

OpenFOAMのパーセルモデリングについて

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* Lagrangian系ソルバ

- spray(Engine)Foam

派生版 その1 → coalChemistryFoam

派生版 その2 → reactingParcelFoam(LTS/simple版が有)

派生版その2のさらに派生版 → **reactingParcelFilmFoam**

- DPMFoam/MPPICFoam(OpenCAE勉強会@関東、2月に報告)

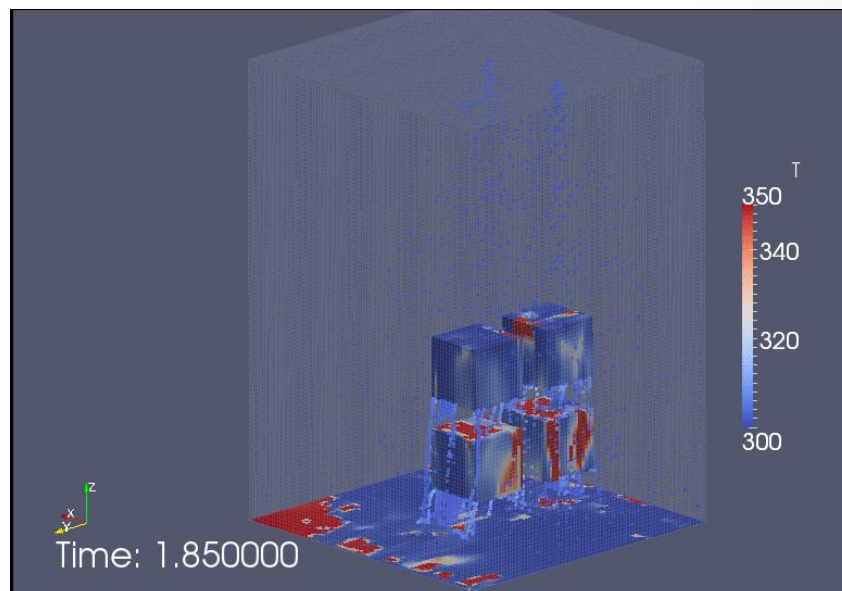
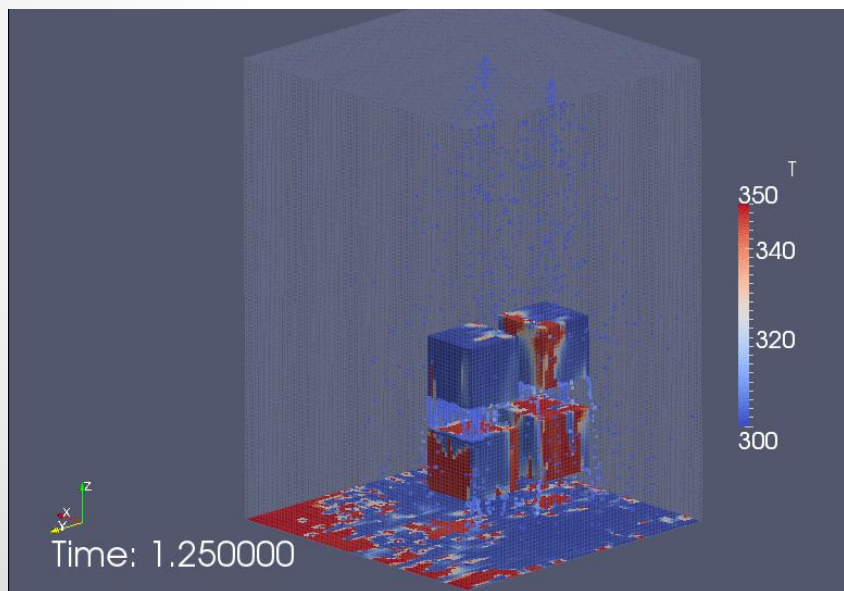
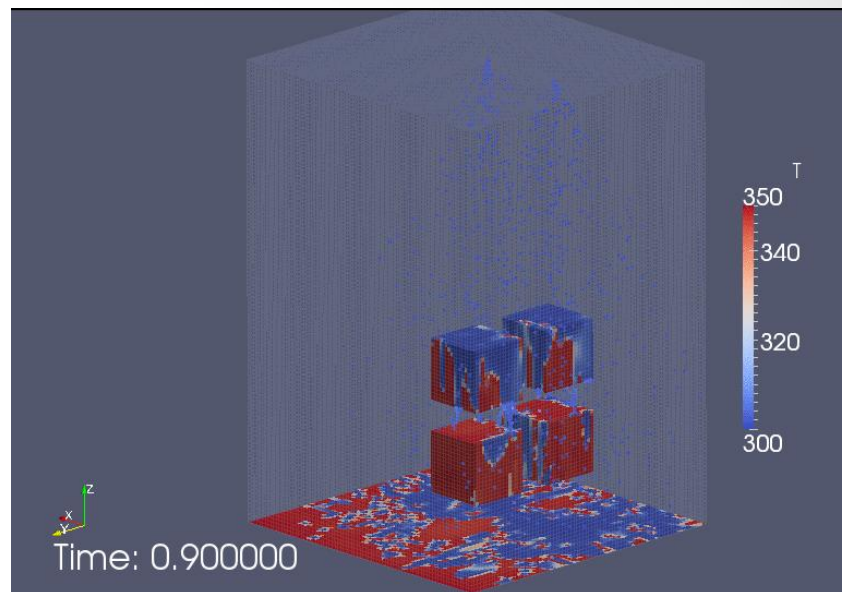
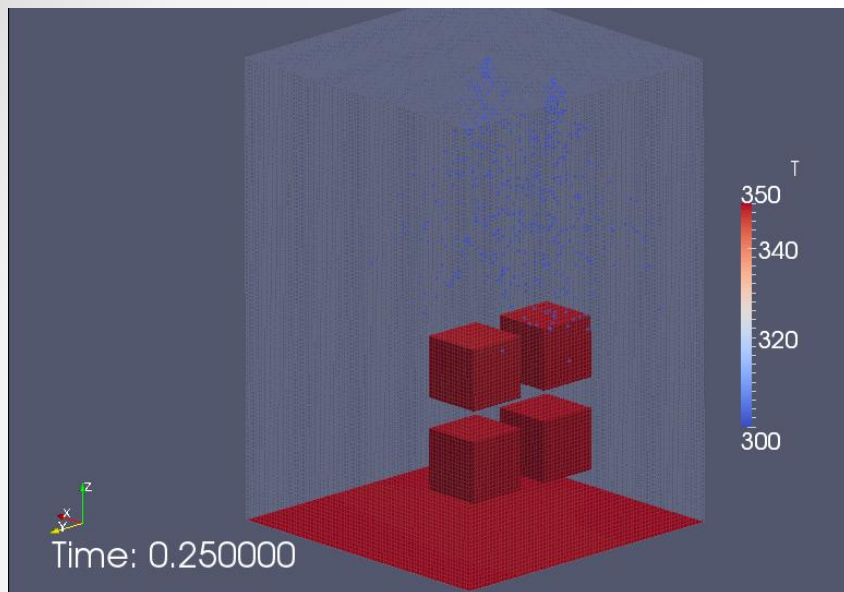
* reactingParcelFilmFoamについて

