icoFoam/cavity

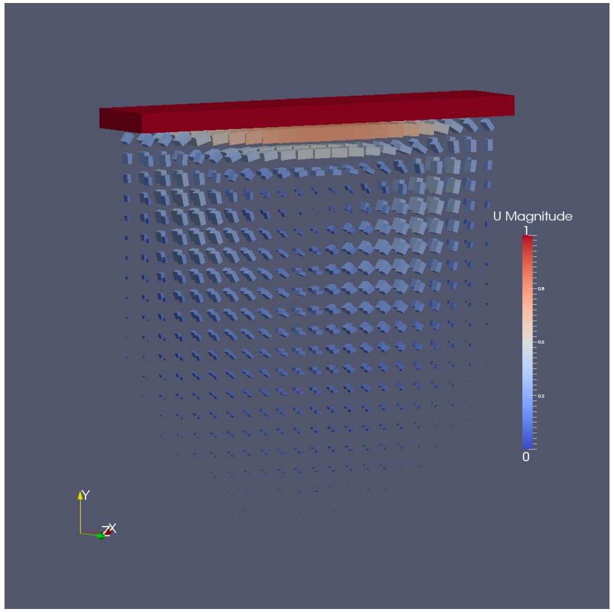

Figure 1: Glyph Filter applied to velocity field in cavity case

- The postprocessing is done in paraFoam.It represents the application of `Glyph Filter`.The filter type is specified as Box.
- Afer applying the filter,the option to color by 'velocity field' is chosen from' Color by' menu.

icoFoam/cavityClipped

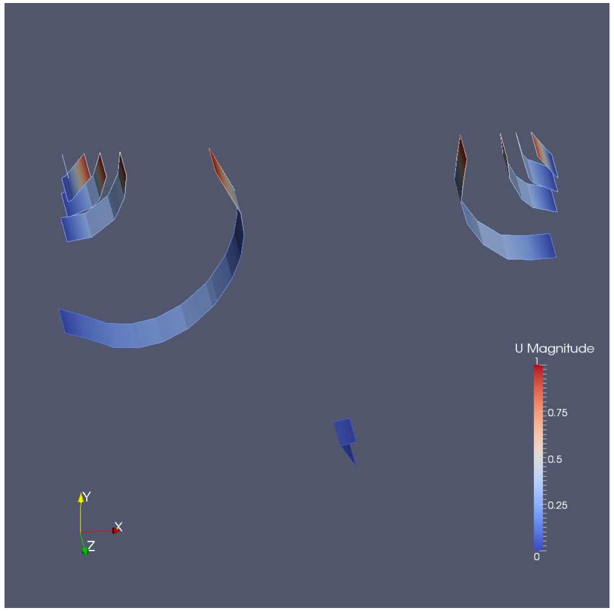

Figure 2: Contour filter applied to velocity field in cavityClipped case

- This is example of `Contour Filter` in paraFoam. Contour plots or iso-surfaces of the velocity field are created using this type of filter.

icoFoam/cavityFine

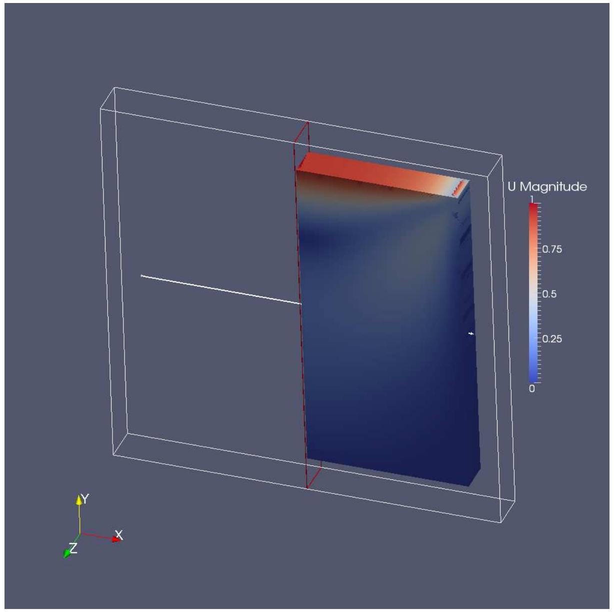

Figure 3: Clip Filter applied to velocity field in cavityFine case

- In paraFoam `Clip Filter` is applied.Filter type is specified as Plane and X-normal is chosen.Option Show plane is selected.
- Afer applying the filter,the option to color by 'velocity field' is chosen from 'Color by' menu.

