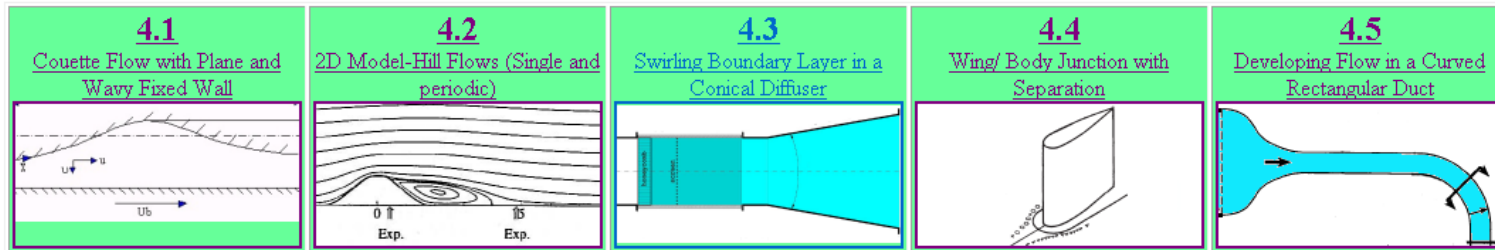# V&V 進捗報告

（株）アライドエンジニアリング
ADVC事業部　　北風　慎吾
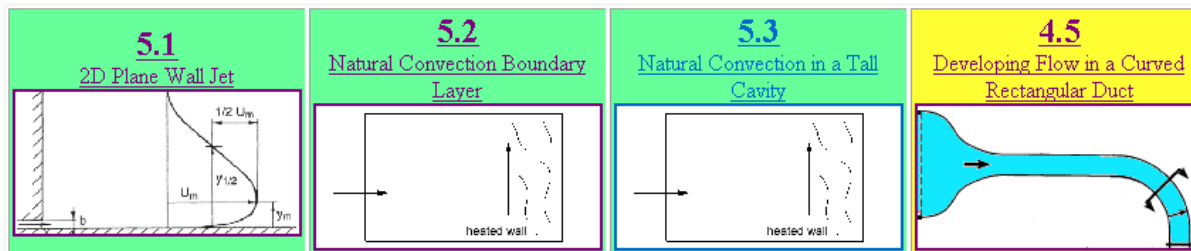
Validation事例 –Ercoftac SIG15 test case

http://www.ercoftac.org/fileadmin/user_upload/bigfiles/sig15/database/index.html
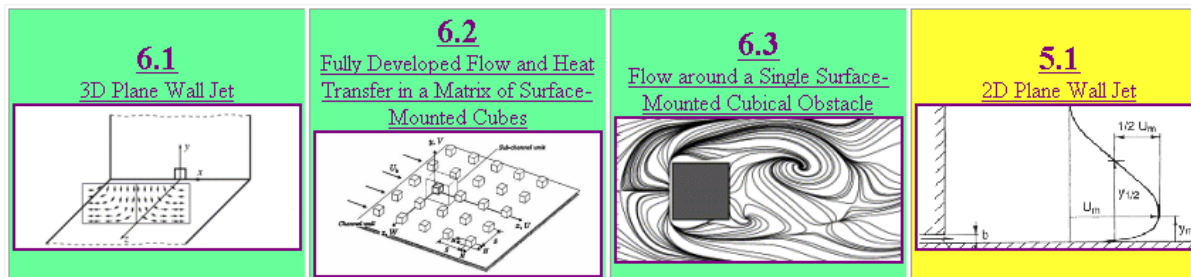
Case4.1 Couette Flow with wavy moving wall
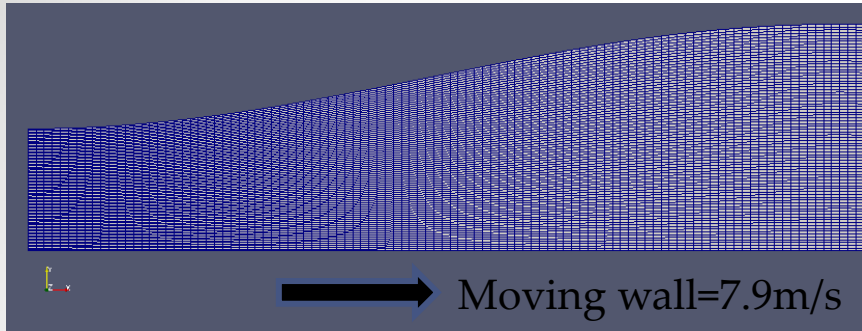
blockMesh 16000cell 2D RANS

Moving wall=7.9m/s
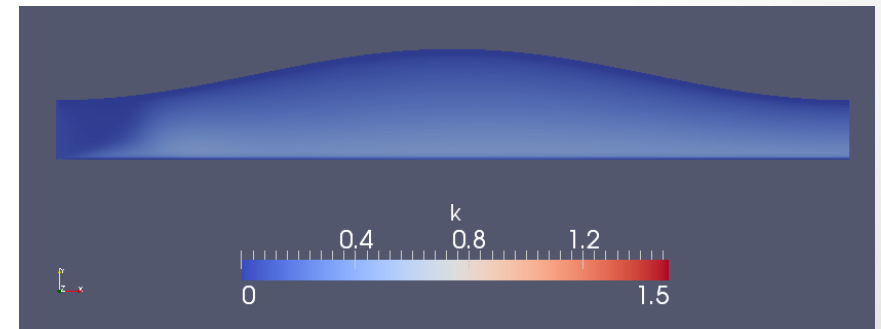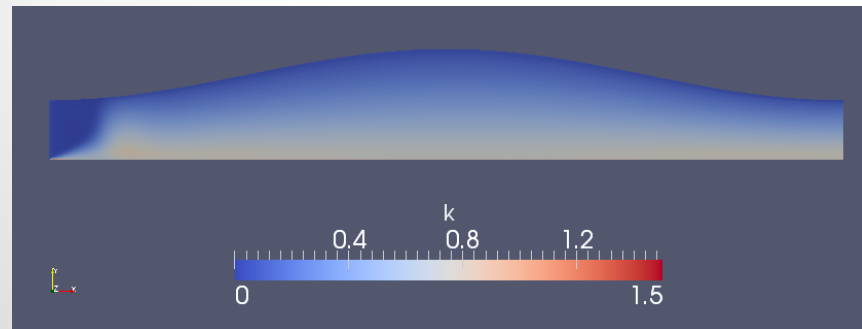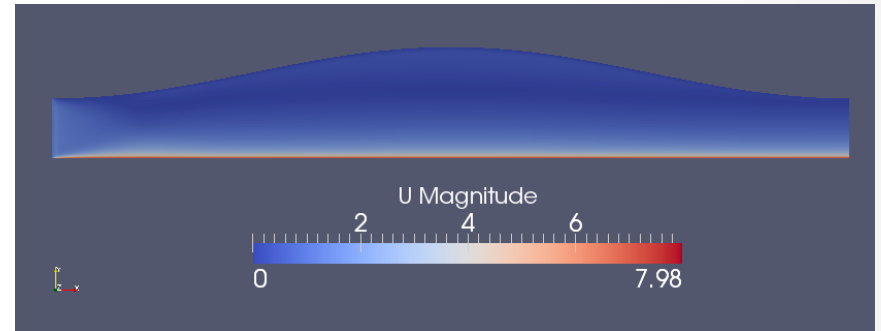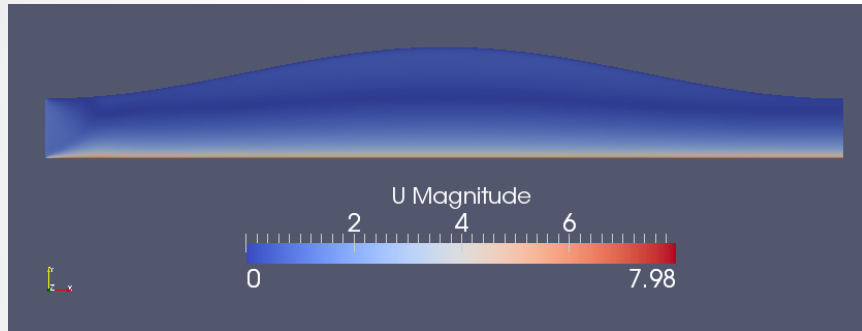
kEpsilon

