

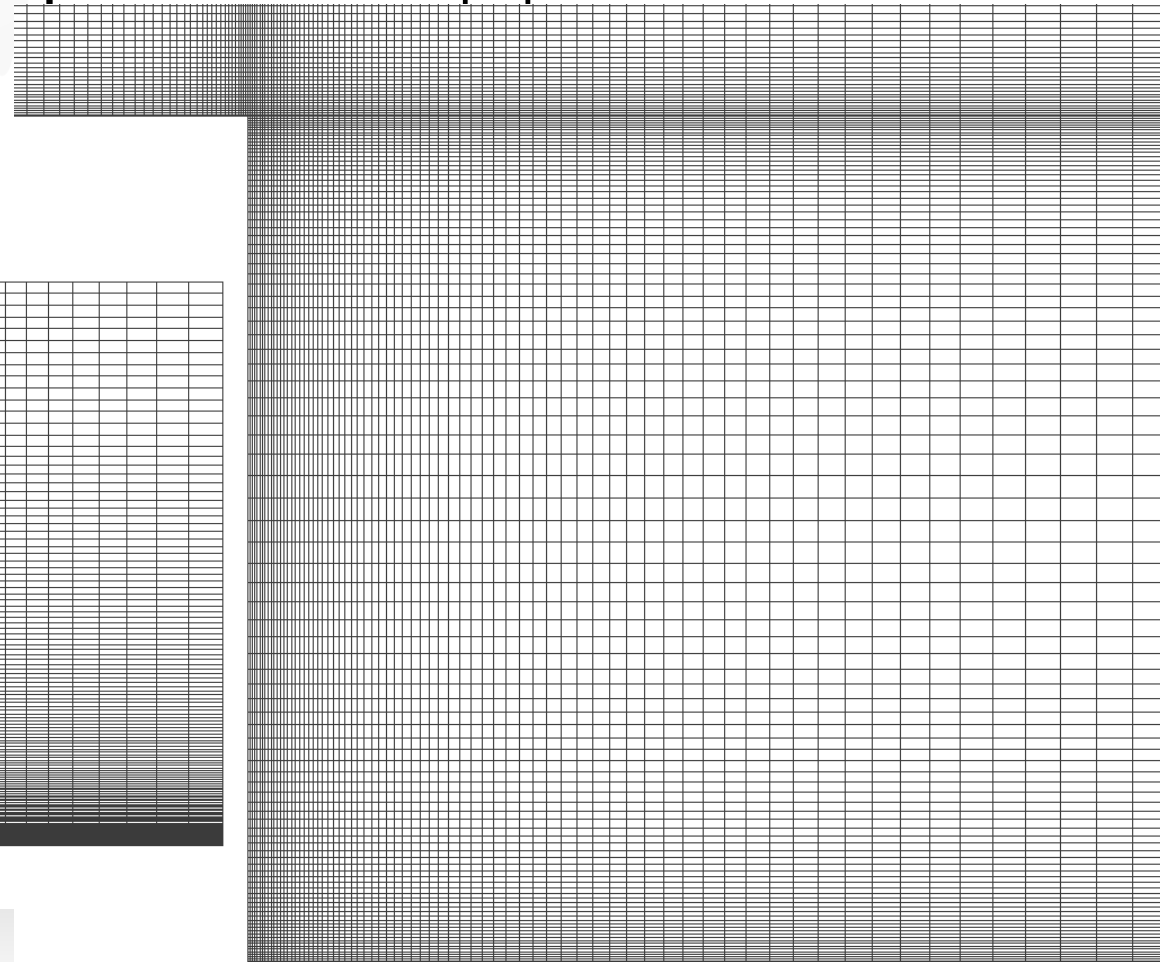
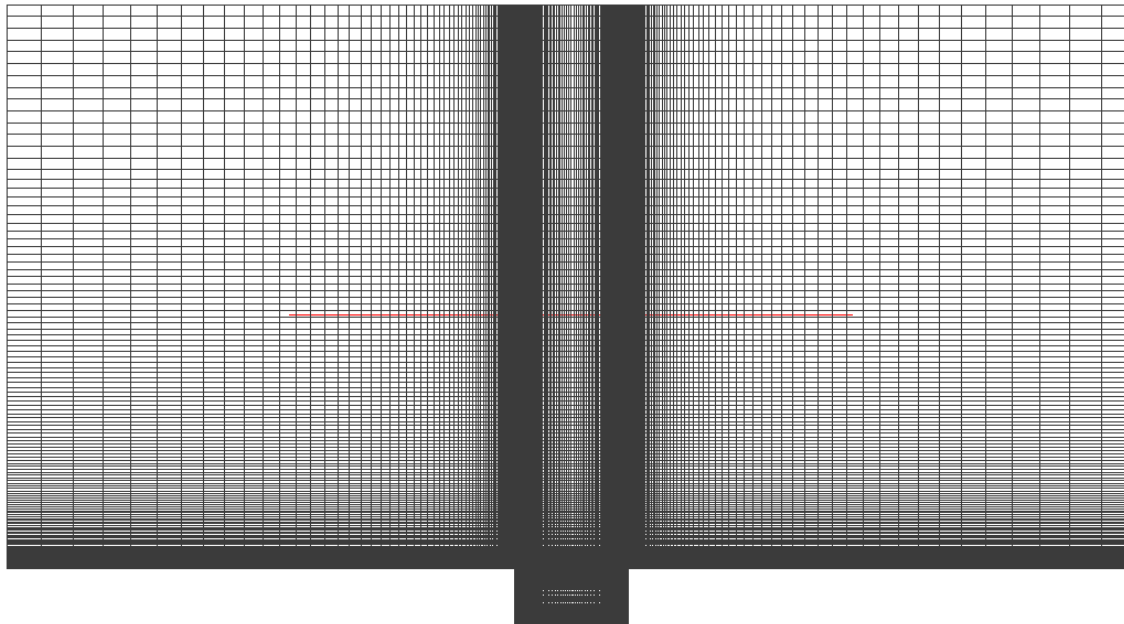
# 2D Cavity Flow