- • • 物体表面上の液膜ならびに液膜と干渉する粒子(パーセル)との相互作用を計算するソルバ

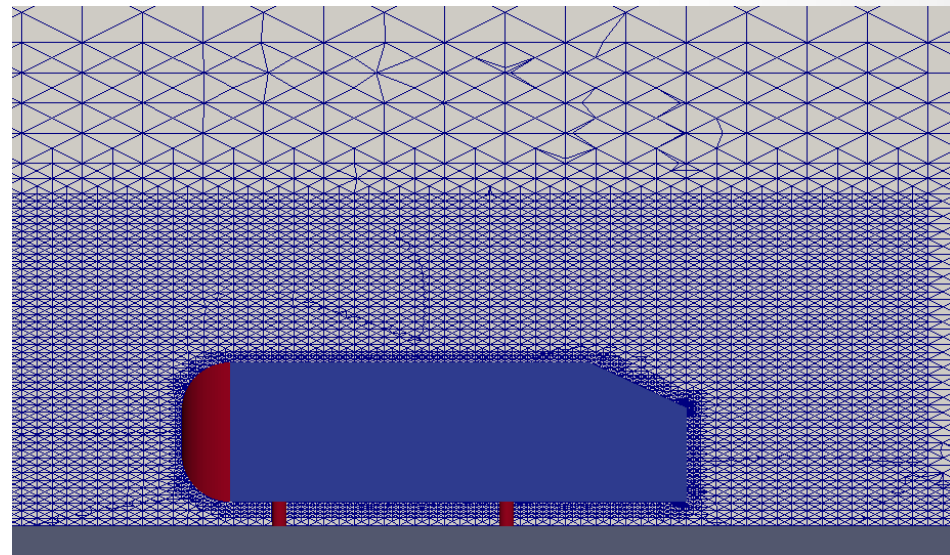
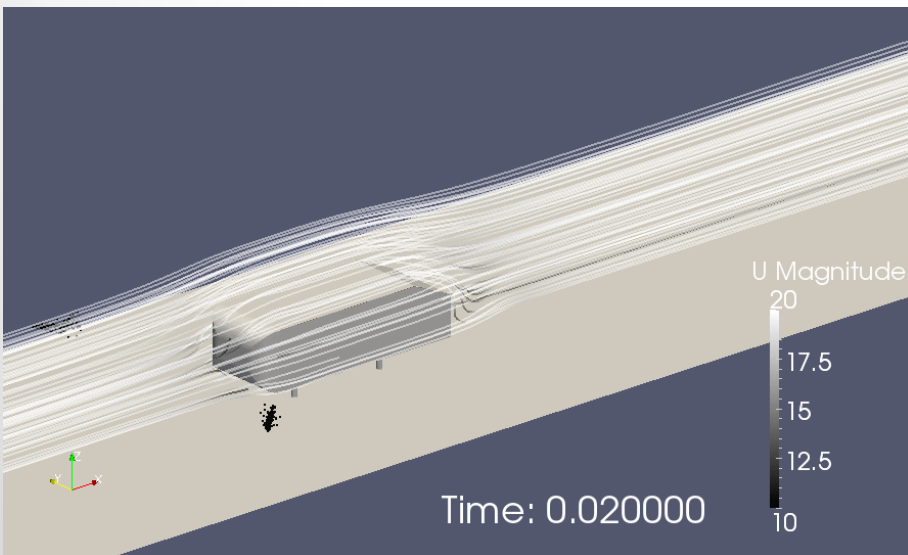
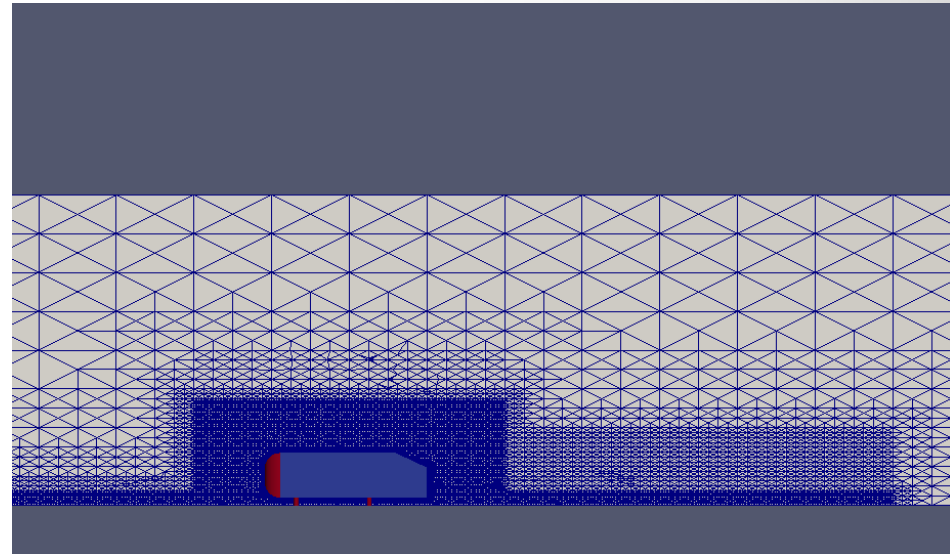
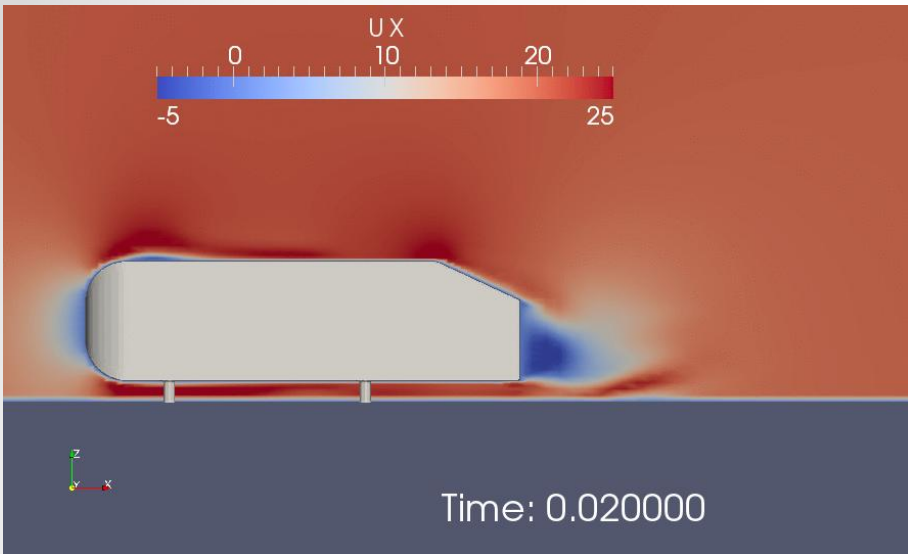
特徴

- 1) 液膜の厚みをメッシュで解像する必要はない(表面メッシュ1層押し出し)
- 2) 蒸発、沸騰考慮可
- 3) 粒子が液膜に衝突した際の跳ね返り、分裂を考慮可

解析事例 hotbox(tutorialから)