kOmega SST

Case4.2   2D single Hill Flow

kEpsilon — Step: 8387

kEpsilon — Step: 8387

SST — Step: 4251

SST — Step: 4251

RNG — Step: 5325

RNG — Step: 5325
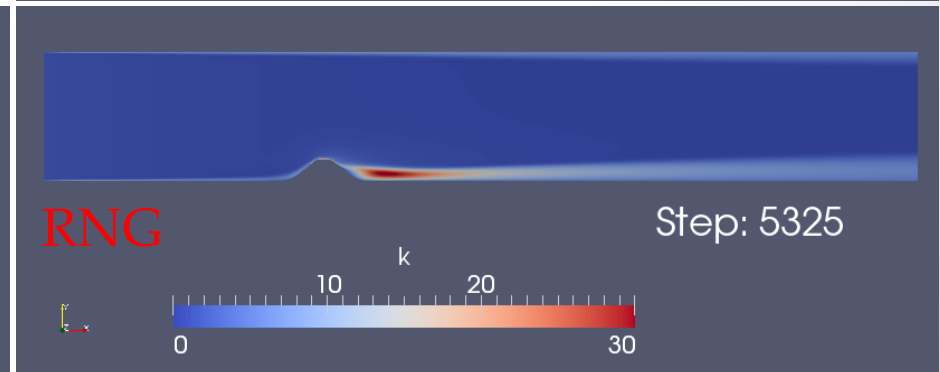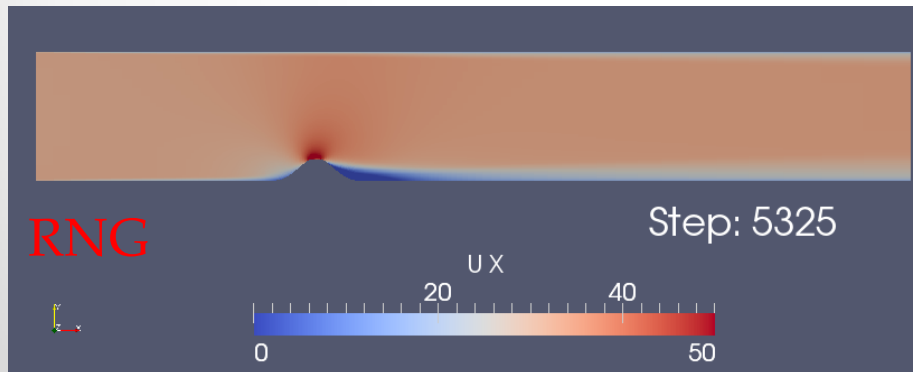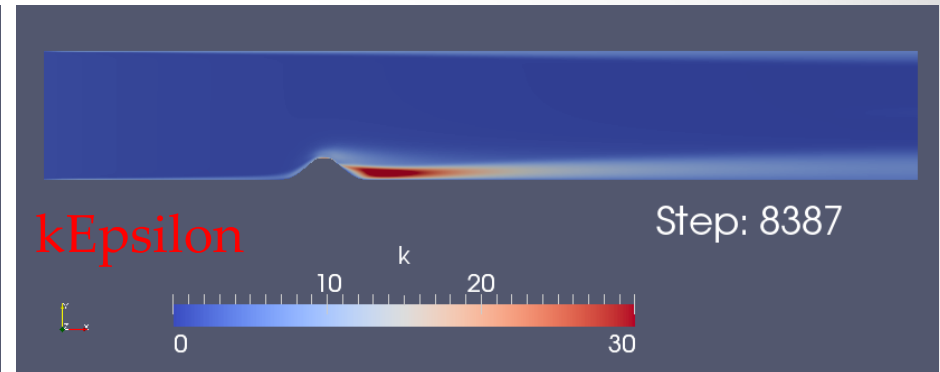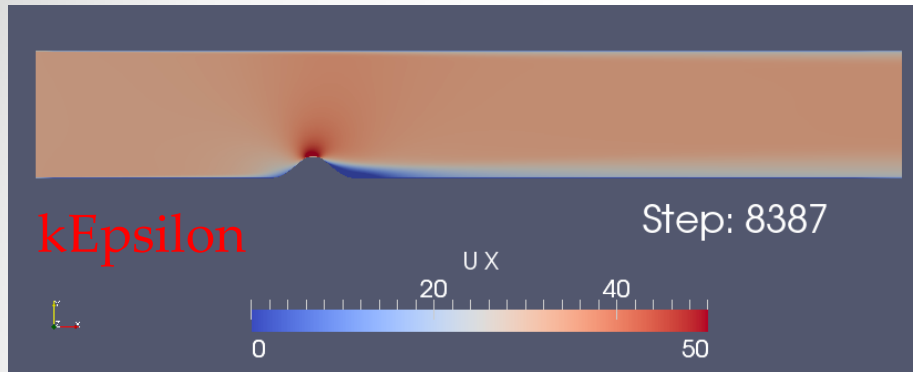
Case4.3　Conical Diffuser　RANS: komegaSST
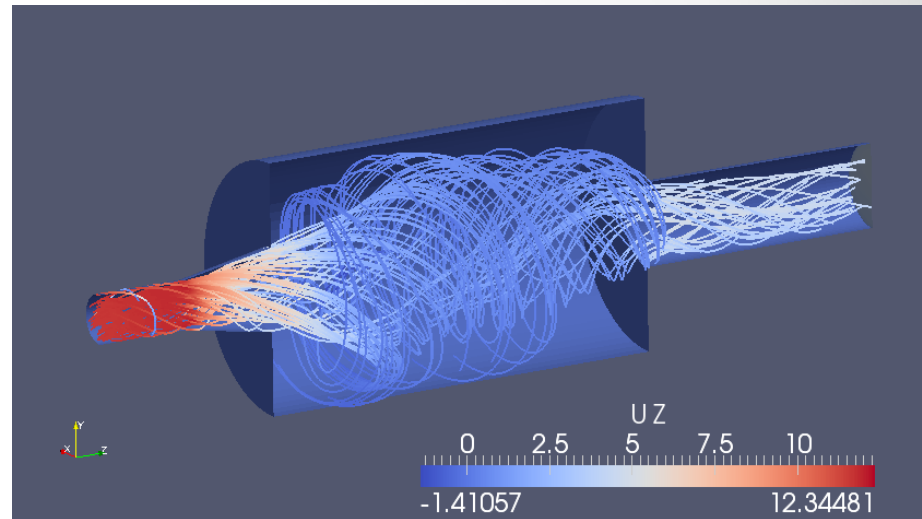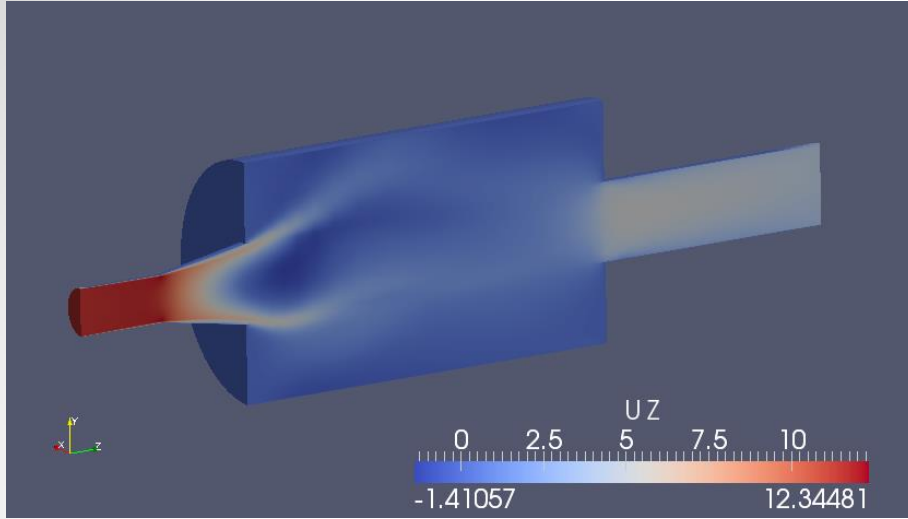
Case2: diffuser + tank + outlet reigion
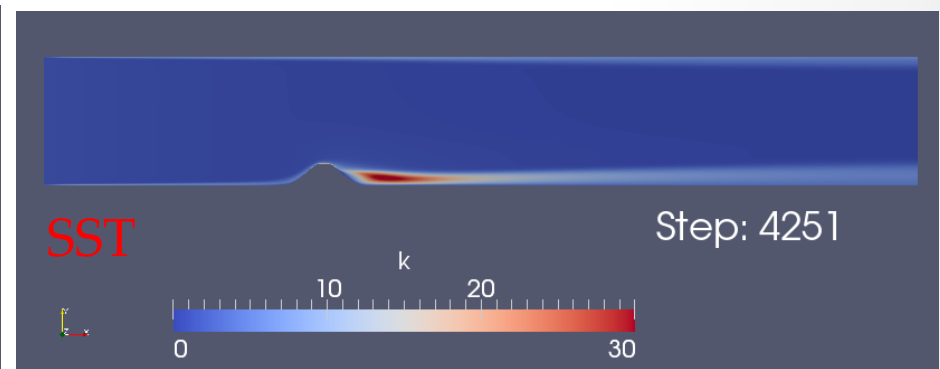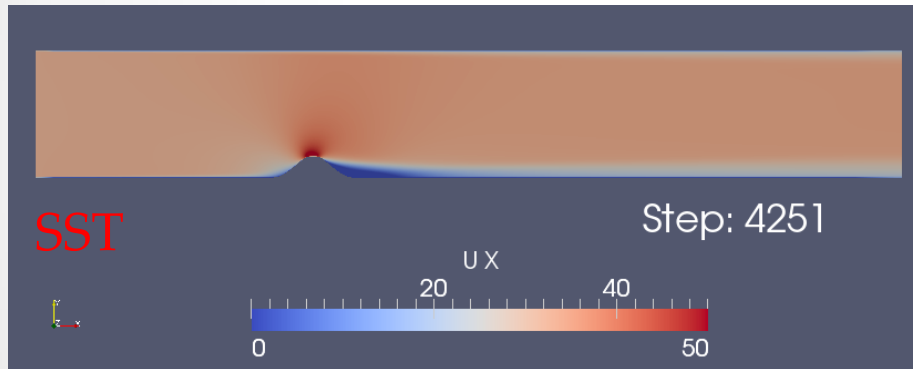

Case1の解析領域
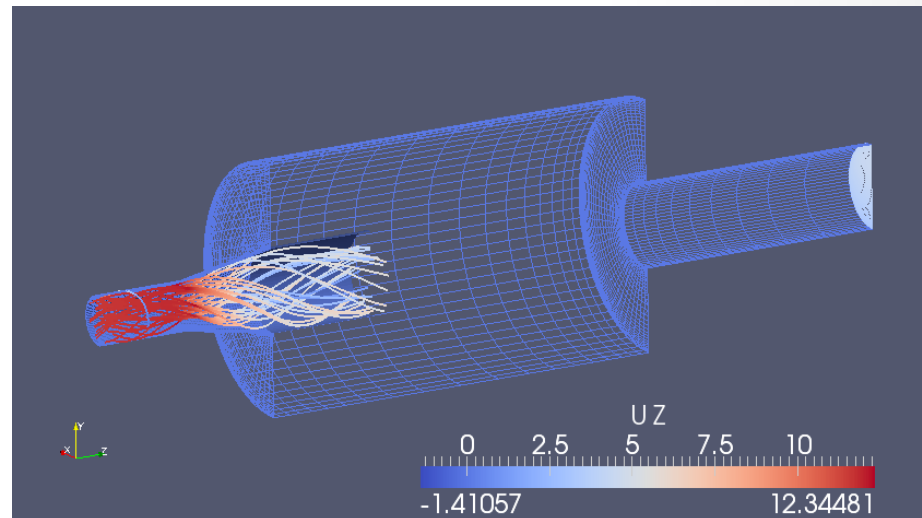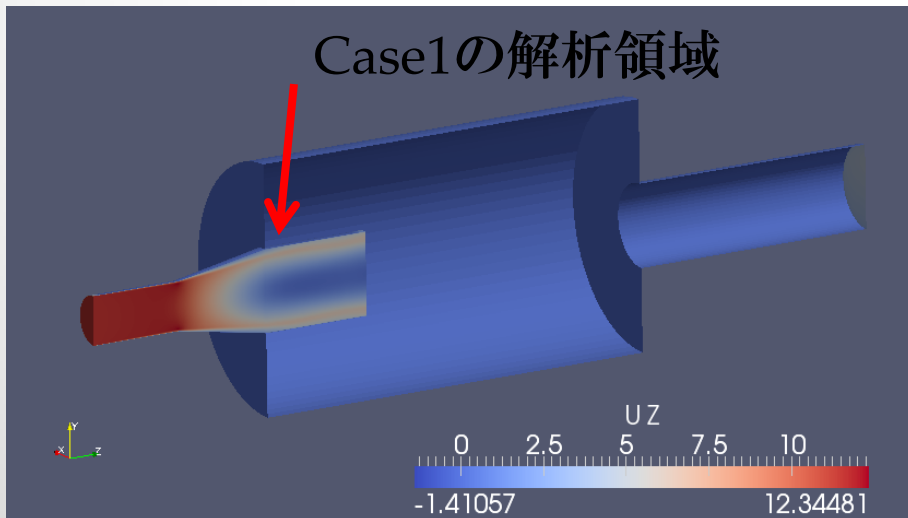
Case1: diffuser only