2015. 01. 23

김 병 윤

# 격자

- ▶ matlab 에서 만든 격자 사용 : 58700
  - Multiblock : 299x151, 141x101
- ▶ Matlab file → plot3d → OpenFOAM 격자



# 계산 방법

## ▶ 계산 조건

- $Ma = 0.6$ ,  $Re=2.75e+5$
- $P=101,325\text{Pa}$ ,  $T=300\text{K}$ ,  $U=203.313\text{m/s}$ ,  
viscosity=0.00176

## ▶ Solver & 난류모델

- rhoPimpleFoam of OpenFOAM-2.3.0
- SST k-omega

## ▶ 경계조건

- 속도
  - fixed value at inlet
  - **waveTransmissive at top and outlet**
  - no-slip at bottom and cavity
- 압력
  - **waveTransmissive at top and outlet**
  - zero gradient at inlet, bottom and cavity

## ▶ 2nd order discretization

- U : Gauss linearUpwindV Gauss linear
- k, omega : Gauss linearUpwind Gauss linear

## ▶ Time step size

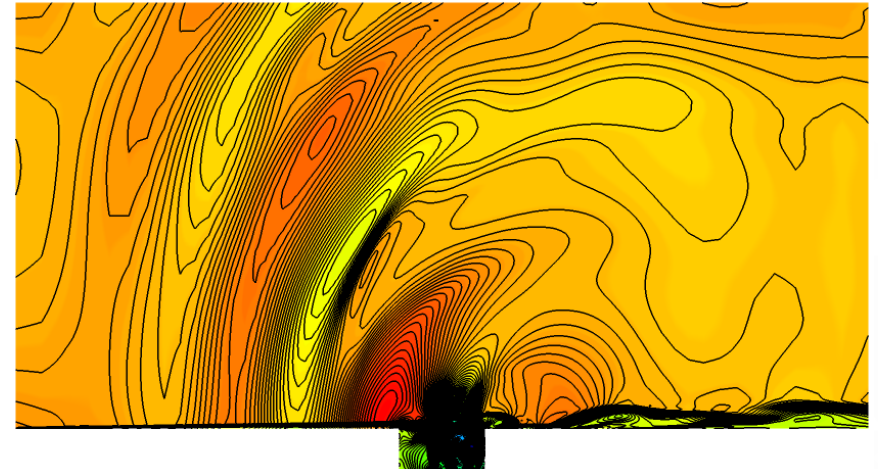
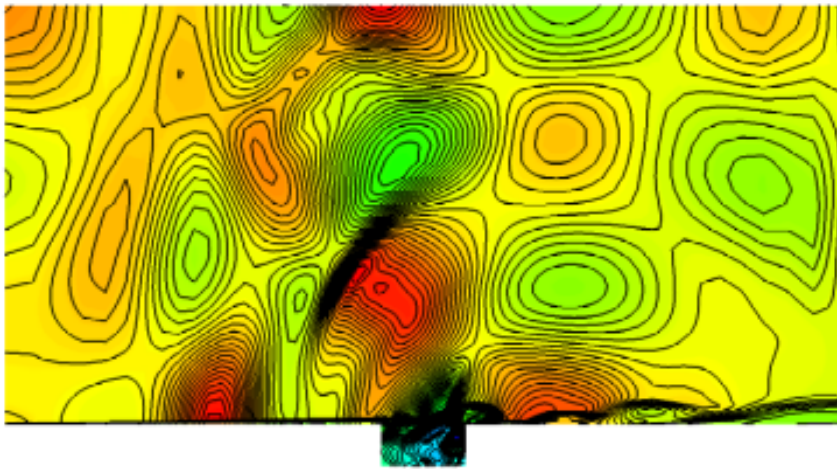
- 0~0.5sec :adjustable time step, maxCo=1.0
- 0.5~0.65sec : dt=0.00001
- WriteInterval : 0.001

## ▶ Initial condition

- U (setField)
  - cavity 내부 : (0 0 0)
  - cavity 외부 : (208.313 0 0)
- P : 101325
- T : 300