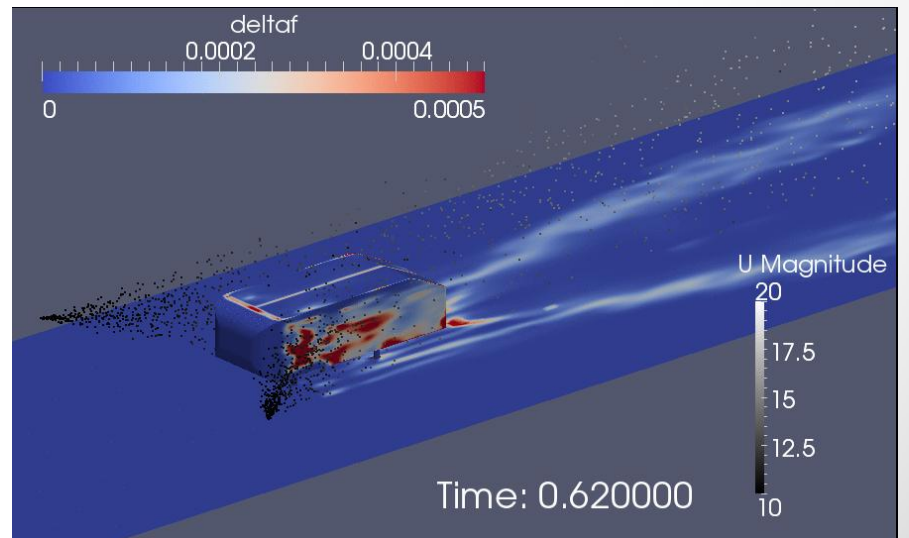
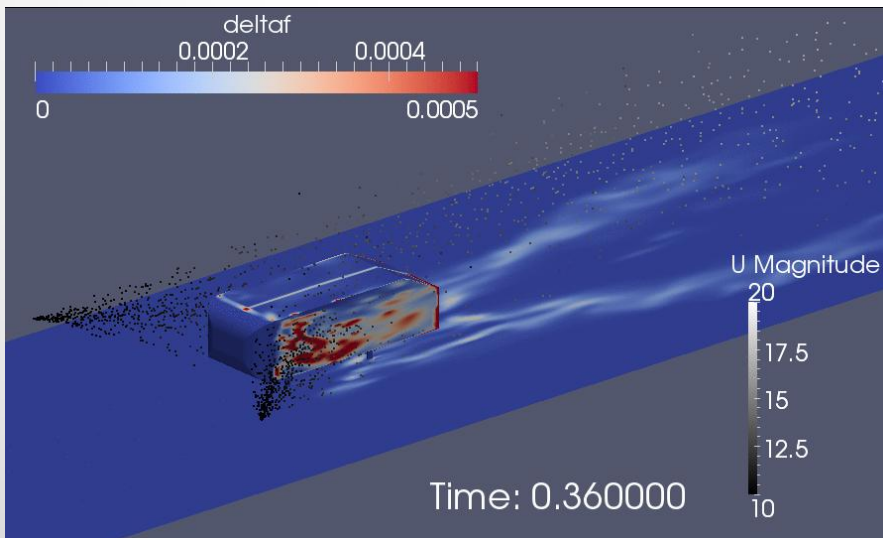
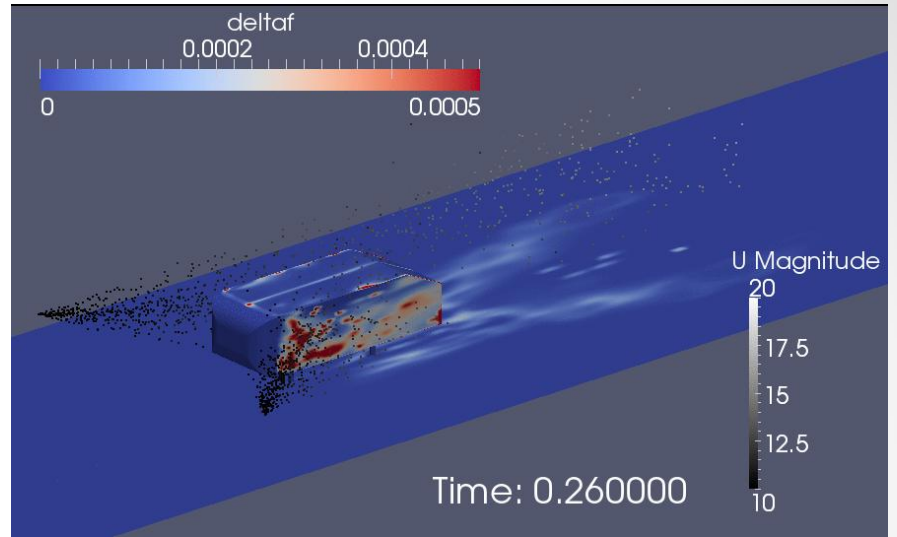
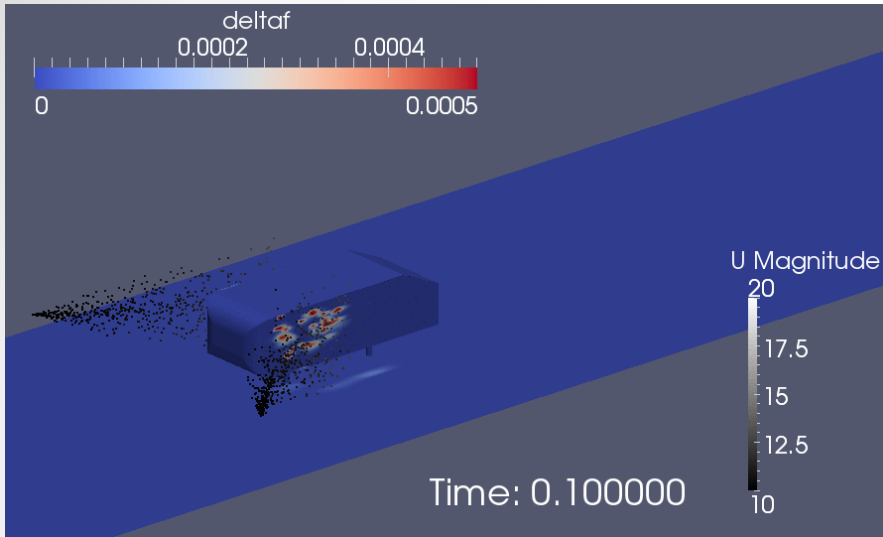


解析事例 簡易車体周りのパーセル挙動



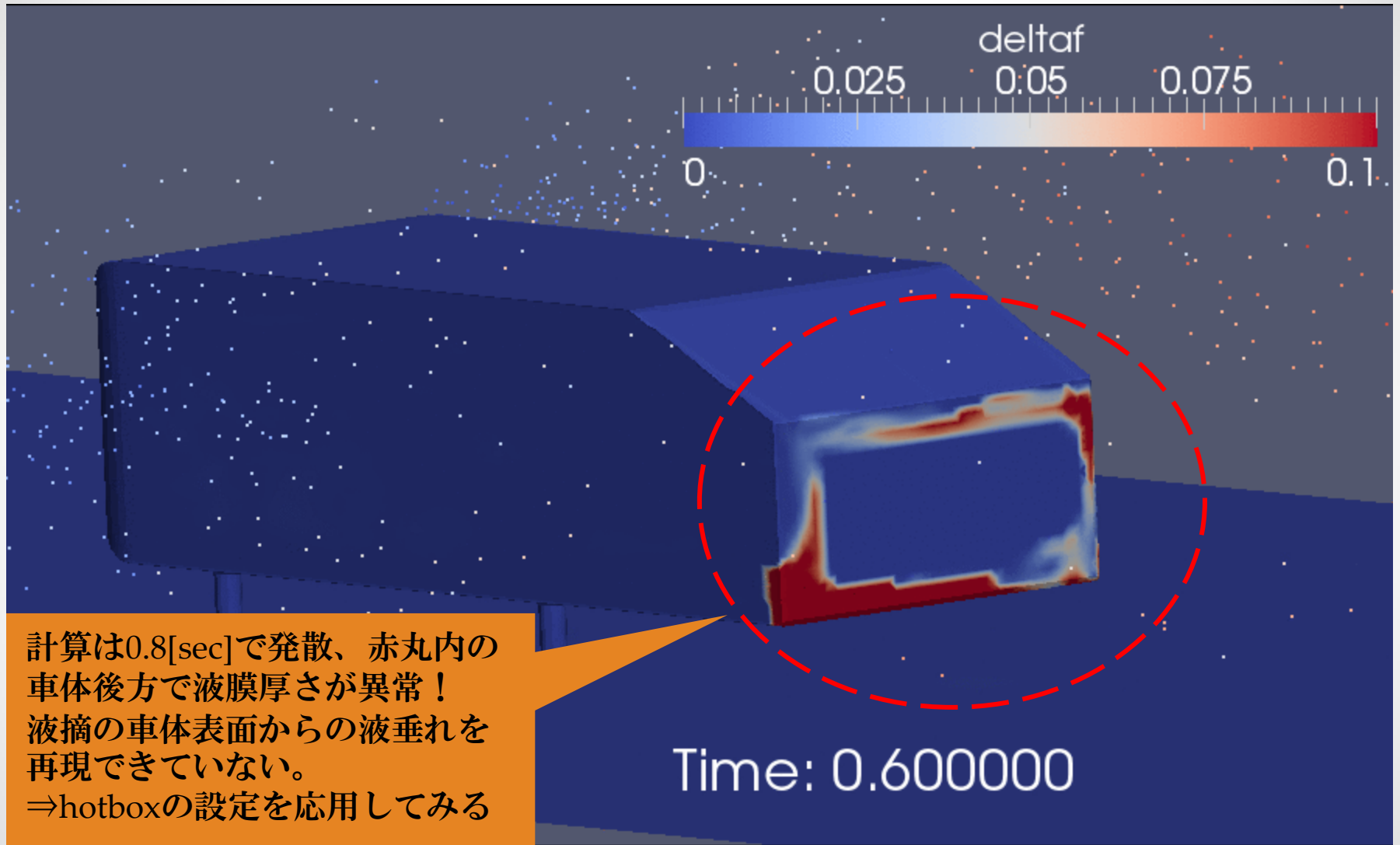
- ポリヘドラル40万セル、主流20m/s、パーセル吹出し10m/s、 $k-\omega$ SST