Case4.5   Curved Duct
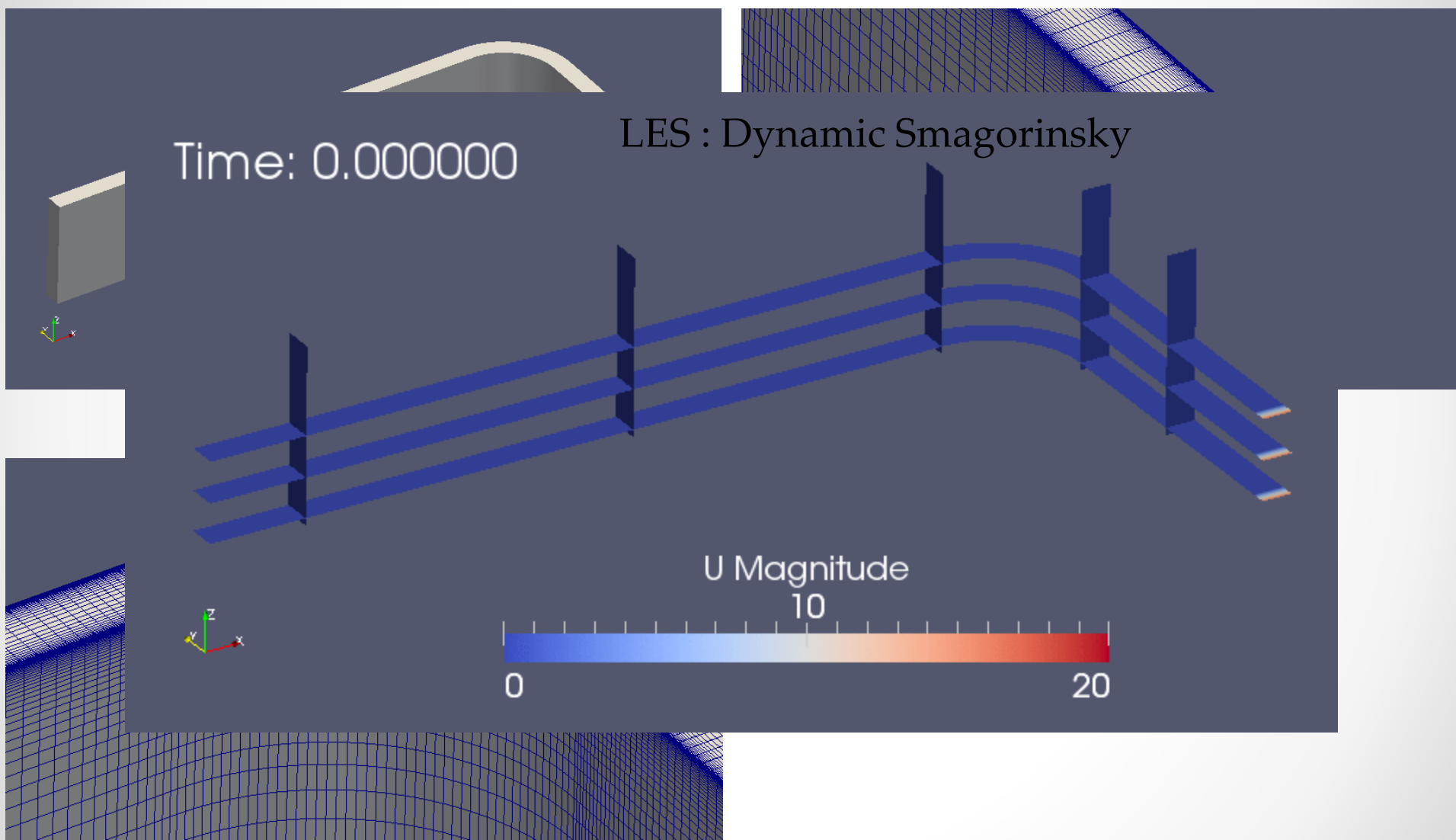
Time: 0.000000

LES : Dynamic Smagorinsky

U Magnitude

Validation事例 –Ercoftac SIG15 test case

http://www.ercoftac.org/fileadmin/user_upload/bigfiles/sig15/database/index.html

手つかず・・・

Case6.1 3D Plane Wall Jet
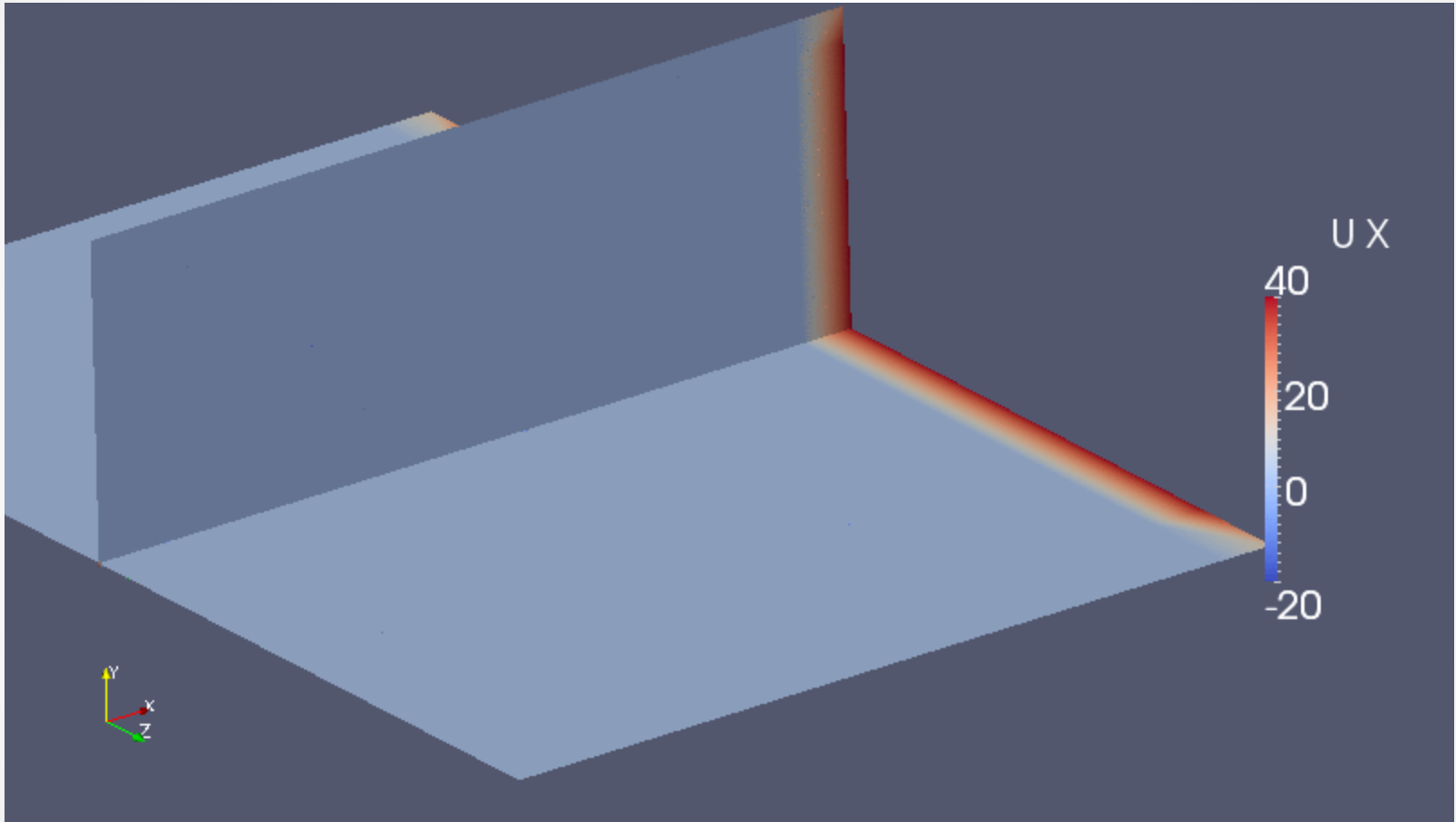
ＬＥＳ： Lagrangian Dynamic model ・・・ 結果は変な感じ
(develop 0.5sec + averaged0.5sec)

Case6.2 3D Plane Wall Jet

流れ方向
⇒周期境界条件

U X

Time: 0.000000

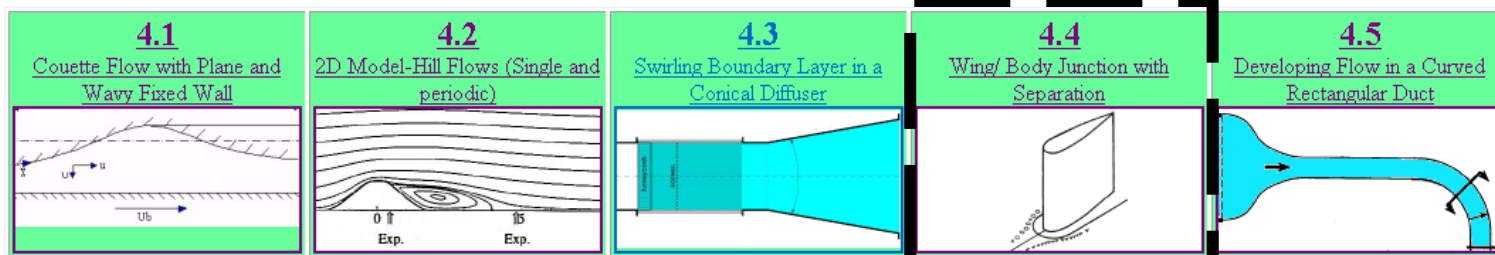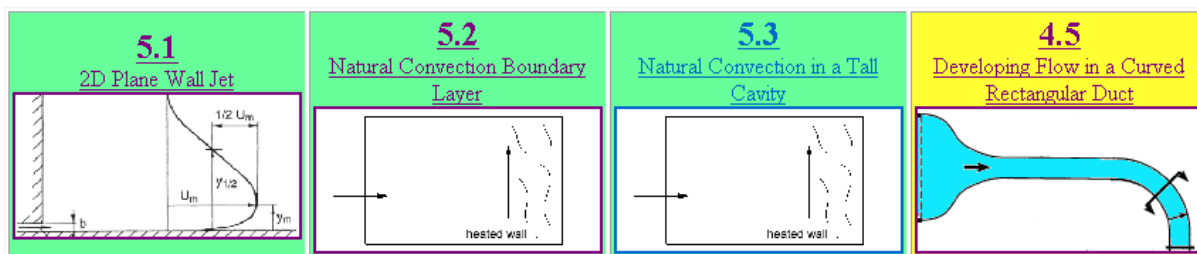# Validation事例 –Ercoftac SIG15 test case

http://www.ercoftac.org/fileadmin/user_upload/bigfiles/sig15/database/index.html
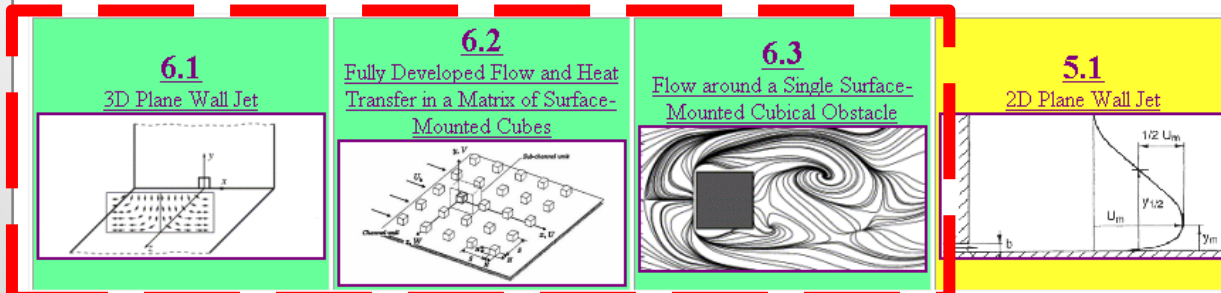

7th workshop at UMIST (28-29 May 1998)