icoFoam/cavityGrade

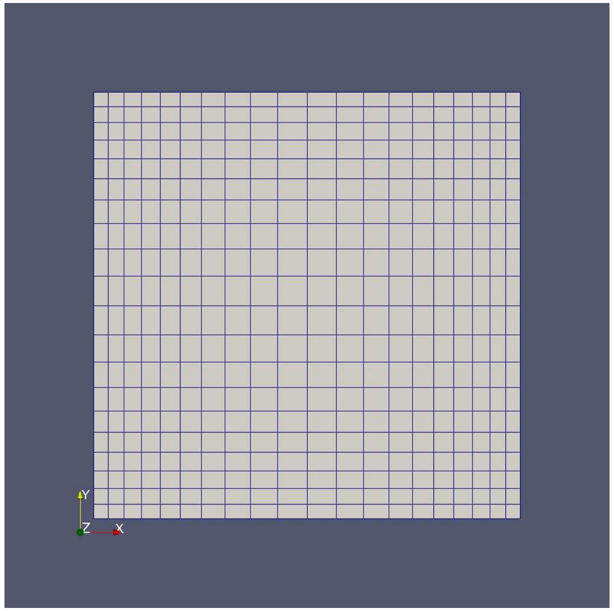

Figure 4: Viewing the mesh in paraFoam

- After launching paraFoam,the Display panel is opened and Color is set by Solid Color, while in the Style panel the Wireframe is chosen from the Representation menu.

icoFoam/cavityHighRe

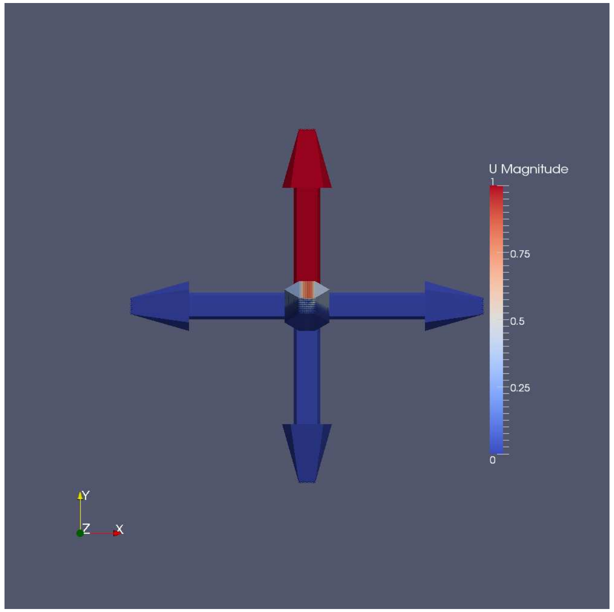

Figure 5: NormalGlyph filter application to the velocity field in cavityHighRe case

- In paraFoam `NormalGlyph Filter` is selected.Before clicking the Apply button Values for Glyph Max. Points and Glyph Scale Factor are specified to 2000 and 1 respectively.
- The option to color by 'velocity field' is chosen from 'Color by' menu.