解析事例 簡易車体周りのパーセル挙動



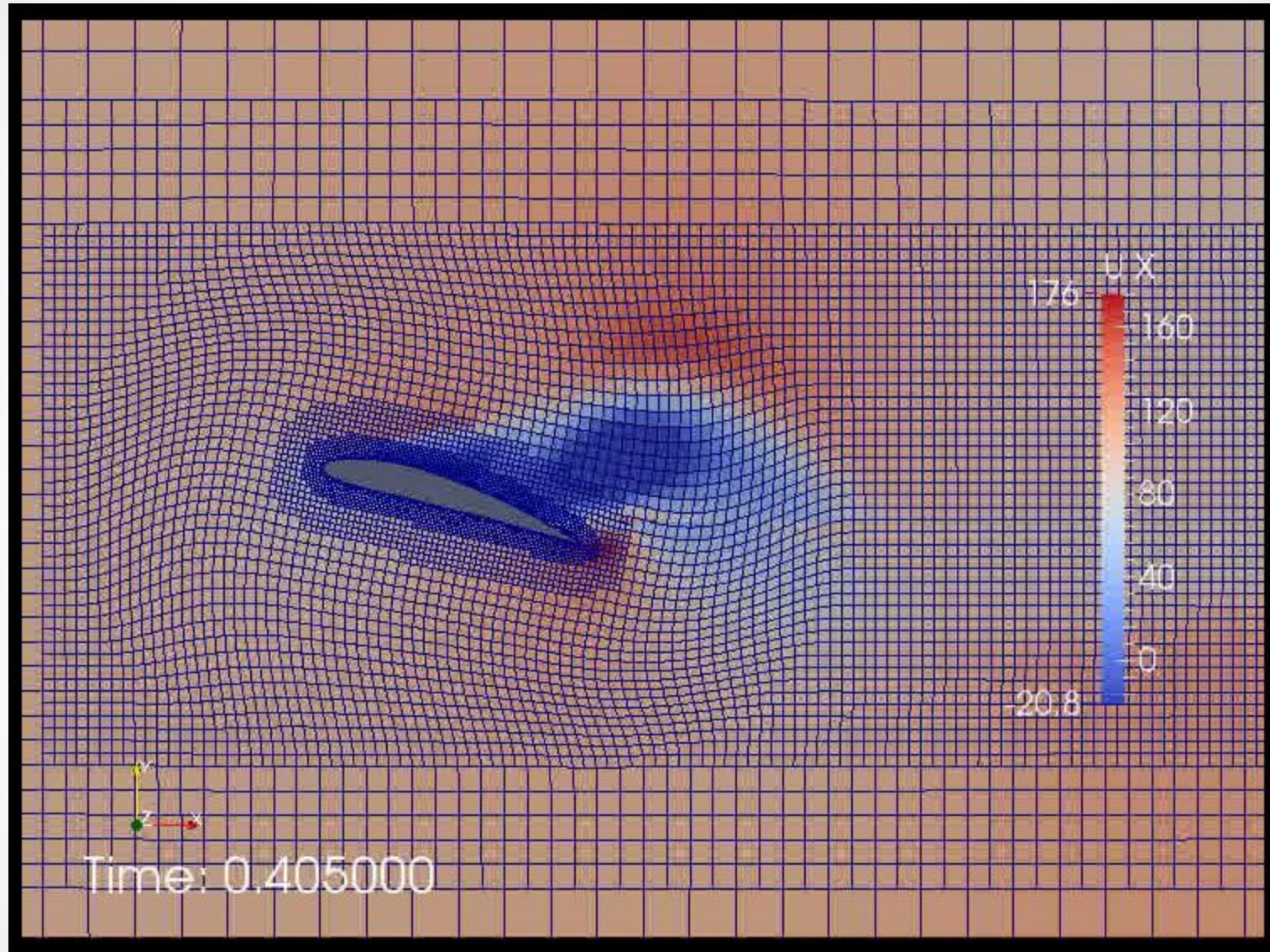
● パーセル挙動と車体表面のフィルム膜厚分布

解析事例 簡易車体周りのパーセル挙動



● パーセル挙動と車体表面のフィルム膜厚分布(後方)