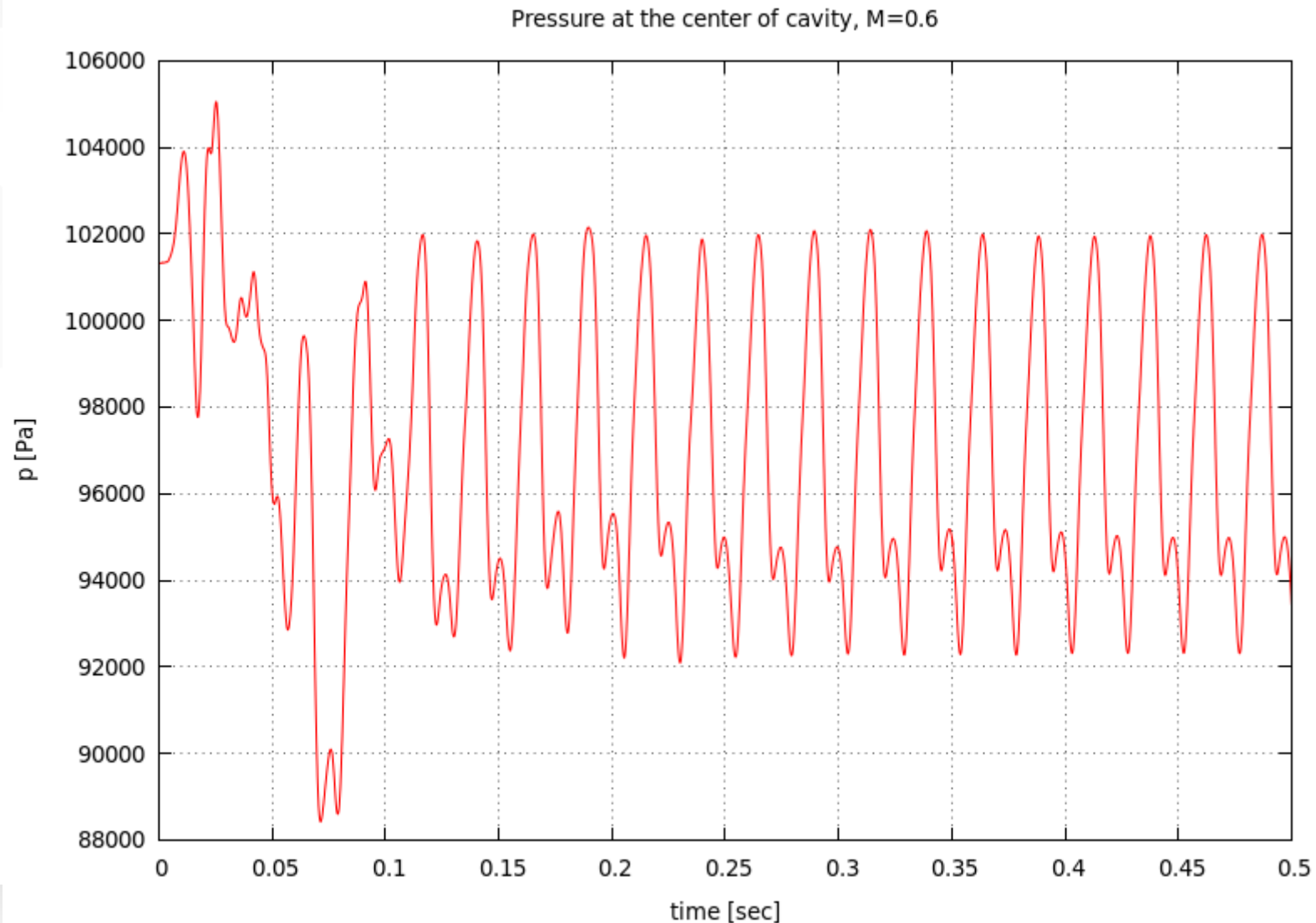
# 계산 방법

- ▶ 이전까지 계산에서 ymax 면 (top) 의 경계조건을 symmetry 경계조건을 사용했음
- ▶ Symmetry 면에서 wave 가 반사되기 때문에 여기와 outlet 을 non-reflecting 경계조건 (waveTransmissive) 으로 바꿈