solidDisplacementFoam/plateHole

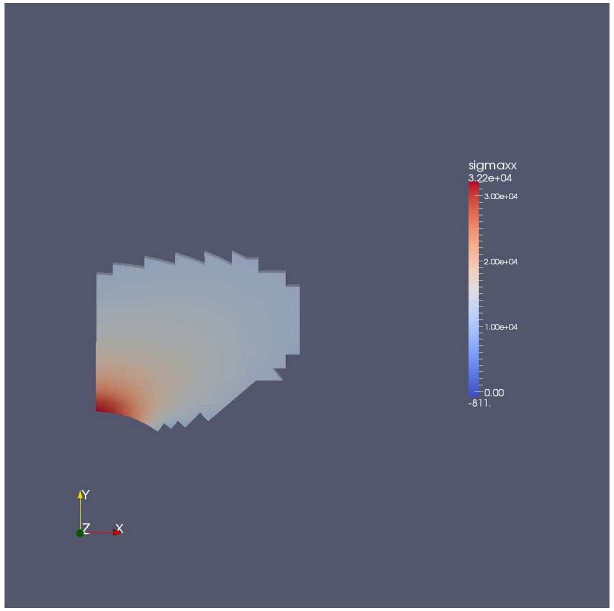

Figure 6: Treshold filter application to the stress field in plateHole case

- Individual scalar field components are generated using `foamCalc` utility.
- The postprocessing is done in paraFoam where `Treshold Filter` is applied, specifying the lower and upper values.
- The option to color by 'sigmaxx' stress component is chosen from 'Color by' menu.

interFoam/laminar/damBreak

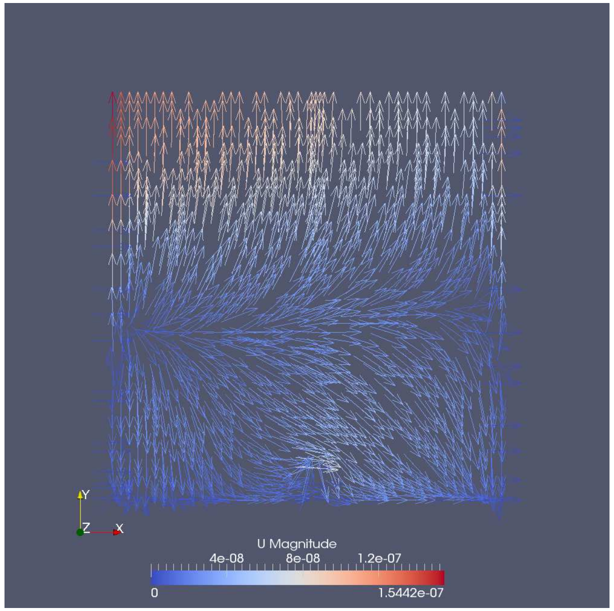

Figure 7: Glyph filter aplication to the velocity field in damBreak case

- In paraFoam `Glyph Filter` is selected.The filter type is specified as 2D Glyph.
- The option to color by 'velocity field' is chosen from 'Color by' menu.

interFoam/laminar/damBreakFine

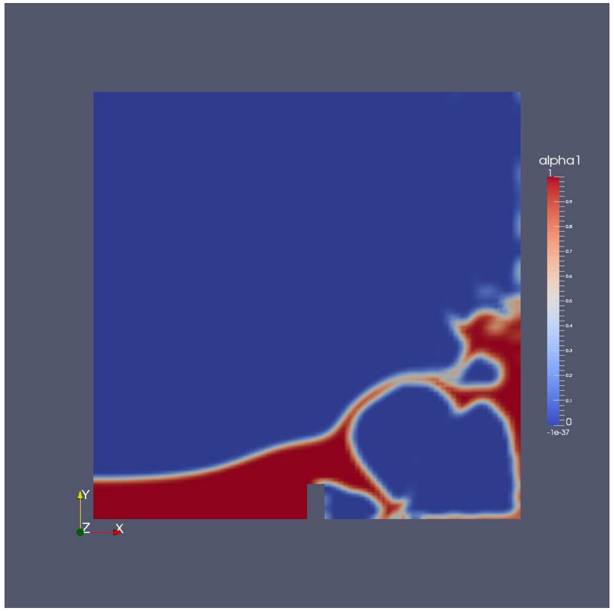

Figure 8: Phase fraction alpha1

- The figure represents snapshots of phase alpha1.In paraFoam, Volume Fields section alpha1 is chosen, while the time is set to 0.5s.