OpenFOAM DynamicMeshの機能調査

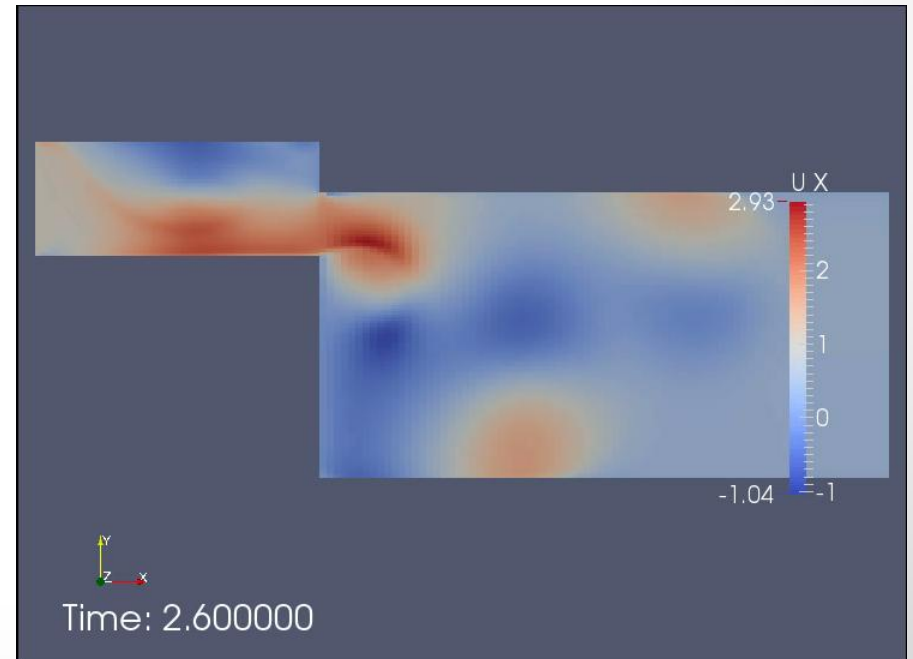
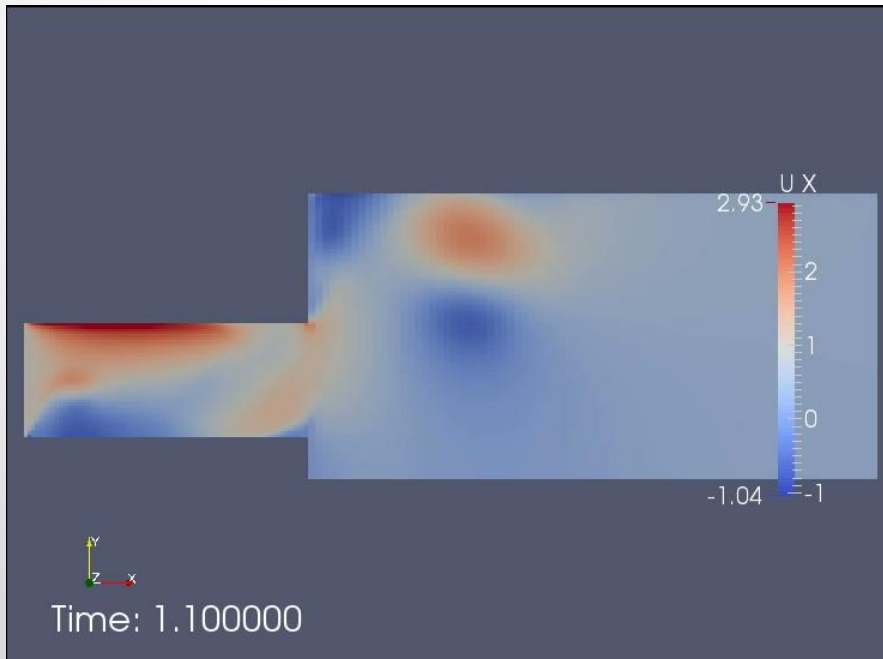


Ver2.3での新機能 Arbitrarily Coupled Mesh Interface (ACMI)

There are many cases where users may wish to couple patches that partially overlap with one another. In this version, a new **cyclicACMI** patch type has been introduced to enable such coupling, by blending a **cyclicAMI** patch with another patch type. For example, the other patch type could be a wall patch to make any non-overlapping boundary region a wall. In the case of wall patches, turbulence wall functions are updated appropriately as part of the blending. As with the **cyclicAMI** patch, the cyclicACMI functionality is fully parallel-aware and requires no special decomposition treatment.

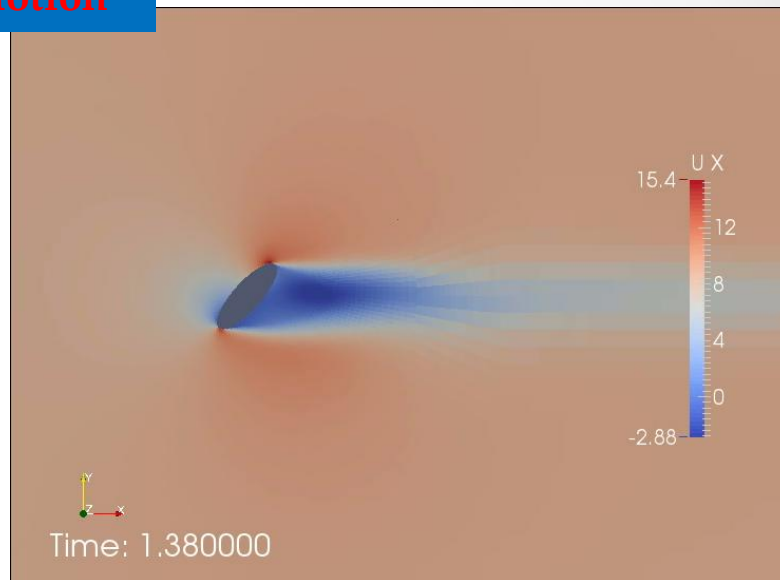
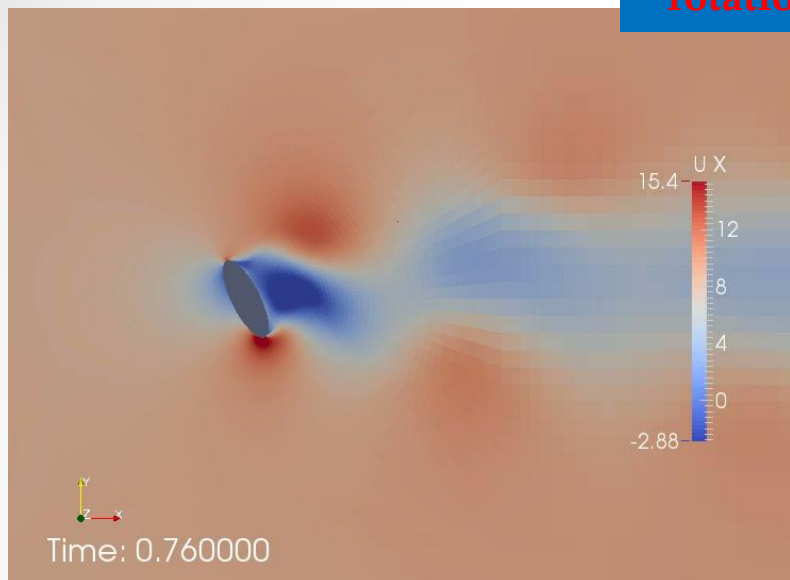
The cyclicACMI changes in behaviour from **cyclicAMI** to wall.

<http://www.openfoam.org/version2.3.0/ami.php> より引用

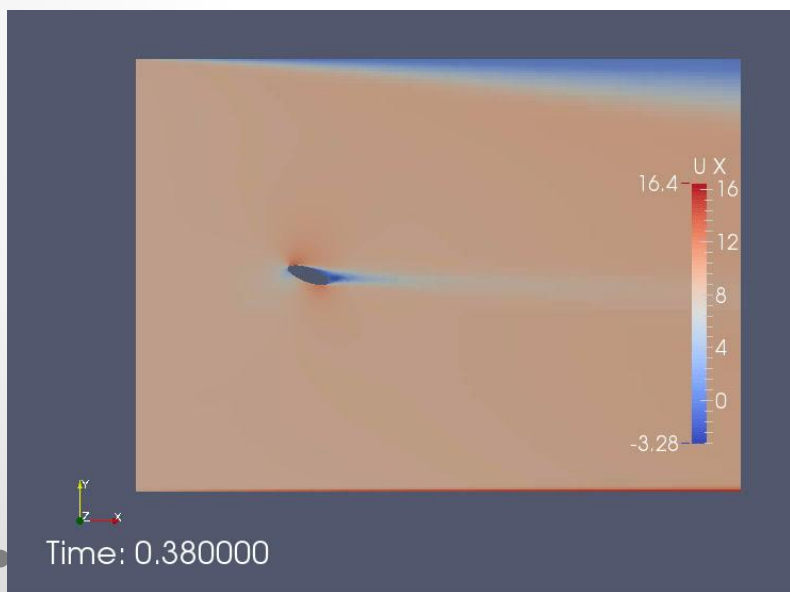


楕円翼周りのDynamicMesh(Rigid Motion)