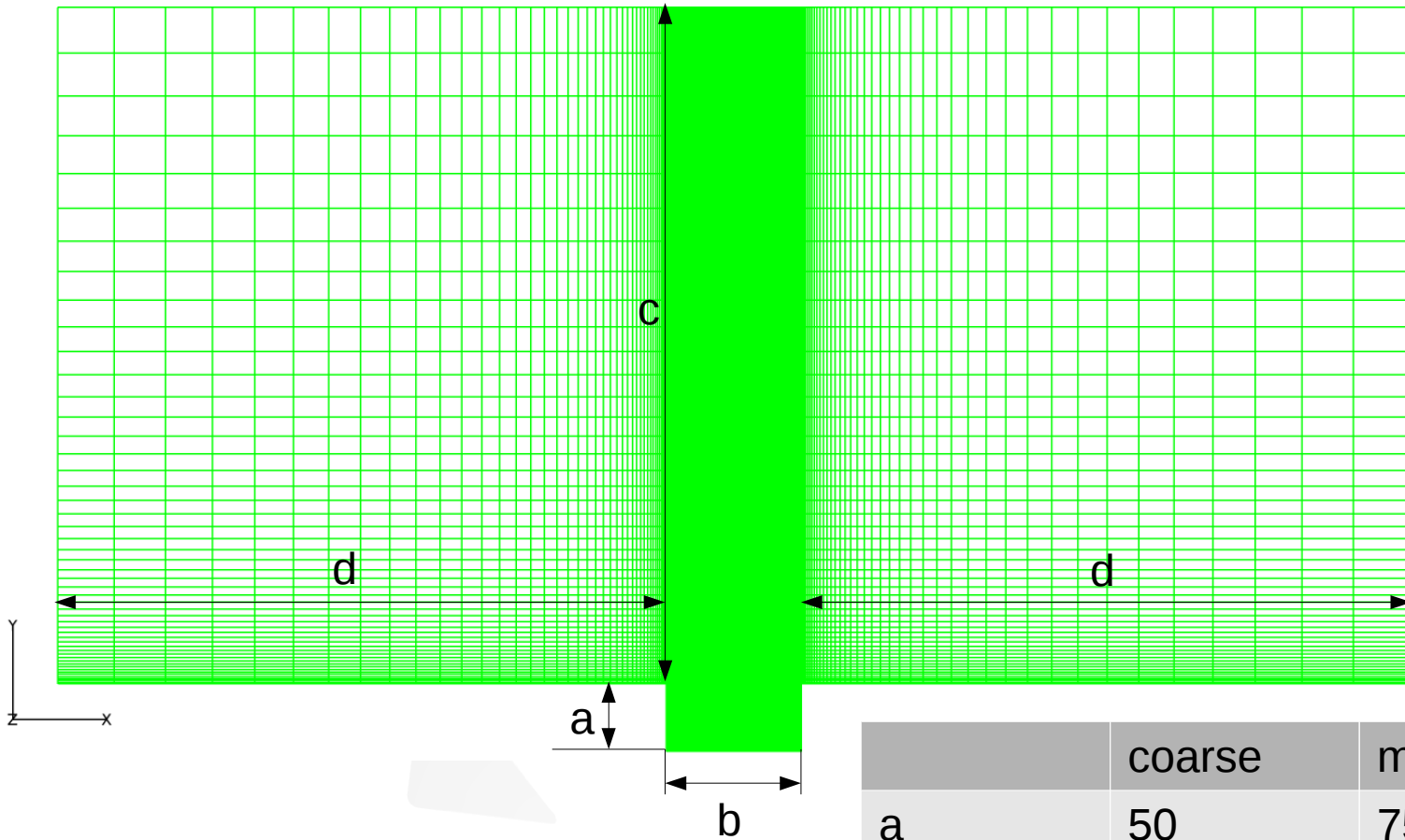


# Convergence

## ► Pressure at the center of cavity

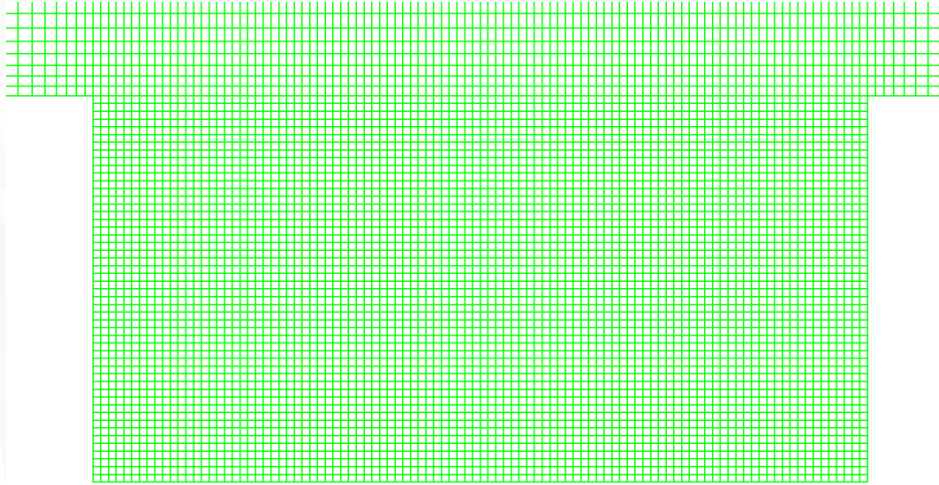


# 참고자료 - grid test (symmetry 조건 사용)

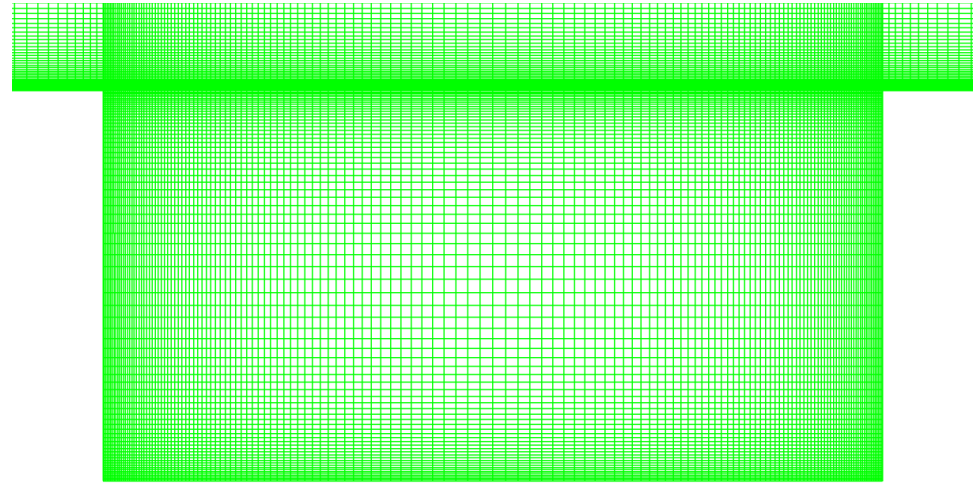