7.1 Fully developed flow in a rotating plane channel

7.2 Flow and heat transfer over a rib-roughened wall

7.3 Flow and heat transfer in a rotating rib-roughened duct

6.2 Developed Flow and Heat Transfer in a Matrix of Surface-Mounted Cubes
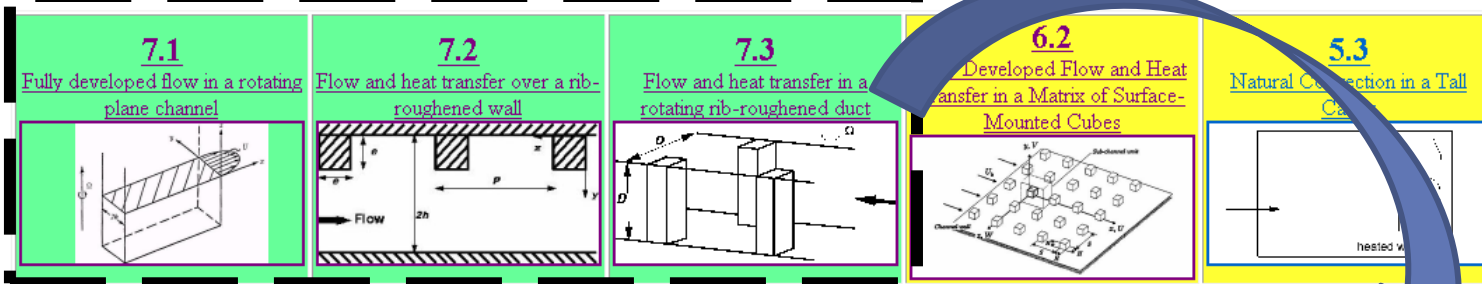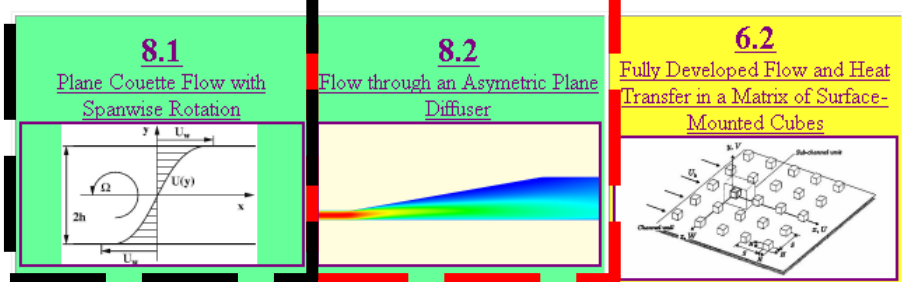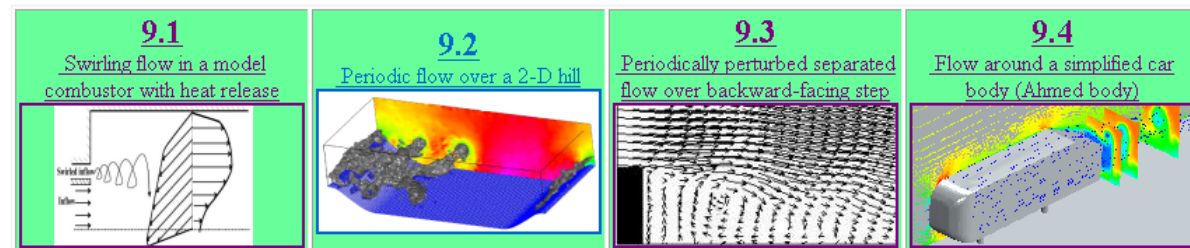
5.3 Natural Convection in a Tall Cavity

8th workshop at Helsinki University of Technology (17-18 June 1999)

8.1 Plane Couette Flow with Spanwise Rotation

8.2 Flow through an Asymmetric Plane Diffuser

6.2 Fully Developed Flow and Heat Transfer in a Matrix of Surface-Mounted Cubes

9th workshop at Darmstadt University of Technology (4-5 October 2001)

9.1 Swirling flow in a model combustor with heat release

9.2 Periodic flow over a 2-D hill

9.3 Periodically perturbed separated flow over backward-facing step

9.4 Flow around a simplified car body (Ahmed body)

10th workshop at University of Poitiers (10-11 October 2002)

課題
System Rotation(Coriori Force)
を含んだ流れ場への対応

shallowWaterFoamを一部流用?

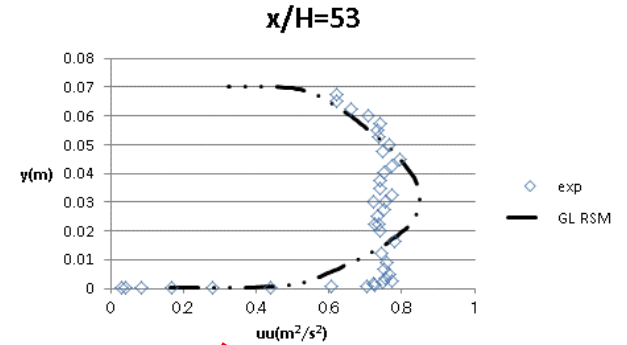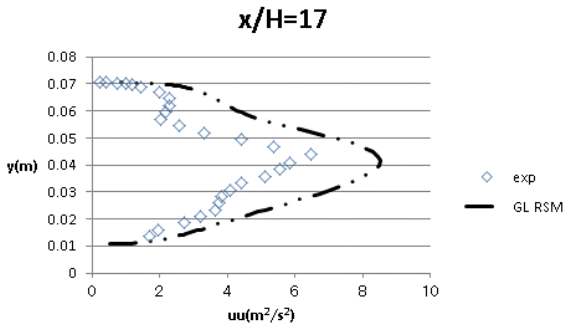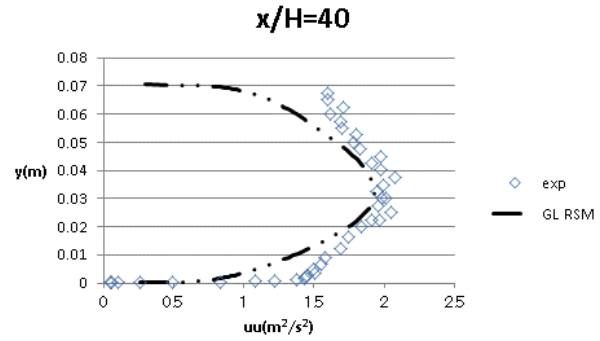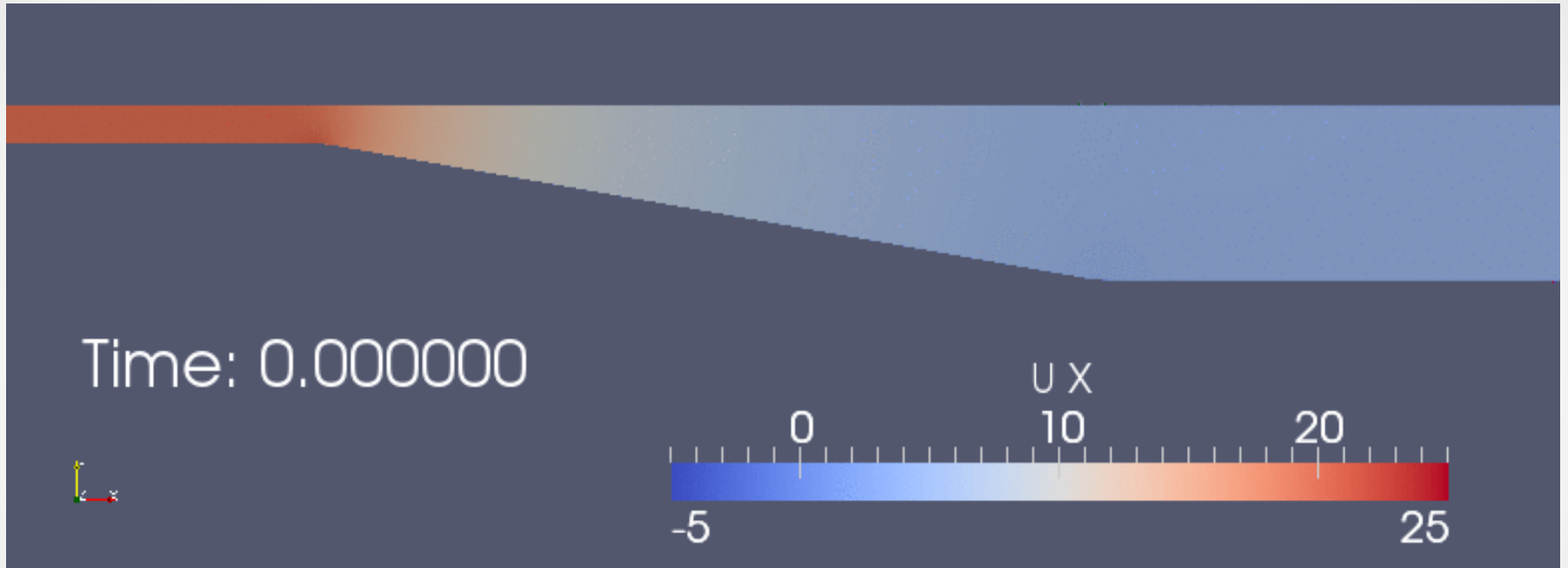# Case8.2 Asymmetric Diffuser