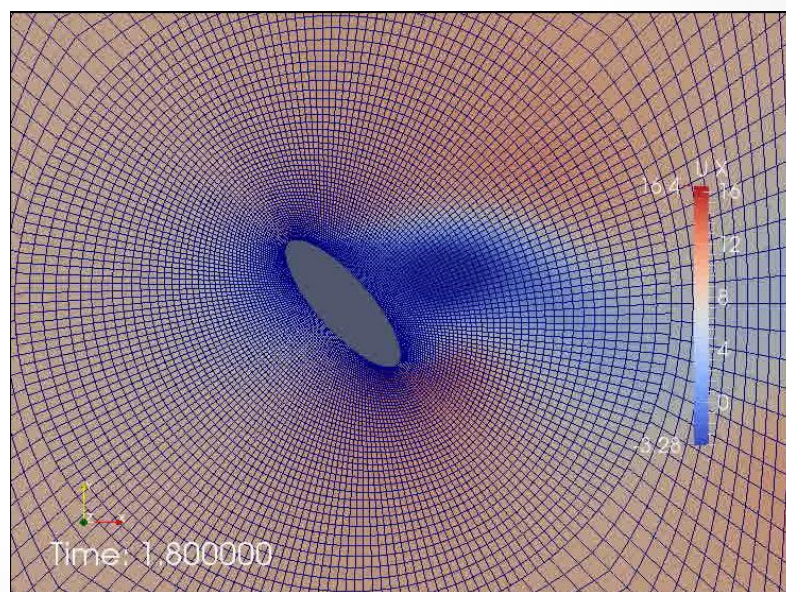
rotationMotion



oscillatingLinearMotion(All Region)

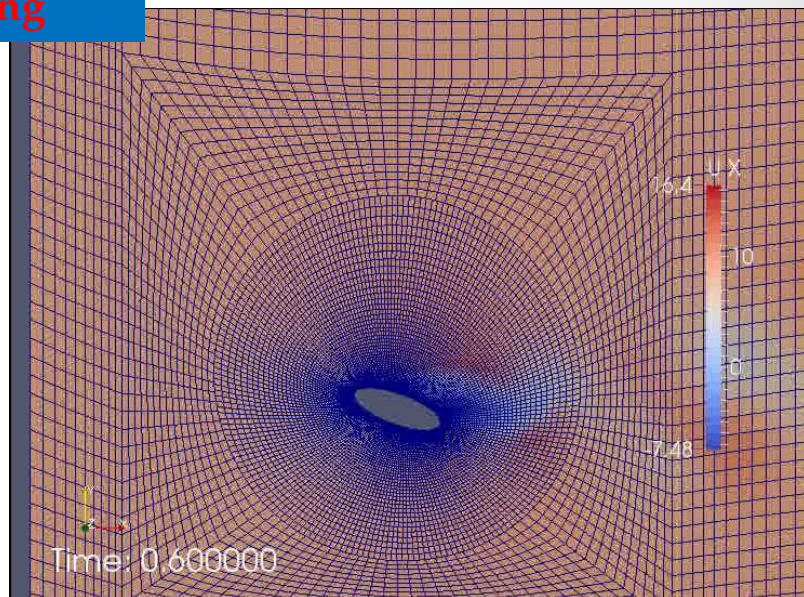
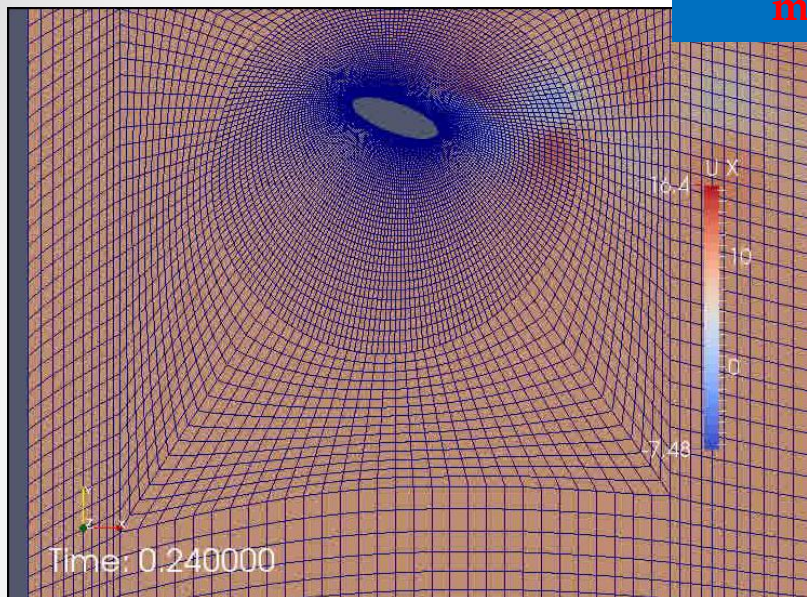


oscillatingRotatingMotion(AMI)



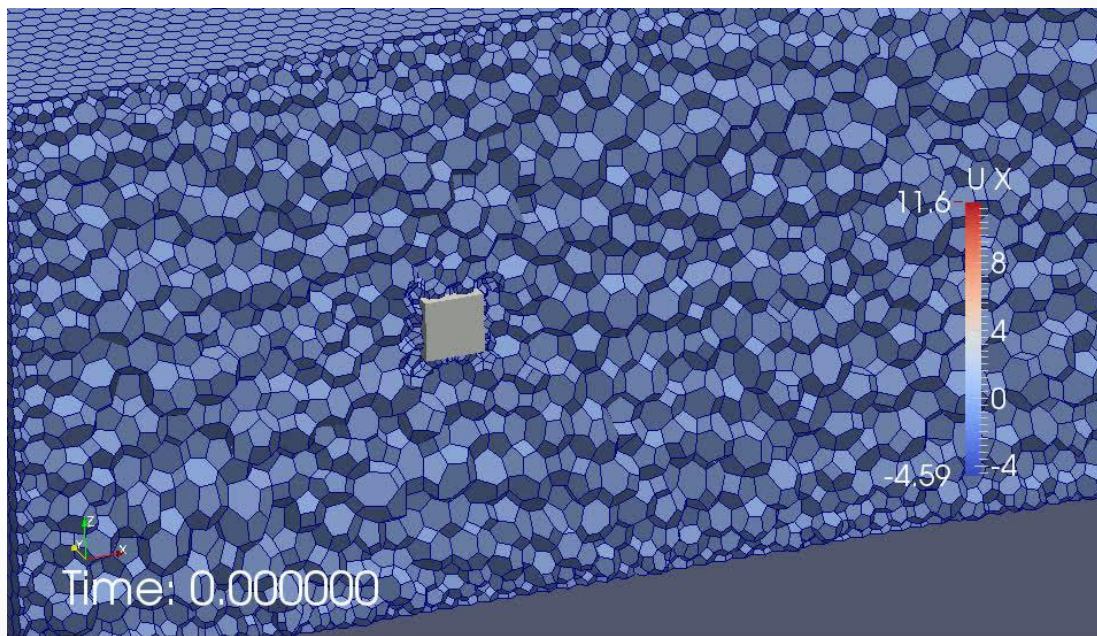
楕円翼周りのDynamicMesh(Morphing)

morphing



oscillatingLinearMotion
(PolyHedra)