	coarse	medium	fine
a	50	75	100
b	100	150	200
c	50	100	130
d	40	50	70
cells	14000	36250	64200

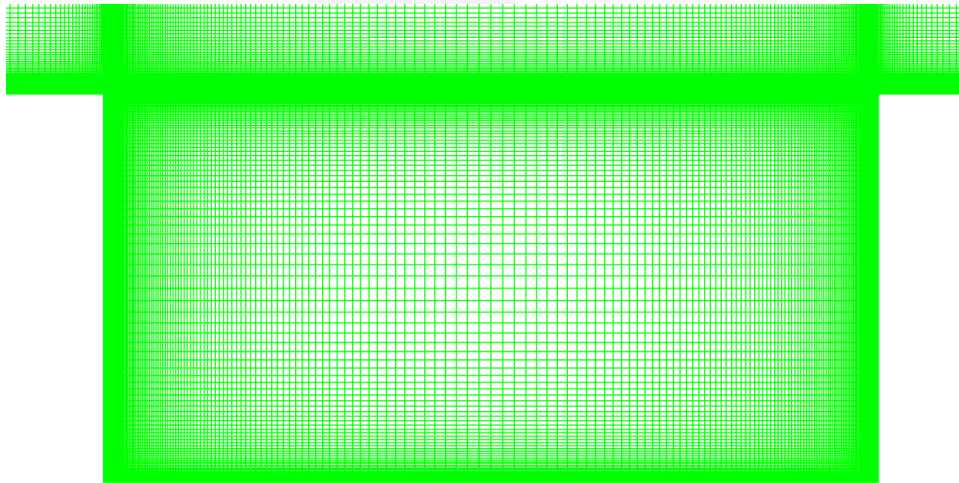
# 참고자료 - grid test (symmetry 조건 사용)



Coarse mesh, 14000 cells



Coarse mesh, 36250 cells