ver1.6-ext
での結果

Case8.2 Asymmetric Diffuser

Time: 0.000000

U X

0   10   20

-5   25
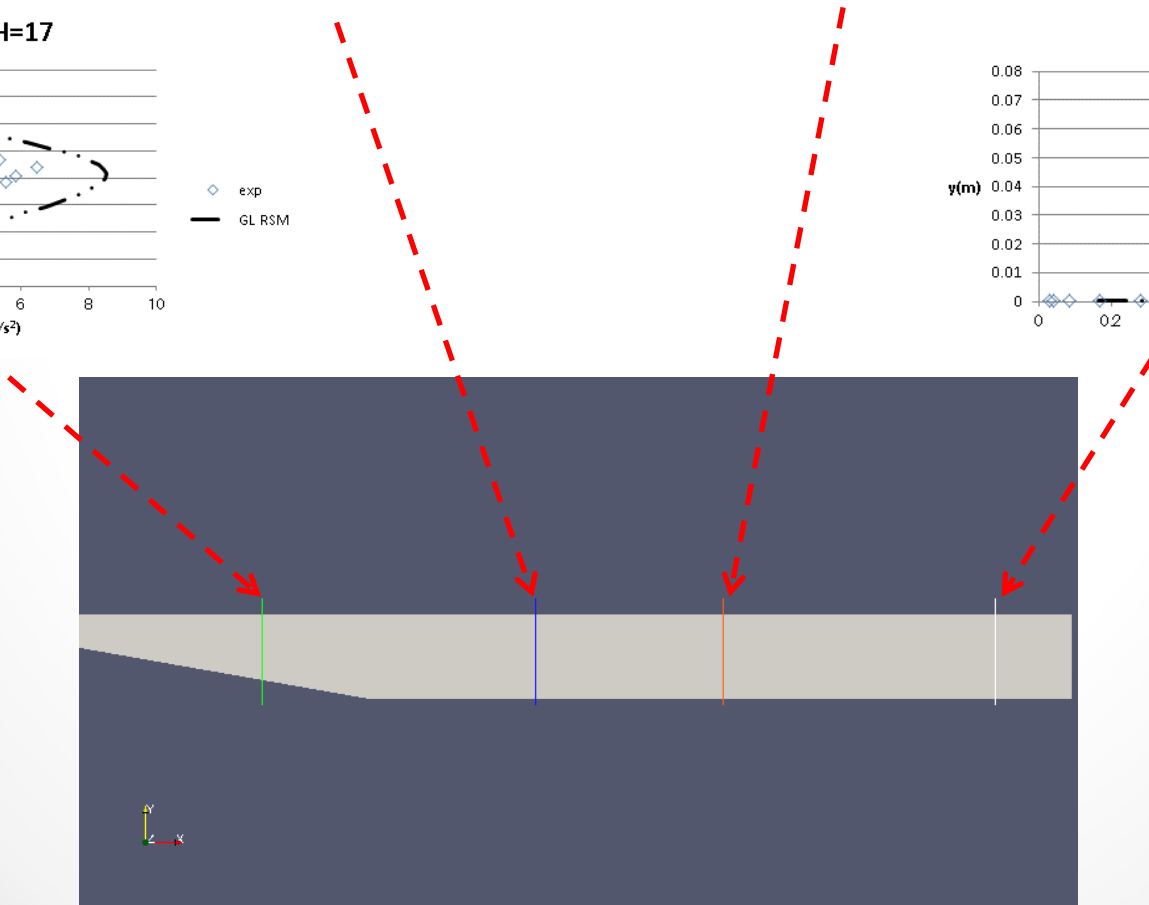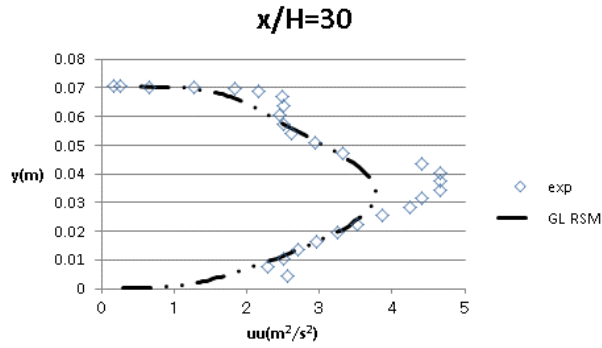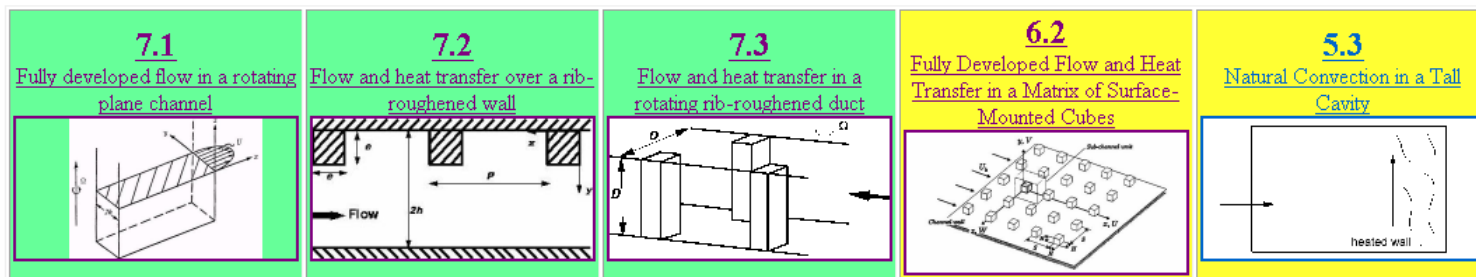
Smagorinsky Cs=0.1
Span方向30セル、Inlet:mapped
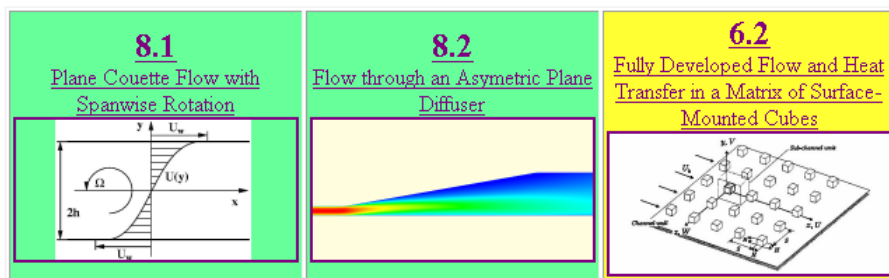流れ場発達0.45sec＋平均値取得0.45sec

Validation事例 –Ercoftac SIG15 test case

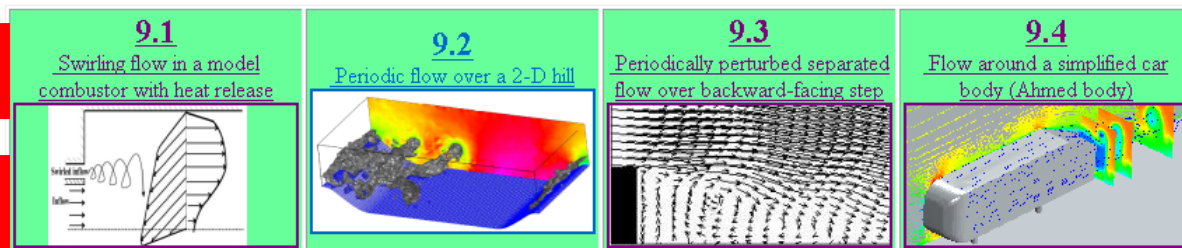http://www.ercoftac.org/fileadmin/user_upload/bigfiles/sig15/database/index.html


7th workshop at UMIST (28-29 May 1998)

| 7.1 Fully developed flow in a rotating plane channel | 7.2 Flow and heat transfer over a rib-roughened wall | 7.3 Flow and heat transfer in a rotating rib-roughened duct | 6.2 Fully Developed Flow and Heat Transfer in a Matrix of Surface-Mounted Cubes | 5.3 Natural Convection in a Tall Cavity |

8th workshop at Helsinki University of Technology (17-18 June 1999)

| 8.1 Plane Couette Flow with Spanwise Rotation | 8.2 Flow through an Asymetric Plane Diffuser | 6.2 Fully Developed Flow and Heat Transfer in a Matrix of Surface-Mounted Cubes |

9th workshop at Darmstadt University of Technology (4-5 October 2001)

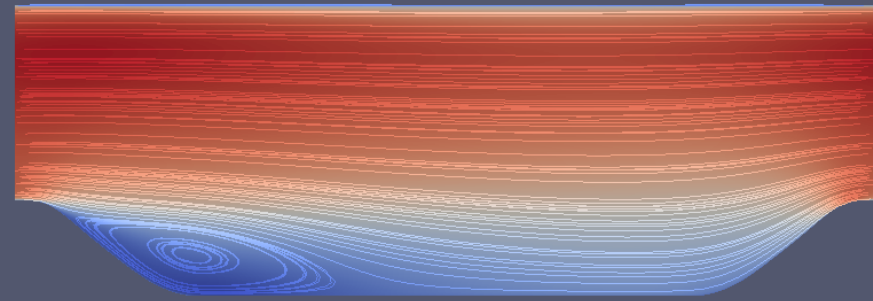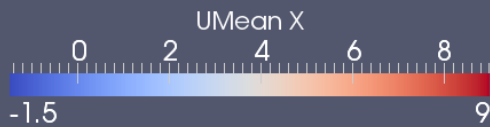| 9.1 Swirling flow in a model combustor with heat release | 9.2 Periodic flow over a 2-D hill | 9.3 Periodically perturbed separated flow over backward-facing step | 9.4 Flow around a simplified car body (Ahmed body) |