※非構造格子のRemeshing
の機能はあるのか・・・？

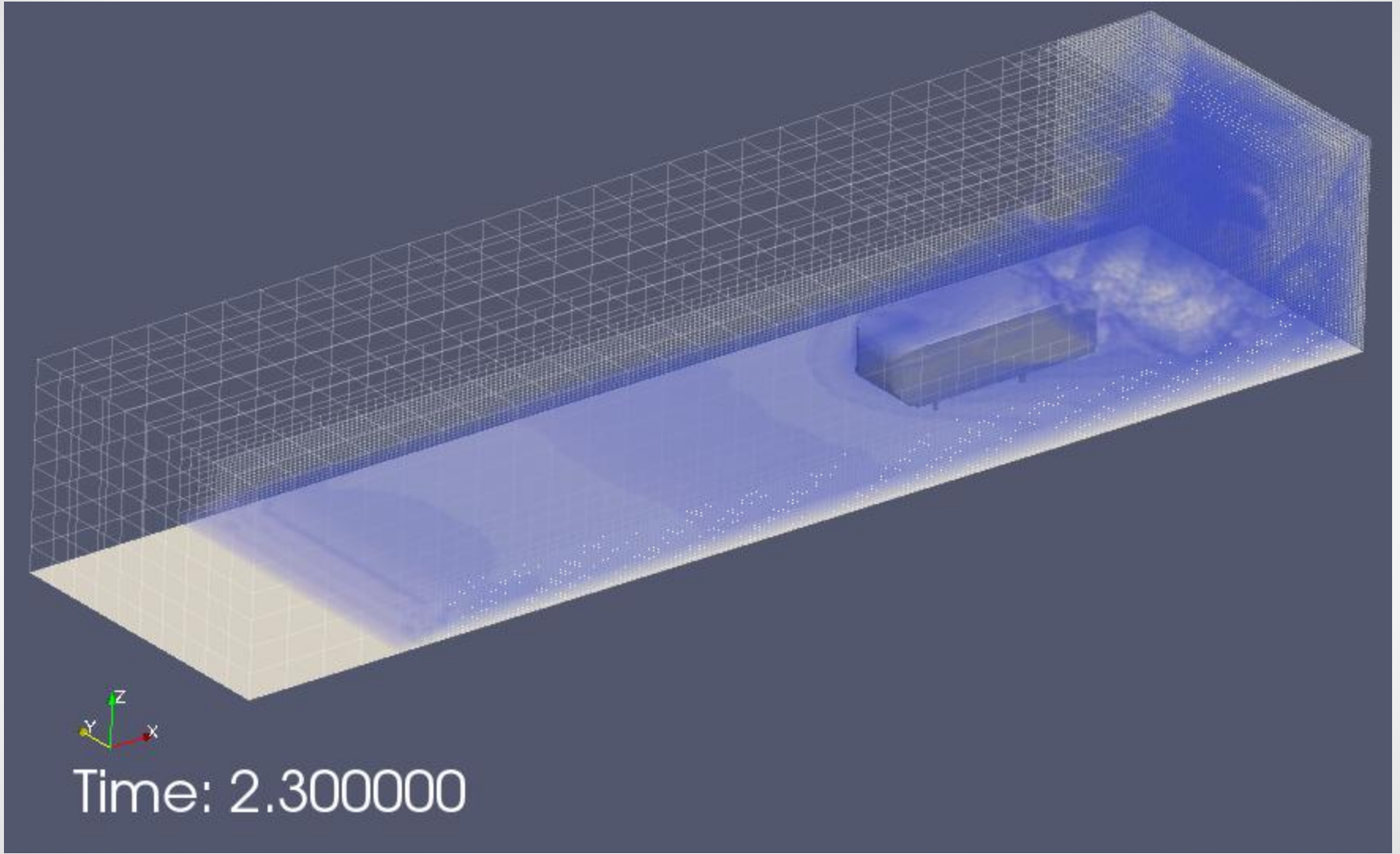


冠水路を想定した車両の走行シーン

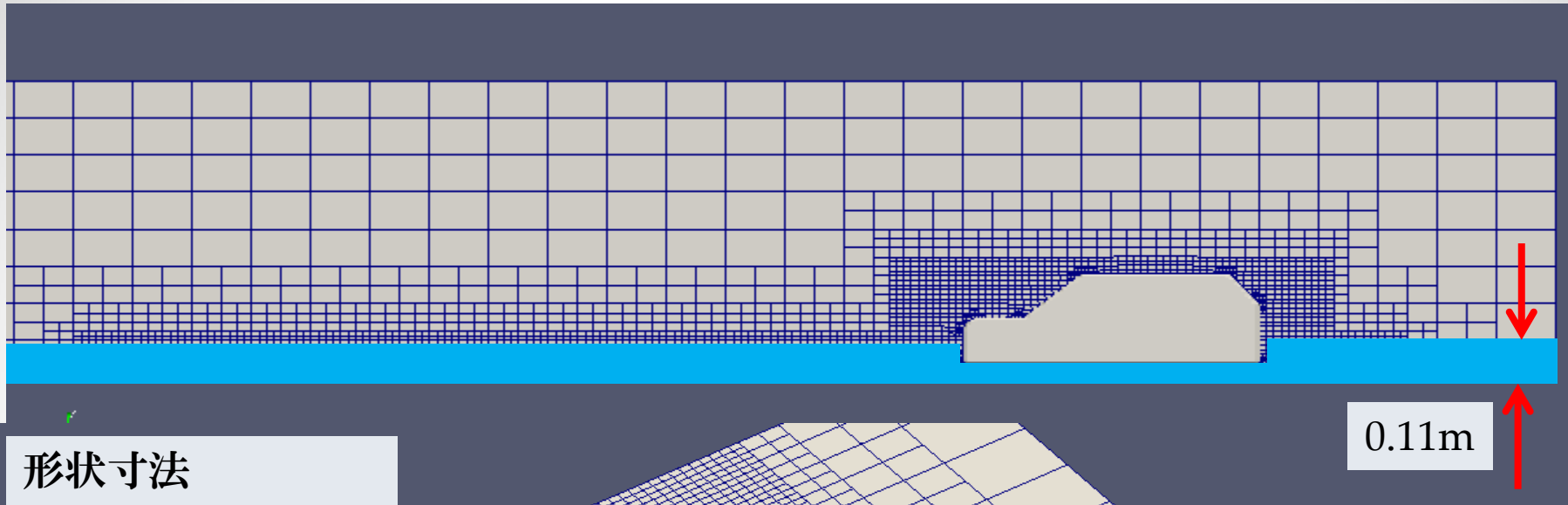


<https://www.youtube.com/watch?v=MfLsK0TGXCo>

簡易車体周りの二相流



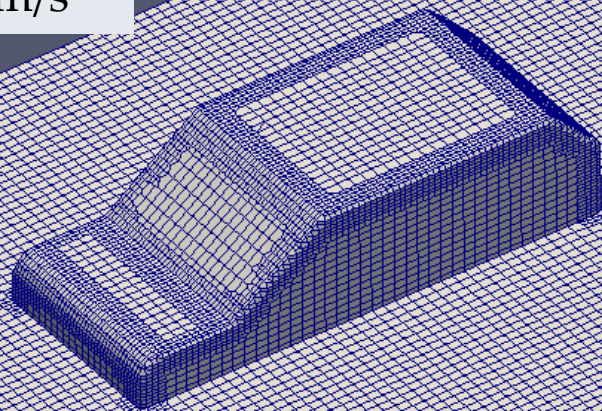
簡易車体周りの二相流+DynamicMesh



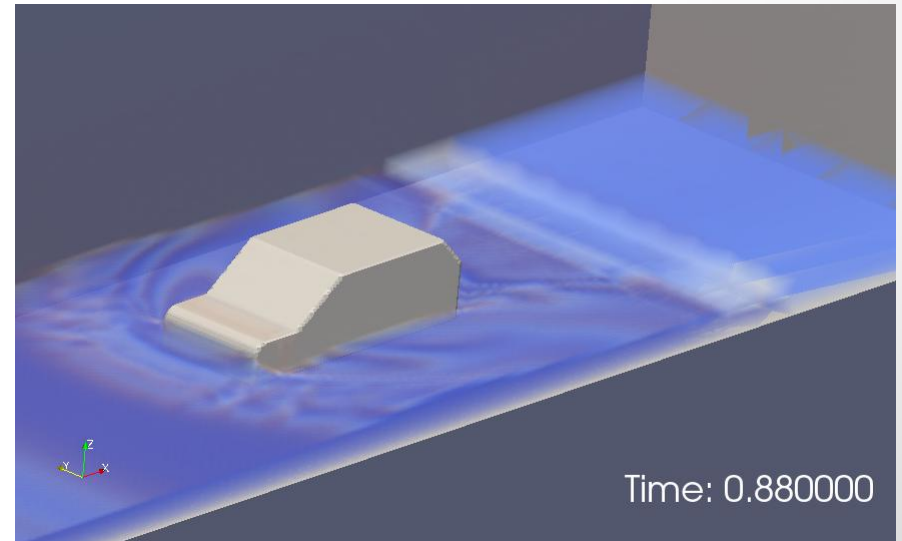