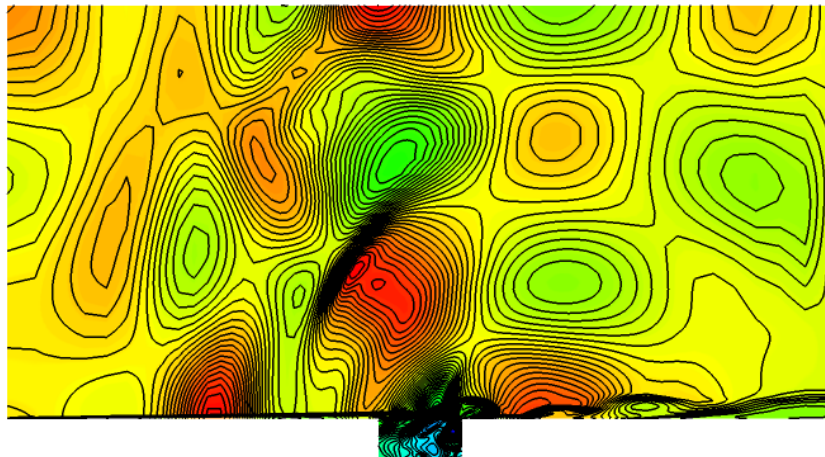
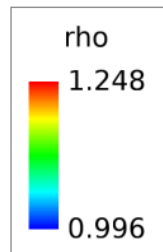
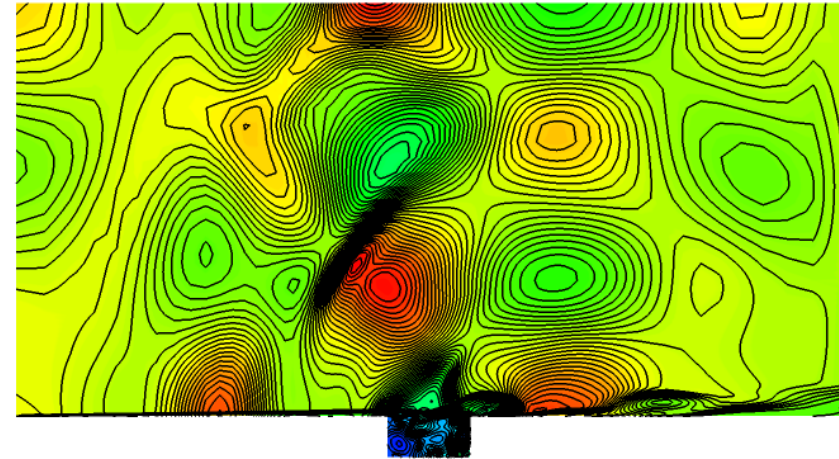
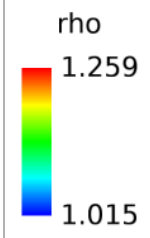
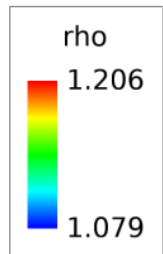