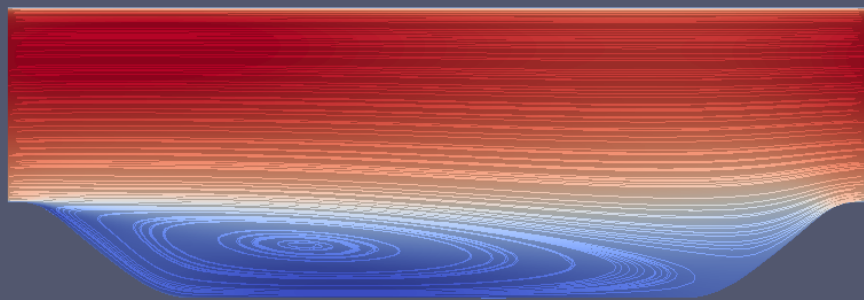**10th workshop at University of Poitiers (10-11 October 2002)**
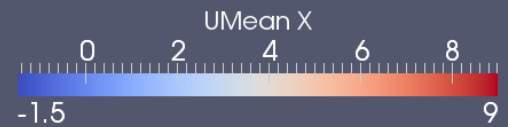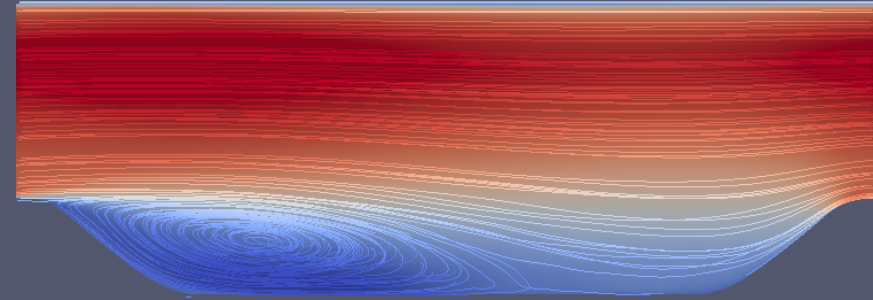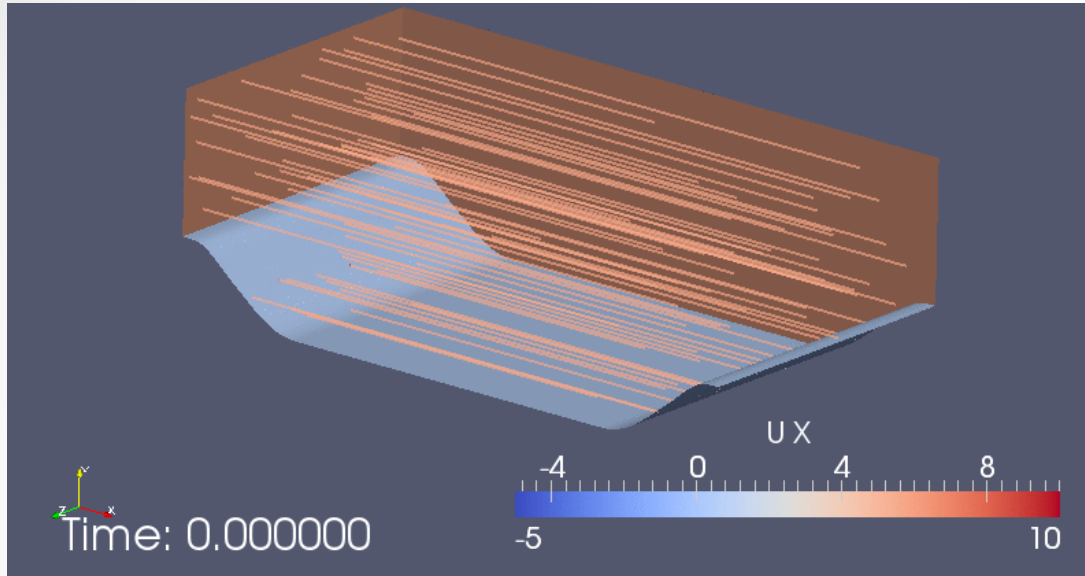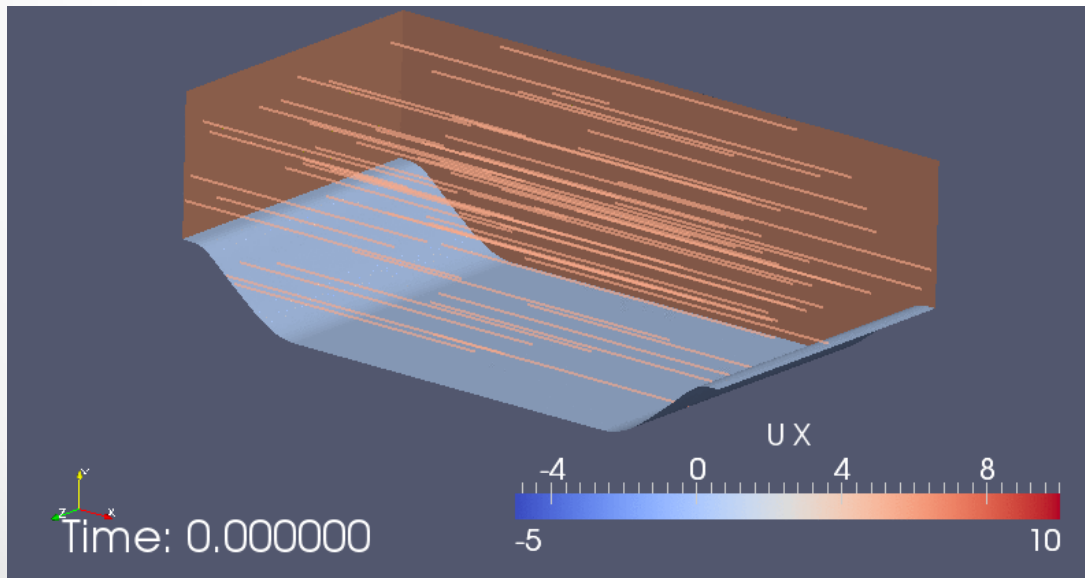
Case9.2 Periodic Flow over a 2D Hill
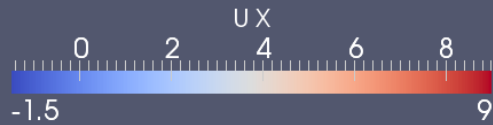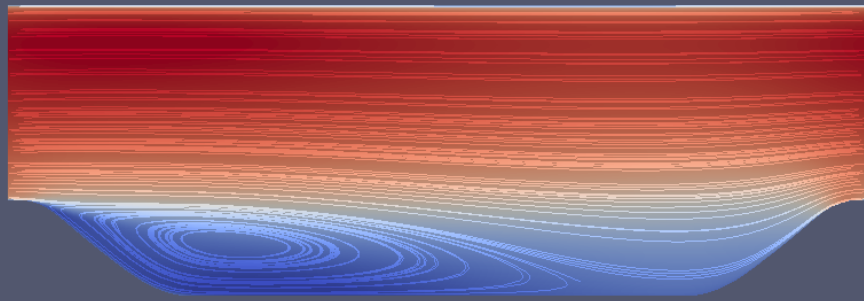
SST
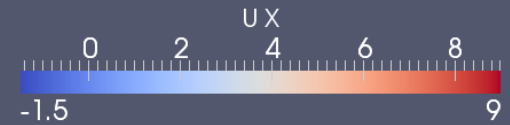
RNG

LienCubicLowRe

Smagorinsky Cs=0.1
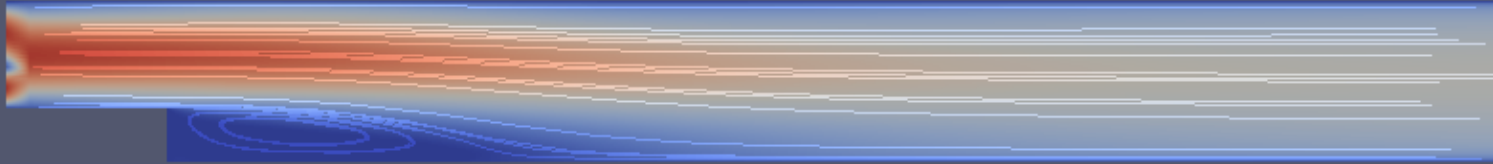Span方向40セル

Case9.2 Periodic Flow over a 2D Hill
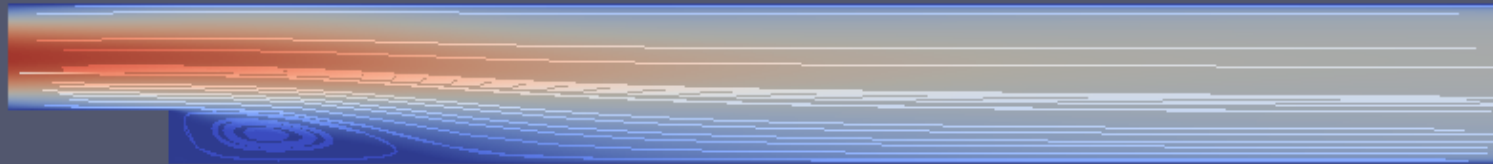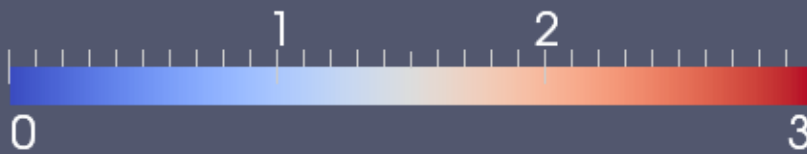

Smagorinsky Cs=0.1
Span方向20セル

Smagorinsky Cs=0.1
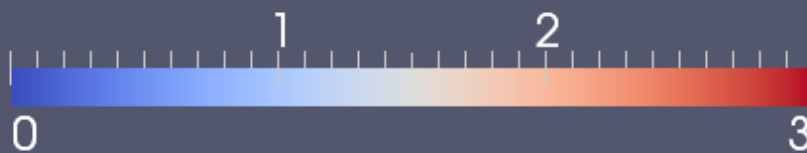Span方向40セル

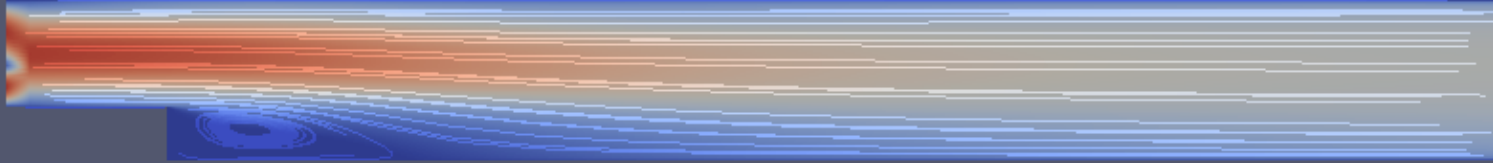# Case9.3 Periodically Perturbed Flow over back-step
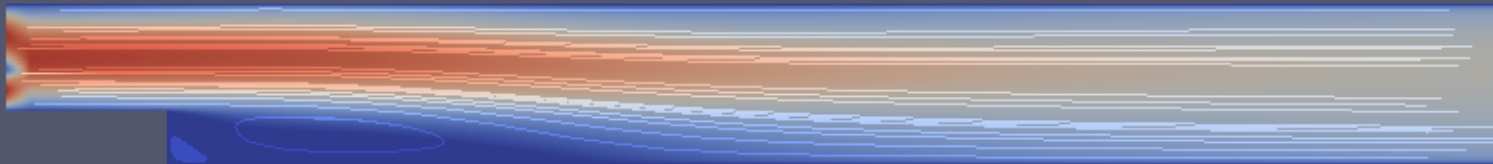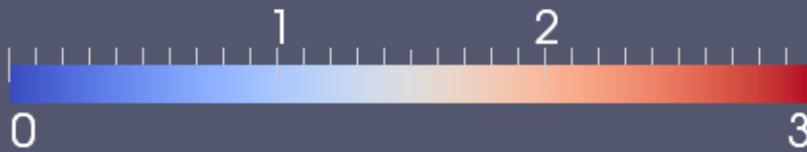

Gibson Launder

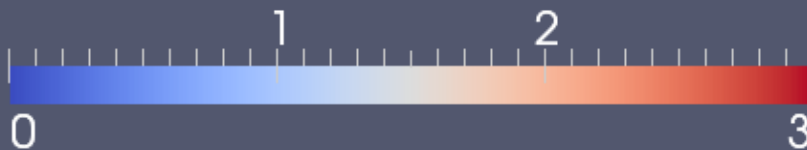Lien-Leschziner

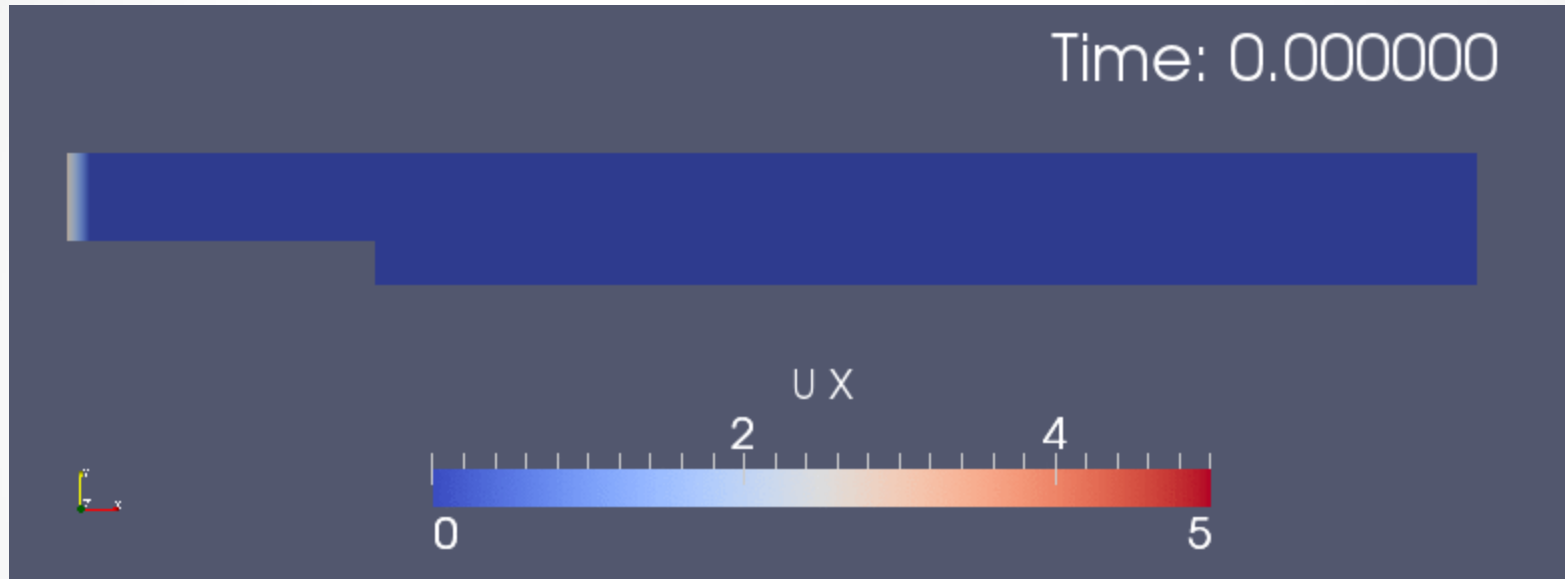# Case9.3 Periodically Perturbed Flow over back-step