potentialFoam/cylinder

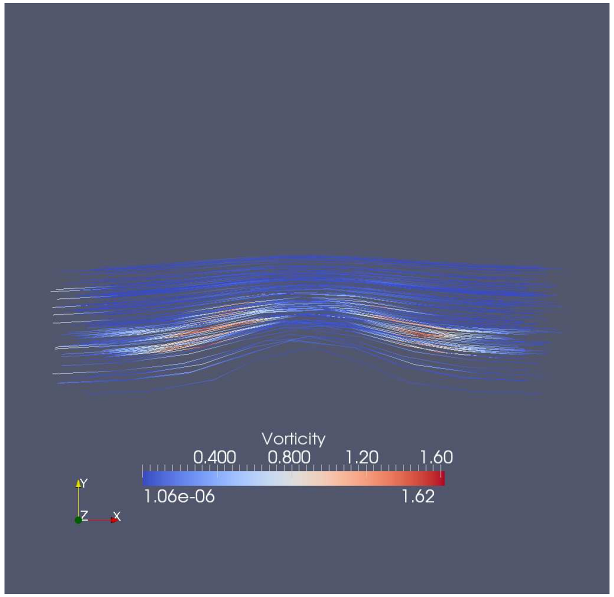

Figure 9: Vorticity in cylinder case

- This is example of `Stream Tracer Filter`.
- The option to color by 'vorticity' is chosen from 'Color by' menu.

simpleFoam/pitzDaily

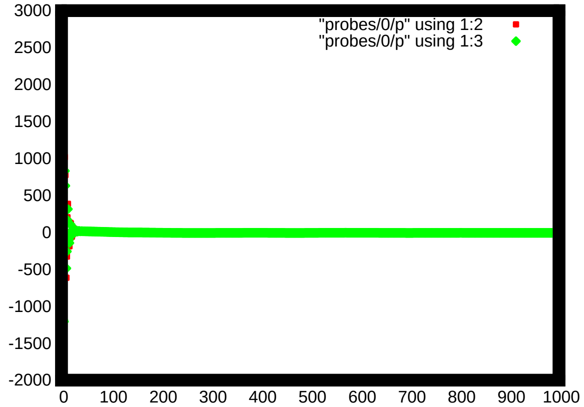

Figure 10: Visualization of the output file of sample;horizontal axis-time[s],vertical axis-pressure[Pa]

- Control dictionary of the current case is modified by adding the functions part.
- The output file is then visualized in Gnuplot by: plot “probes/0/p”using 1:2, “probes/0/p” using 1:3.

sonicFoam/forwardStep

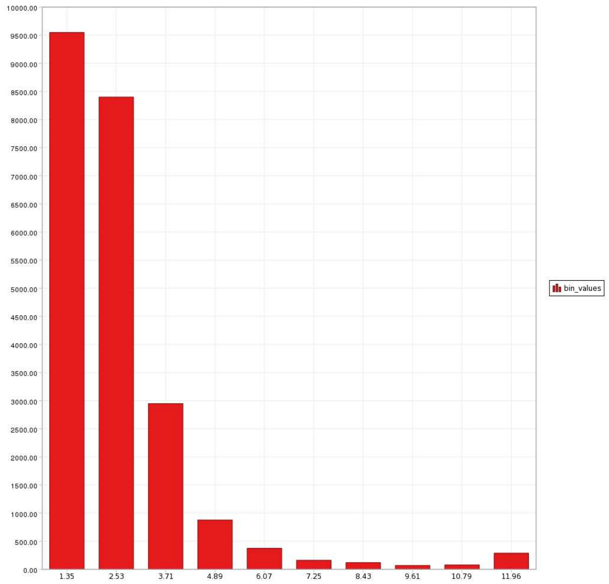

Figure 11: Pressure field in forward step case

- This is application of `Histogram Filter` in paraFoam.
- BinCount value is set to 10. Options Calc. Averages and Use Cust.Bin ranges are both selected. In Scalars pressure is chosen.