fine mesh, 64200 cells



# 참고자료 - grid test (symmetry 조건 사용 )

## Density at time = 2 sec



Medium mesh

fine mesh



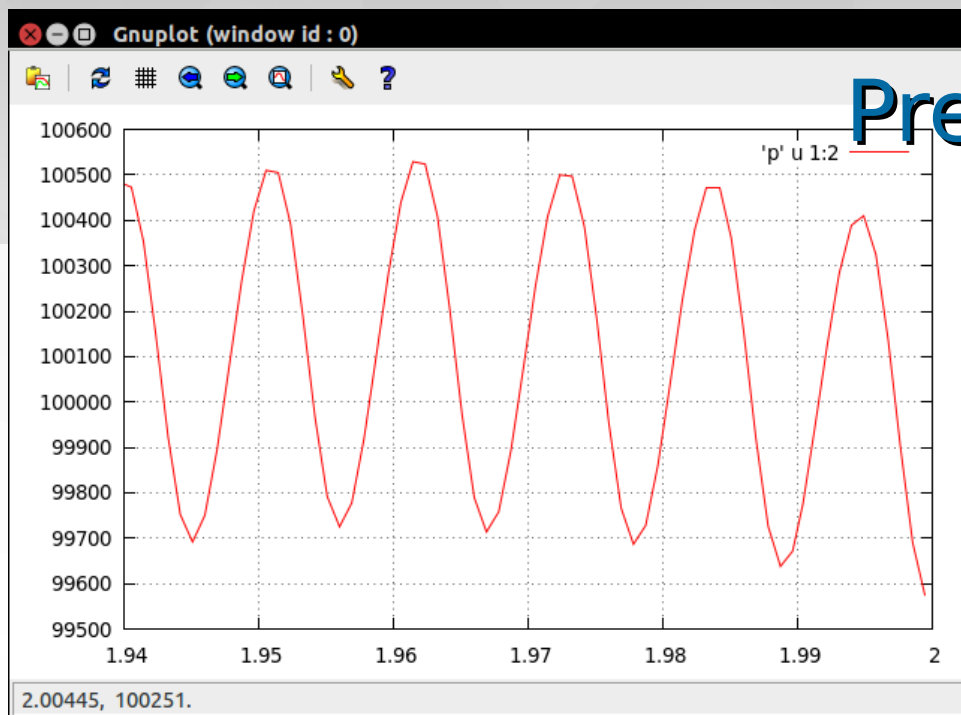
# Velocity vector in cavity

Coarse mesh