Realizable KE

U X

Komega SST

U X

Case9.3 Periodically Perturbed Flow over back-step

Smagorinsky Cs=0.1
Span方向30セル、Inlet:mapped
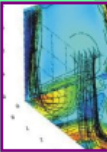流れ場発達2sec＋平均値取得2sec

Case9.4 Flow around Ahmed Body
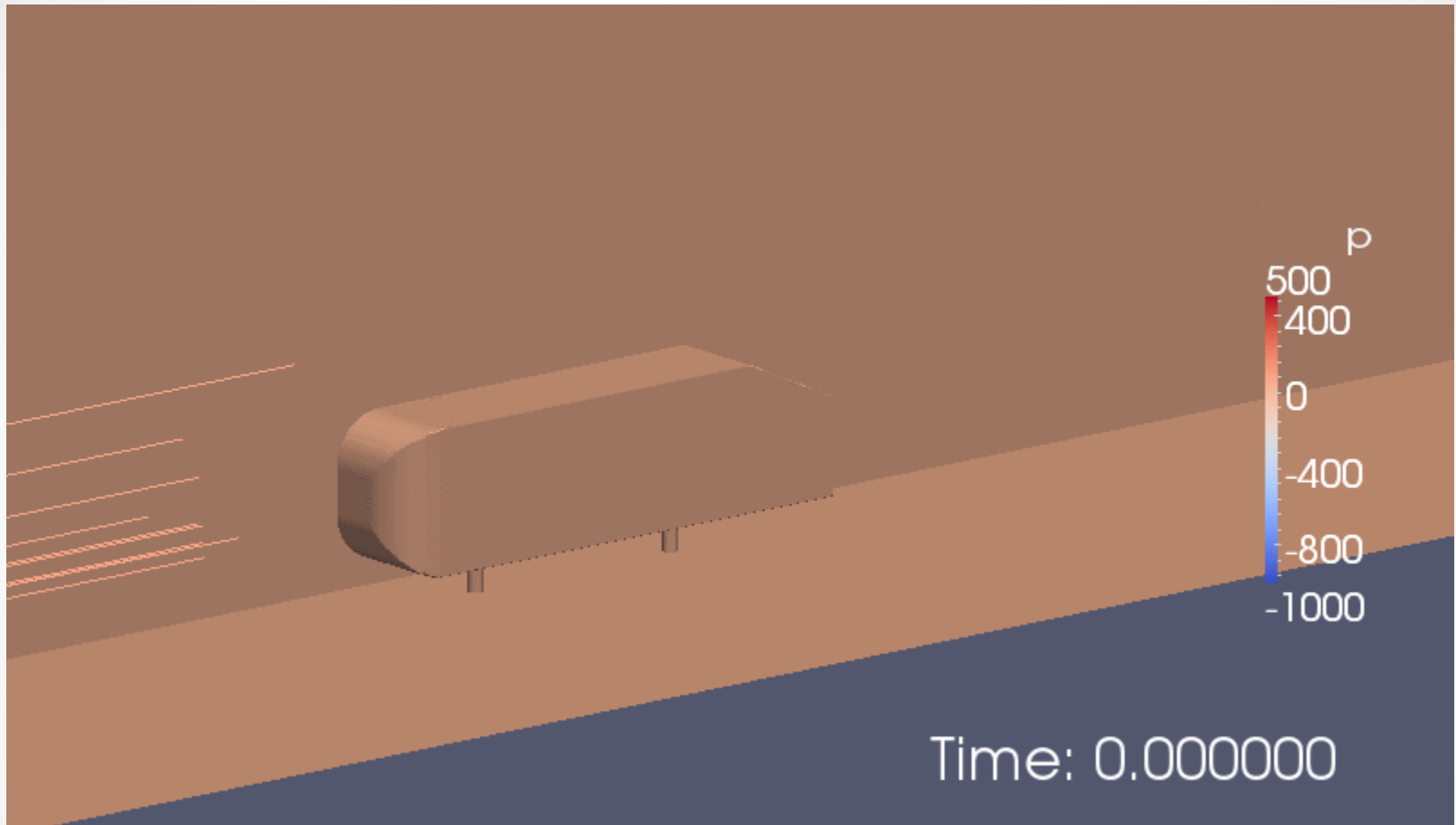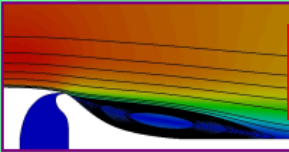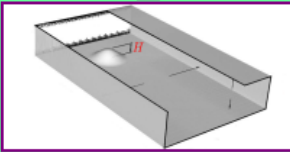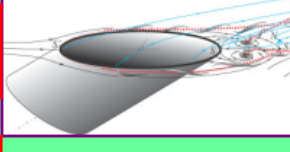
Spalart Allmaras Delayed DES
Mesh : SnappyHexMesh 約70万セル
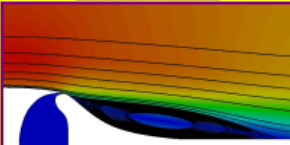流れ場発達0.1sec + 平均値取得0.1sec
入口：一様流、　　ground：全てno-slip
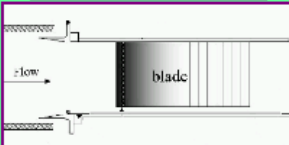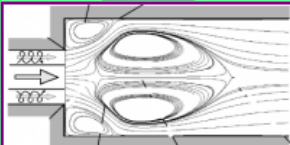
Case11.2   Flow over a axisymmetric 3D hill
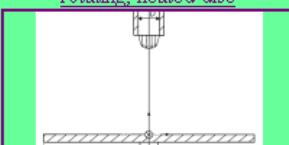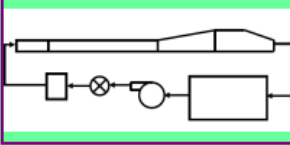

Structure of Vortical Separations

11th workshop at Chalmers University of Technology (7-8 April 2005)

11.1 2D hump with flow control through a slot jet

11.2 Flow over an axisymmetric 3D hill

11.3 Slanted jets in cross-flow

Multiple-imp... he...

12th workshop at Technical University of Berlin (12-13 October 2006)

12.1 Tip-gap turbulent flow in a low-speed compressor cascade

12.2 A model of tubo-annular swirl combustor

11.1 2D hump with flow control through a slot jet

Flow over ...

13th workshop at Graz University of Technology (25-26 September 200...)

13.1 Round jet impinging onto a rotating, heated disc

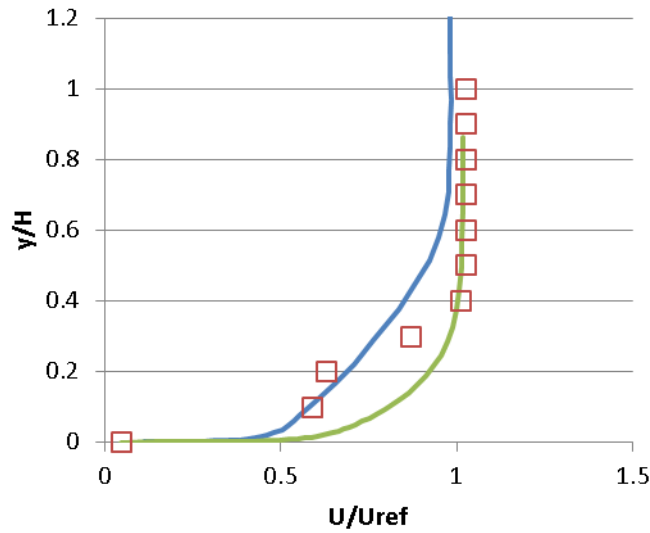**13.2** Flow in a 3-D diffuser
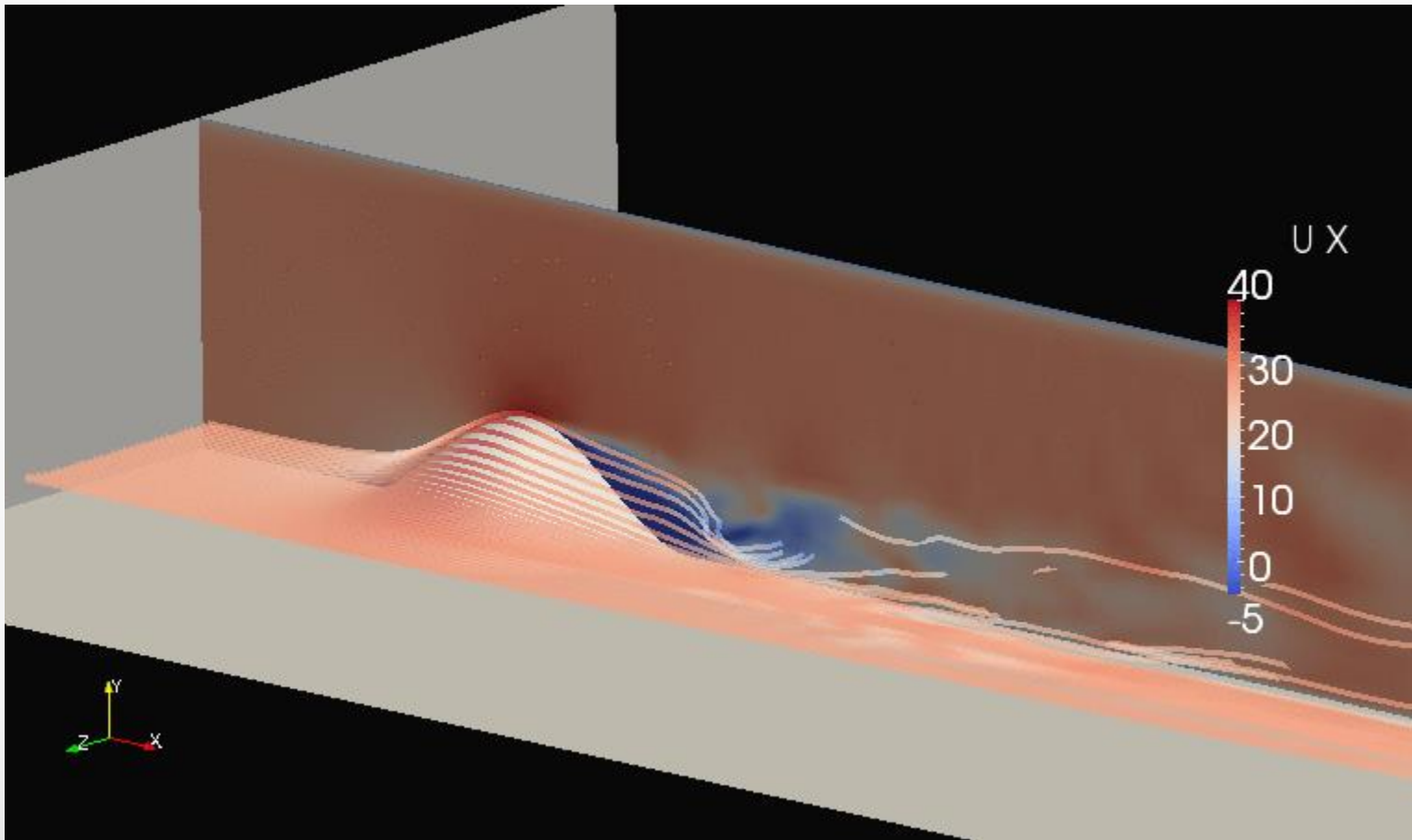
流れ方向流速分布
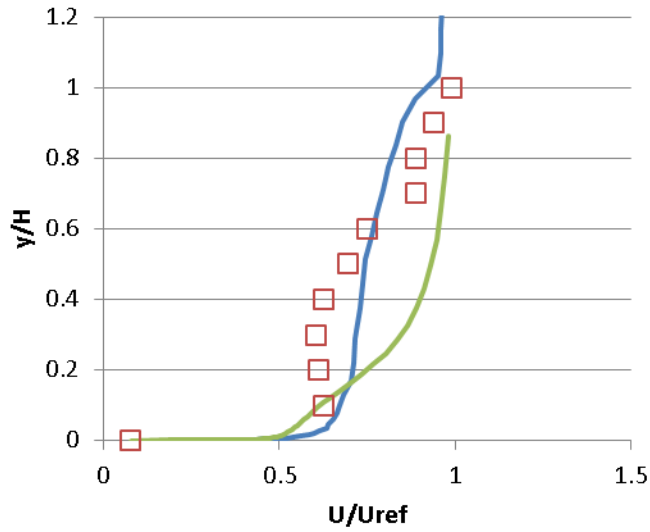
x/H=3.63
Z/H=0
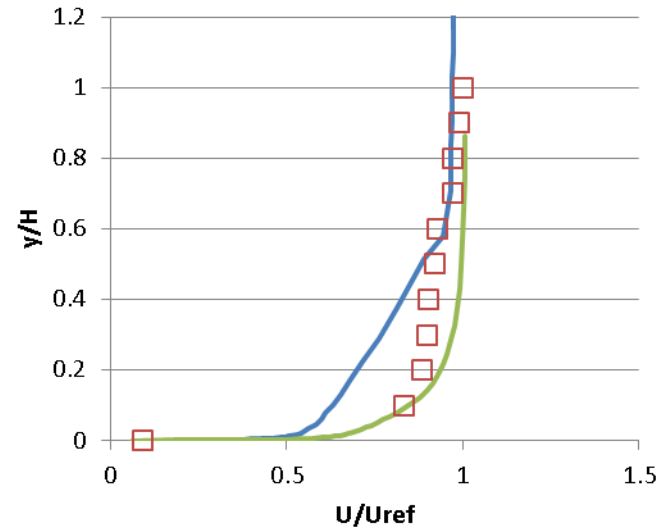
x/H=3.63
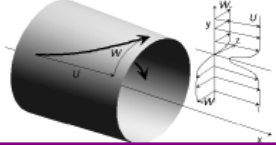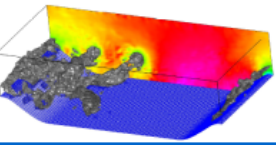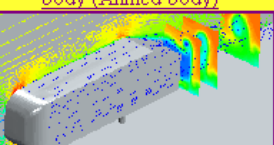Z/H=-0.81