sonicLiquidFoam/decompressionTank

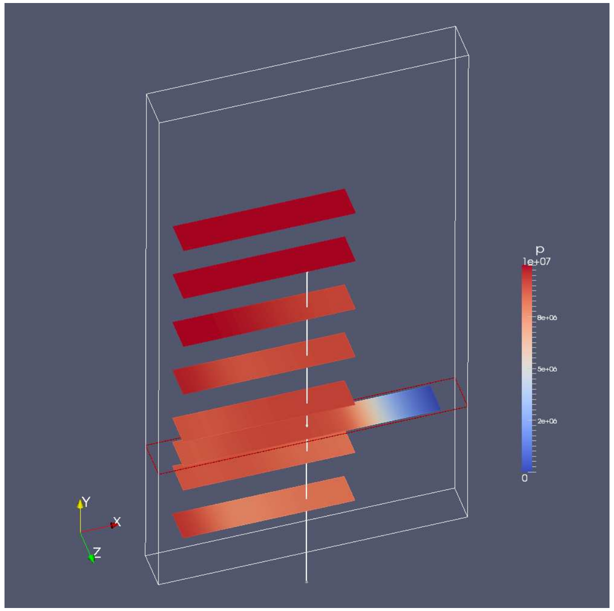

Figure 12: Slice filter application to velocity field in decompressionTank case

- This is application of `Slice filter`.Y-normal is chosen and Slice Ofset values range is specified.
- The option to color by' pressure field' is chosen from 'Color by' menu.

sonicLiquidFoam/decompressionTankFine

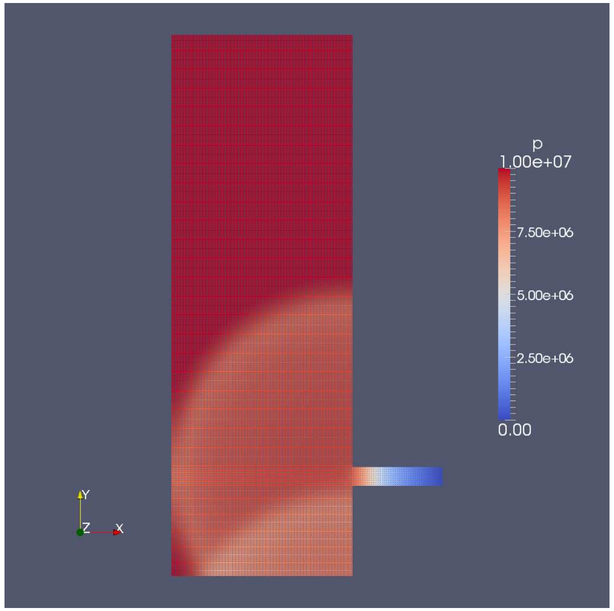

Figure 13: Pressure field in decompressionTankFine case

- This is application of `Slice filter`.Y-normal is chosen and Slice Ofset values range is specified.
- The option to color by 'pressure field' is chosen from 'Color by' menu.