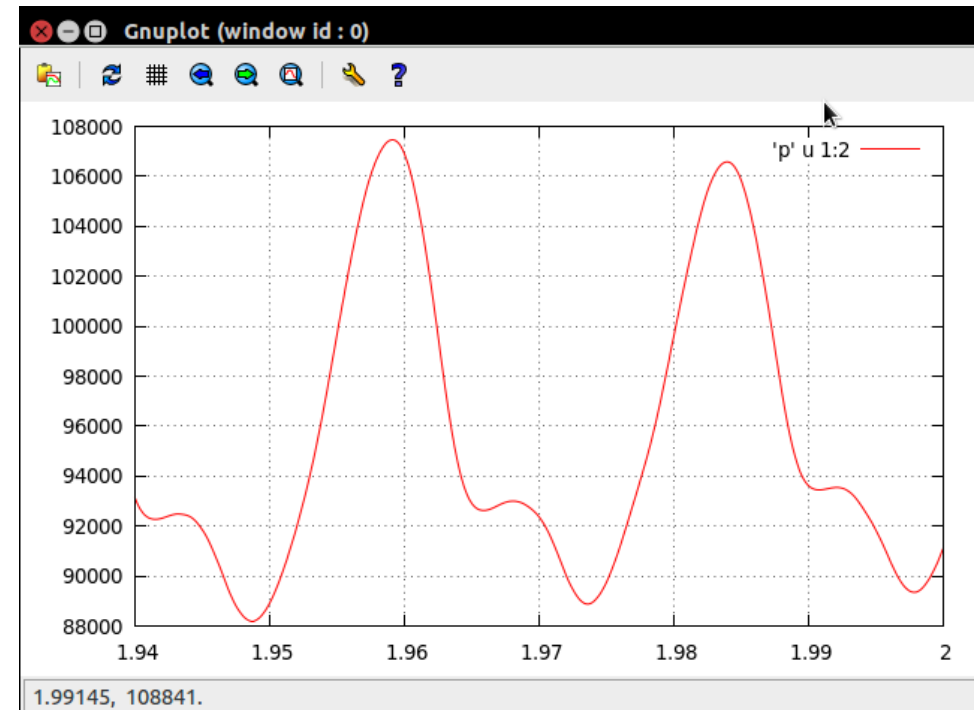
Medium mesh

Fine mesh

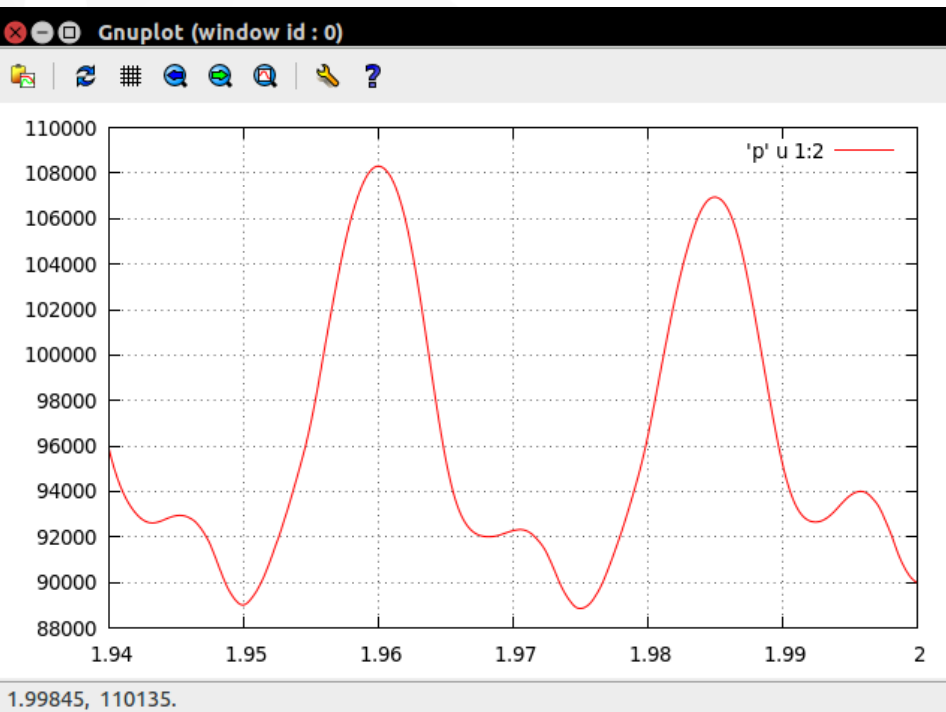
# Pressure at center of cavity



Coarse mesh



Medium mesh



Fine mesh