x/H=3.63
Z/H=-1.79
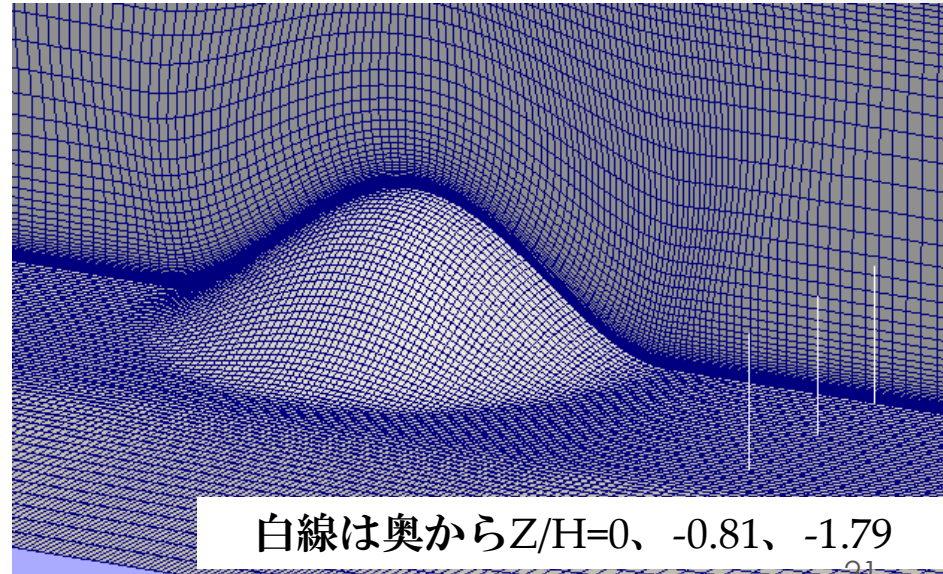
白線は奥からZ/H=0、-0.81、-1.79

フローパターン

・計算手順として、
同一メッシュのkEpsilonで定常計算⇒初期値として0.6秒+0.6秒(時間平均)

Inlet: 一様流　⇒　乱れ無し , 今後はmapped or Vortex method でテスト

15 test case

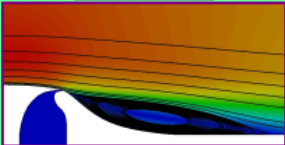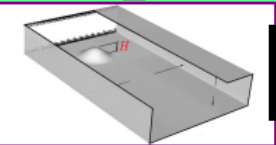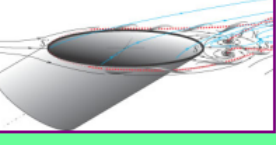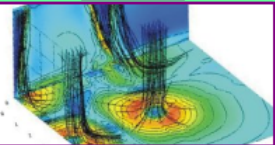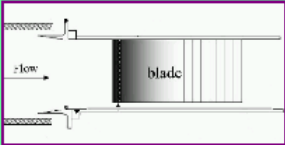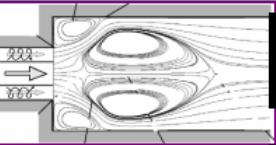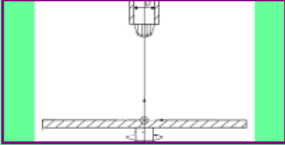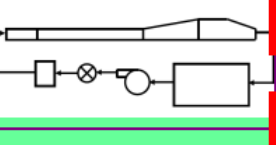...d/bigfiles/sig15/database/index.html

Case13.2 3D Asymmetric Diffuser
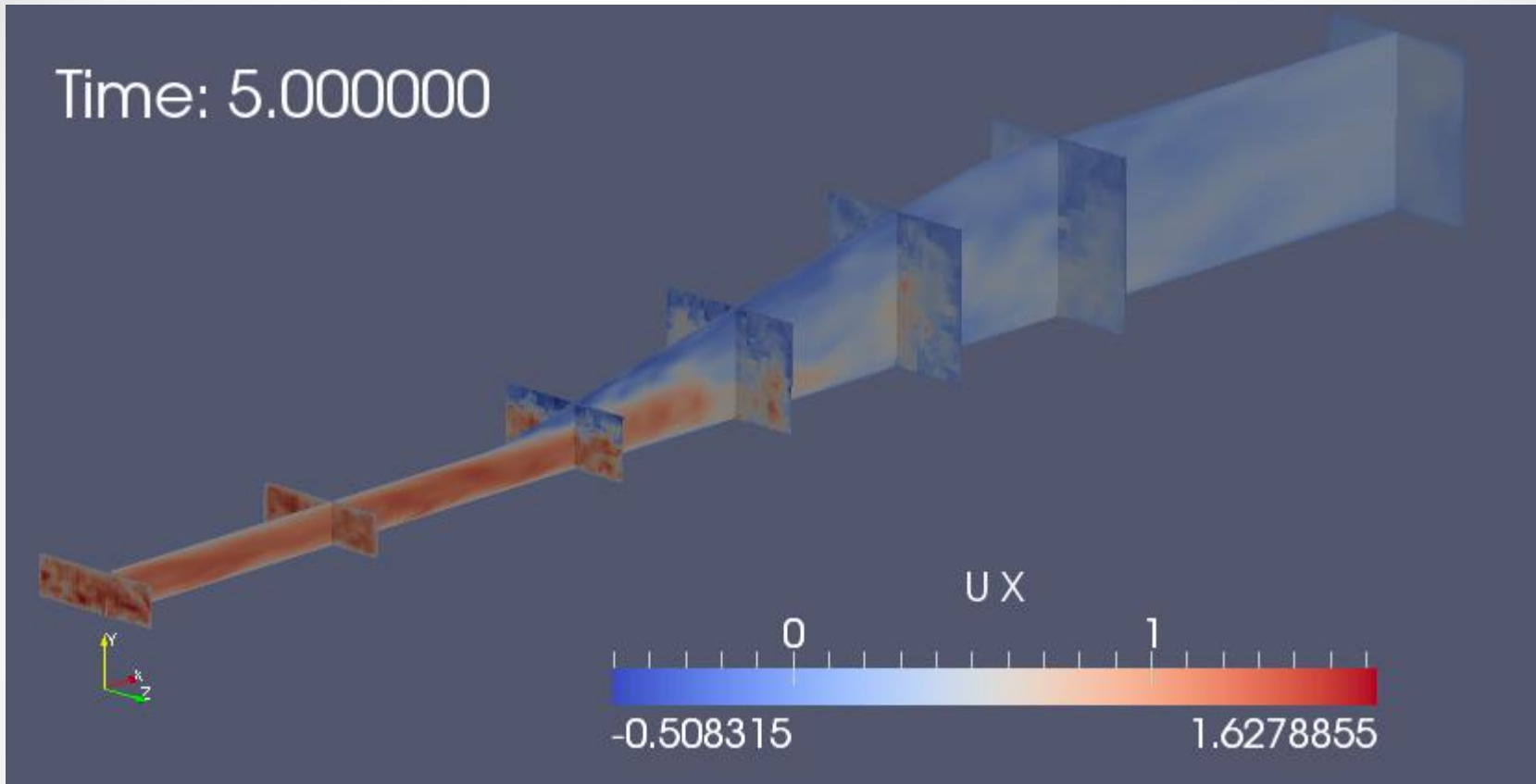
Smagorinsky Cs=0.1
Span方向30セル、Inlet:mapped
流れ場発達3sec＋平均値取得2sec

まとめ

- モデリング未達成は29ケース中9ケース
  ⇒**進捗率 69%**

- 今後、実験値などとの定量比較を順次実施

- データベースに参照データがないものも
  あり、それらの扱いをどうするか・・・