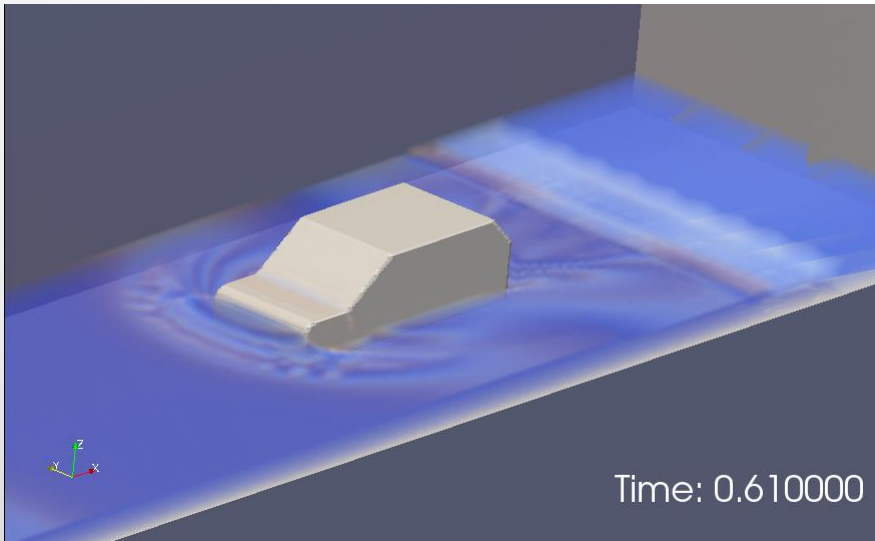
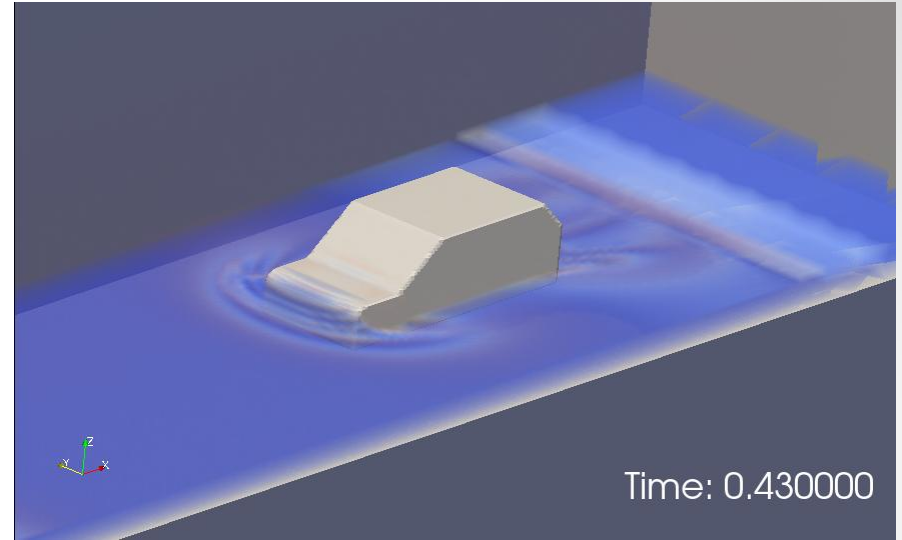
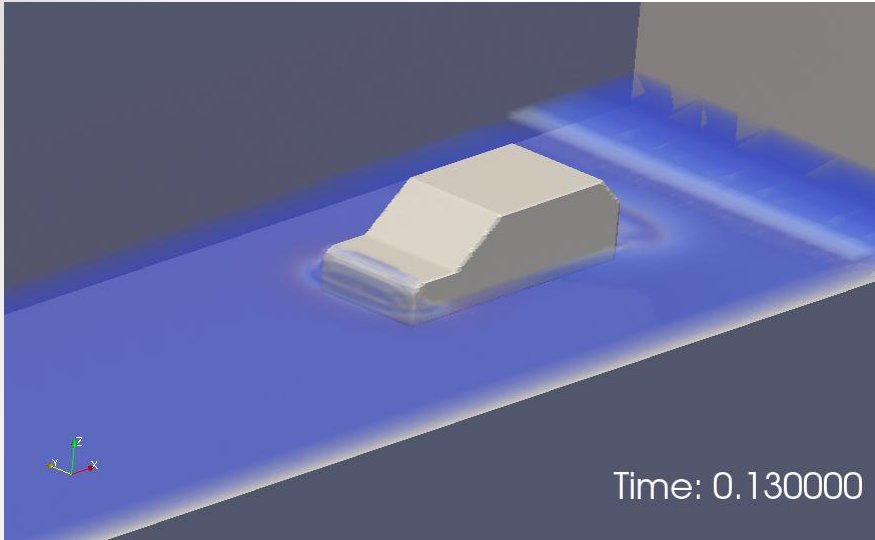
形状寸法

1m × 0.4m × 0.3m

移動速度 $V=3\text{m/s}$

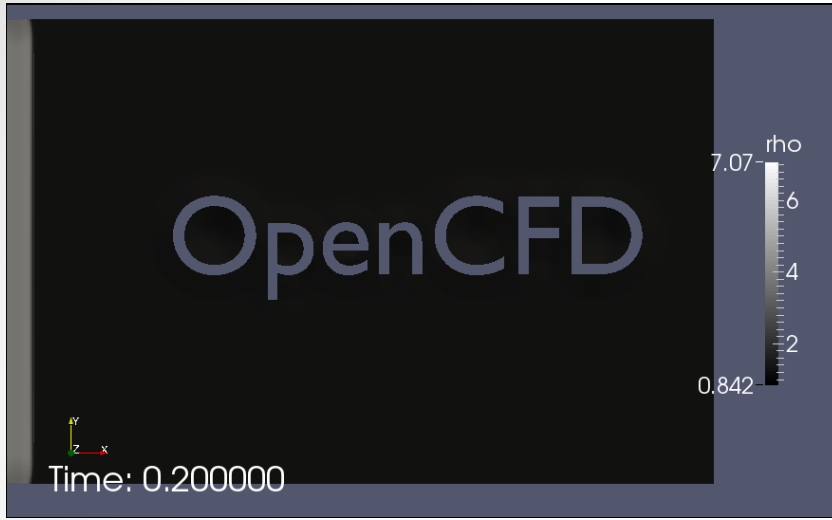


簡易車体周りの二相流 + DynamicMesh



foamyQuadMesh + rhoCentralDyMFoam

solver : oscillatingLinearMotion



- より実用的な解析にはOverSetの機能がほしいところだが・・・