mhdFoam/hartmann

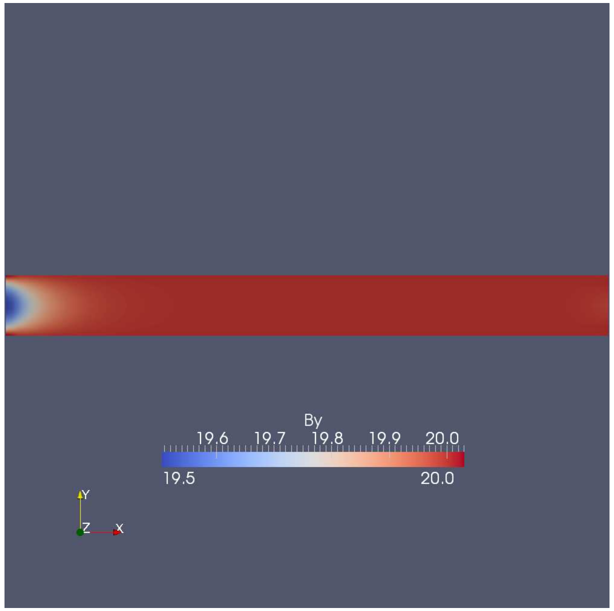

Figure 14: PlotOverLine filter application in hartmann case

- Components of magnetic flux density B are calculated using `foamCalc` utility.
- In paraFoam By component of the magnetic flux density is shown in Surface representation.

Modification of forwardStep case

- In forwardStep case the supersonic flow over a forward-facing step is investigated.
- The problem description involves a flow of 3 Mach at an inlet to a rectangular geometry with a step near the inlet region that generates shock waves.
- The effect on the solution of increasing the inlet velocity is examined, in particular flows of 5 Mach and 10 Mach.
- Hypersonic speeds are speeds that are highly supersonic. This term generally refers to speeds of Mach 5 and above.

forwardStep-inlet flow of 3 Mach

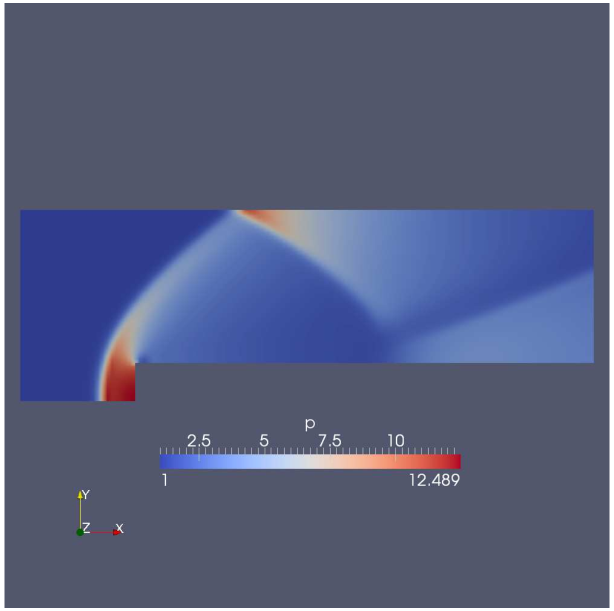

Figure 15: Pressure field in forwardStep case

- The results for pressure field are shown in Figure above.
- The discontinuities in pressure ,starting from ahead of the base of the step can clearly be seen.

forwardStep-modifications

- In 0 directory of forardStep case the inlet velocity U is set to 5 Mach.
- The utility `refineWallLayer<patch name><edgeWeight>` to refine cells next to patches is used.
- This utility is applied to patch `obstacle`.
- Polymesh is written in `0.002` directory.
- Variables from `0` directory need to be copied to `0.002` directory.
- In `controlDict` the start time should be set to 0.002 s.
- The case can be run using `sonicFoam` solver.

