0.345
LIRE_MALLAGE :	MAIL
FORMAT :	MED
b_format_med :	
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
MALLAGE :	MAIL
AFFE :	
AFFE_1 :	
GROUP_MA :	(steel)
MATER :	MA
MATER :	AL
AFFE_CHAR_MECA :	CHAR
MECA_STATIQUE :	RESU
CALC_CHAMP :	RESU

①AFFE\_2を選択  
②GROUP\_MAを選択  
③Validateをクリック

# 演習7 Eficasによるコマンドファイルの修正

Salome-Meca 2014.2\_LGPL - [Study1]

Eficas QT4 7.4

File Edit JdC Help translation Options

mat.comm

Command	Concept/Value
mat.comm	
DEBUT :	
DEFI_MATERIAU :	MA
ELAS :	
E :	210000.0
NU :	0.3
DEFI_MATERIAU :	AL
ELAS :	
E :	70600
NU :	0.345
LIRE_MALLAGE :	MAIL
FORMAT :	MED
b_format_med :	
MODI_MALLAGE :	MAIL
AFFE_MODELE :	MODE
AFFE_MATERIAU :	MATE
MALLAGE :	MAIL
AFFE :	
AFFE_1 :	
GROUP_MA :	(steel)
MATER :	MA
AFFE_2 :	
GROUP_MA :	AL
MATER :	CHAR
AFFE_CHAR_MECA :	

Enter value

Actual value(s)

Value

alumi

View

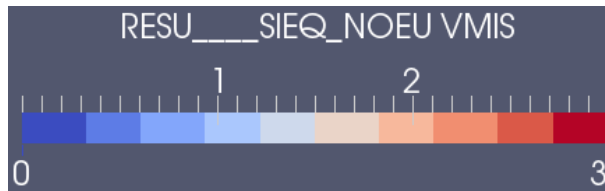
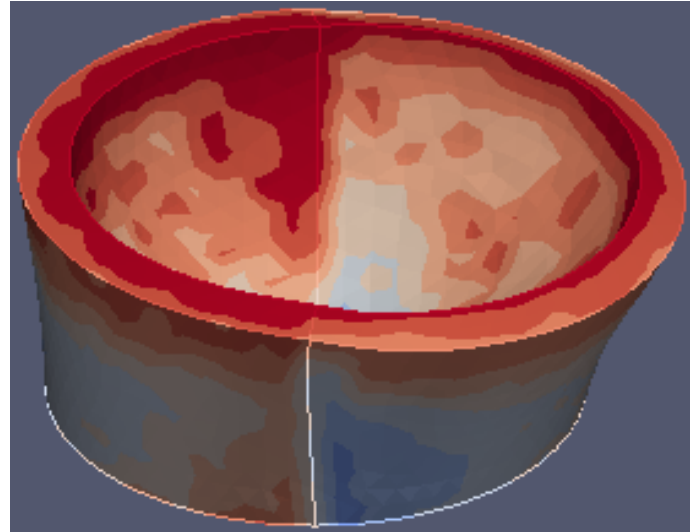
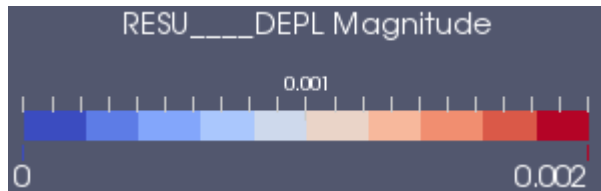
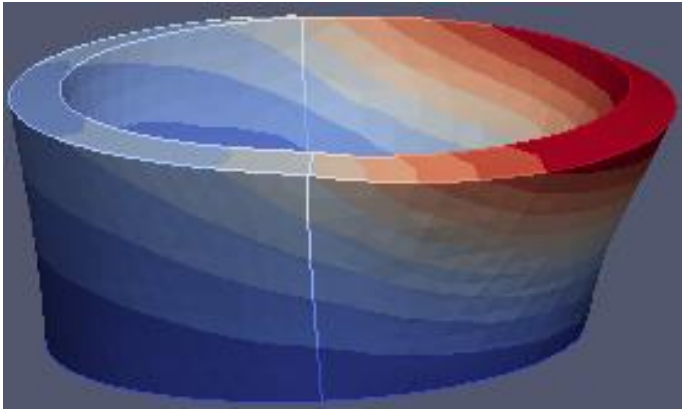
Parameters

Import

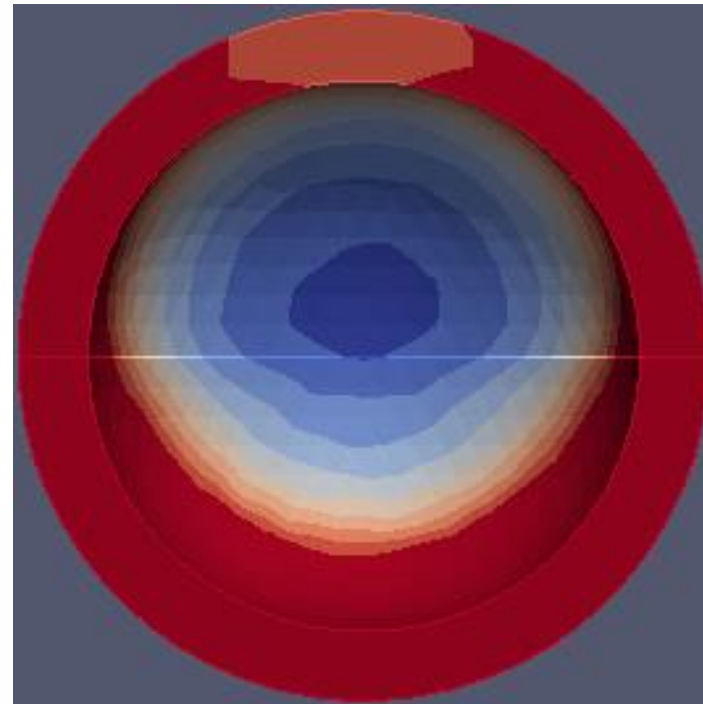
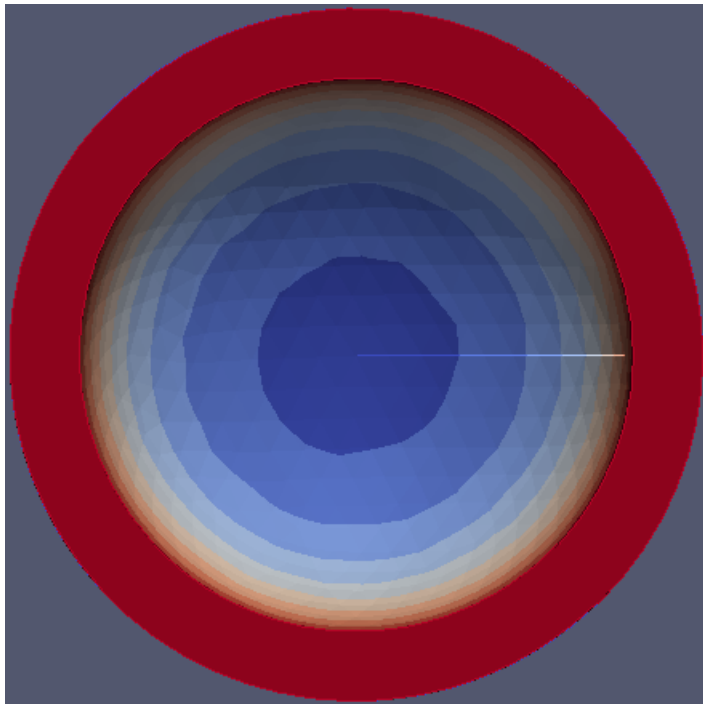
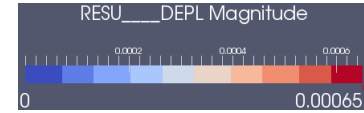
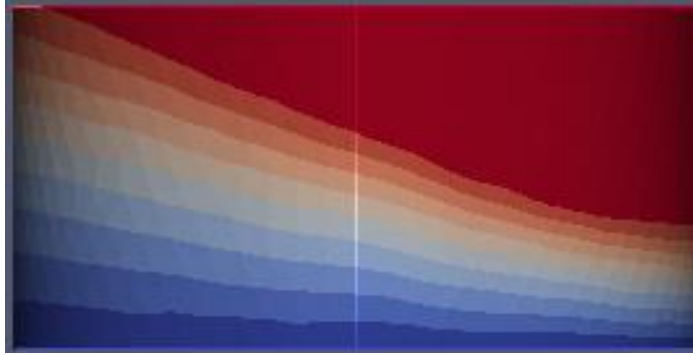
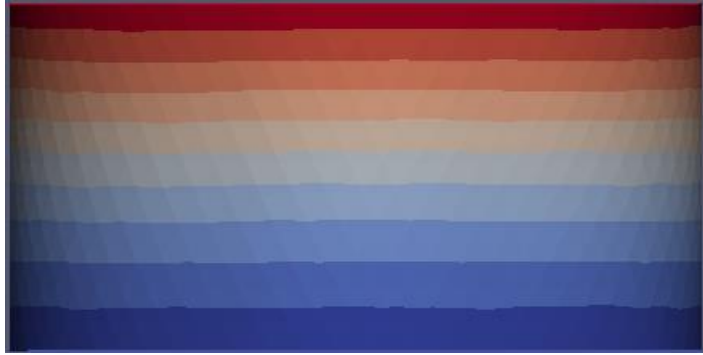
enter between 1 and \*\*values : no duplication is allowed