forwardStep-inlet flow of 5 Mach

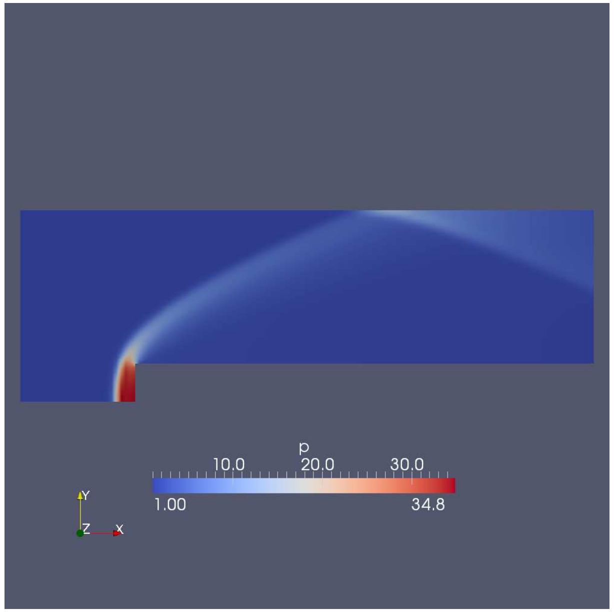

Figure 16: Pressure field in forwardStep case for inlet flow of 5 Mach

- As Mach numbers increase,the density behind the shock also increases.This corresponds to a decrease in volume behind the shock wave due to conservation of mass. As a consequence,the distance between the shock and the body generating it is reduced.
- This is refered to as small shock stand-off distance.

forwardStep-inlet flow of 10 Mach

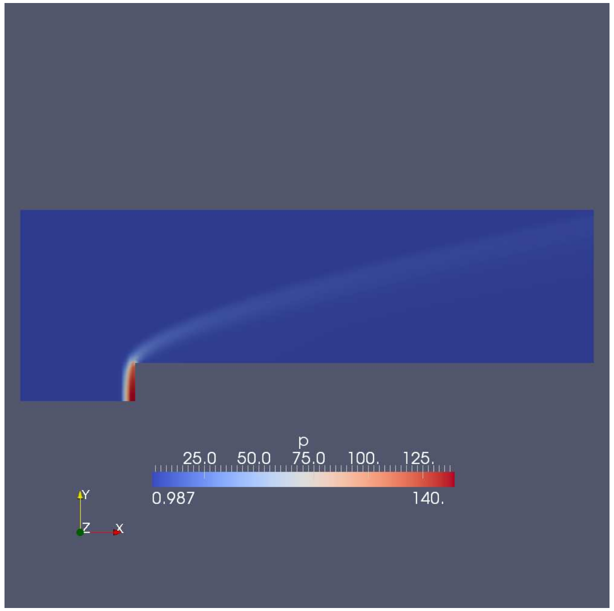

Figure 17: Pressure field in forwardStep case for inlet flow of 10 Mach

- The flow of 10 Mach can be classified as' high' hypersonic.
- Conlusion similar for the flow of 5 Mach can be drawn.
- Previously described efffect is more obviuous while having the flow of 10 Mach.

forwardStep-inlet flow of 5 Mach

- The utility `wallGradU` that calculates gradient of U at the wall is used.

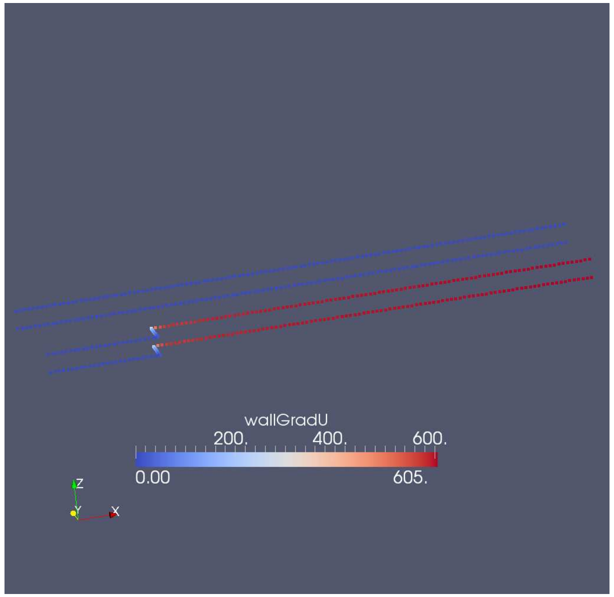

Figure 18: Gradient of velocity at the wall

- Postprocessing is done in paraFoam as usual.
- In'Display panel', bottom, top and obstacle patches are selected.Points representation is specified.