- ① GROUP\_MAを選択
- ② alumiを入力
- ③ 手のマークをクリック

# 演習7 解析結果



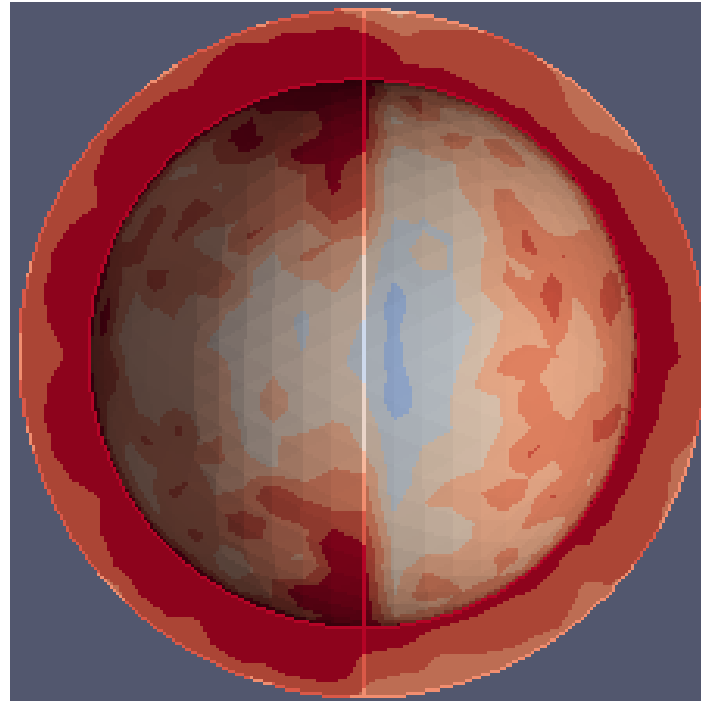
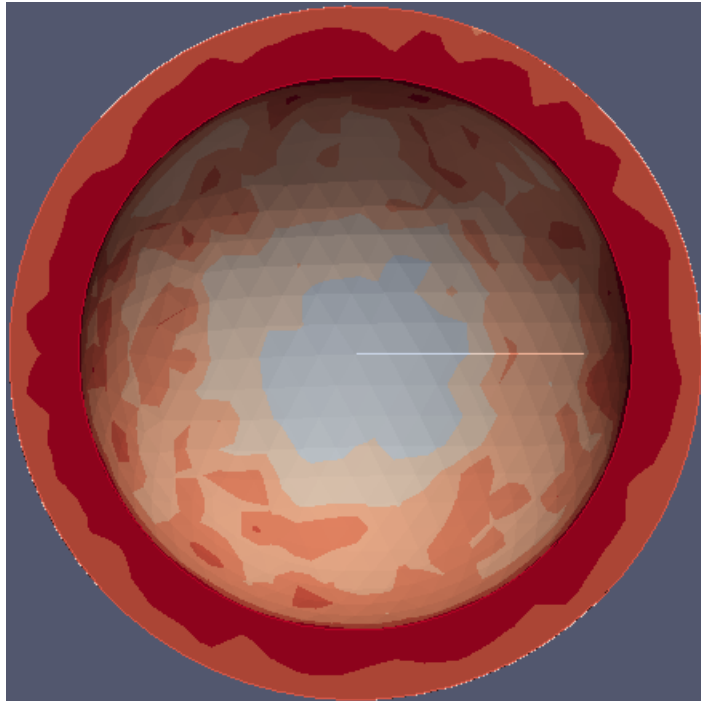
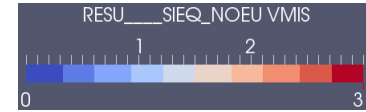
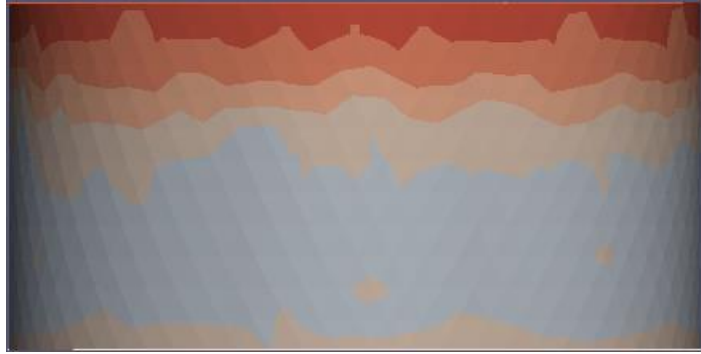
# 演習7 解析結果(変位)



演習1

演習7

# 演習7 解析結果(応力)



演習1

演習7



# 参考文献

- <https://sites.google.com/site/codeastersalomemeca/>
- <http://www.geocities.co.jp/SiliconValley-SantaClara/1183/>
- [http://salome-meca.cocolog-nifty.com/blog/blog\\_index.html](http://salome-meca.cocolog-nifty.com/blog/blog_index.html)
- <http://opencae.gifu-nct.ac.jp/pukiwiki/index.php?SALOME-Meca%A4%CE%BB%C8%CD%D1%CB%A1%B2%F2%C0%E2>