Simulation discussion for curved weld pipe using FLUENT

Yan Zhan

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Mesh for the Pipe

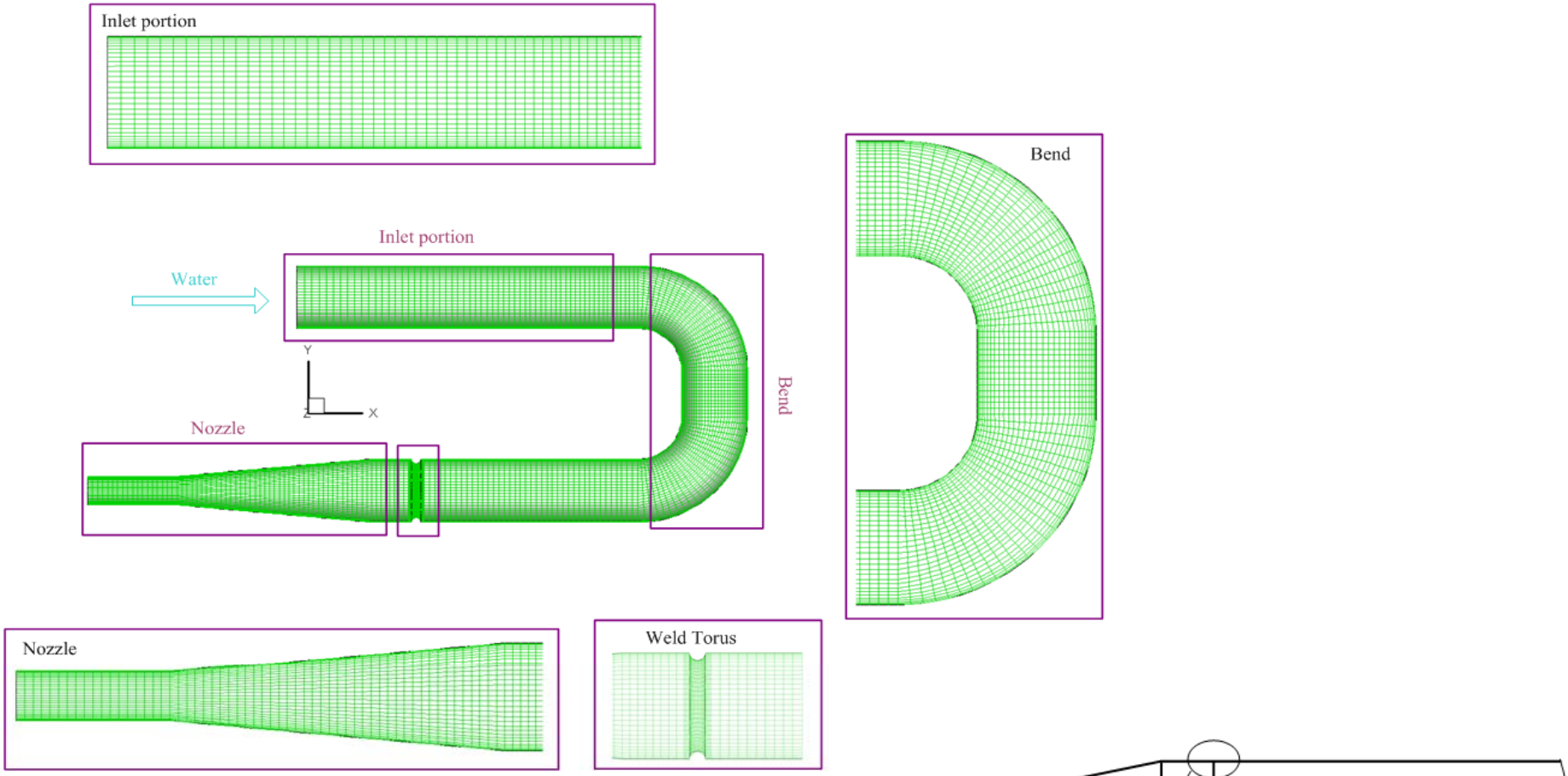


Fig. 1 Mesh intruction for the 90°/90° pipe

Mesh Tables

	n_r	n_θ	$n_{\tilde{z}}$	n_{tot} (million)
Mesh0	65	32	260	0.533
Mesh1	77	40	274	0.833
Mesh2	90	48	294	1.26
Mesh3	**257**	**48**	**623**	**7.655**

	n_r	n_θ	$n_{\tilde{z}}$	n_{tot} (million)
Mesh0	65	32	260	0.533
Mesh1	77	40	274	0.833
Mesh2	90	48	294	1.26
Mesh3	**150**	**48**	**572**	**4.0**

	n_r	n_θ	$n_{\tilde{z}}$	n_{tot} (million)
Mesh0	65	32	260	0.533
Mesh1	77	40	274	0.833
Mesh2	90	48	294	1.26
Mesh3	**177**	**48**	**652**	**5.5**

Grid# = 7.65 Million

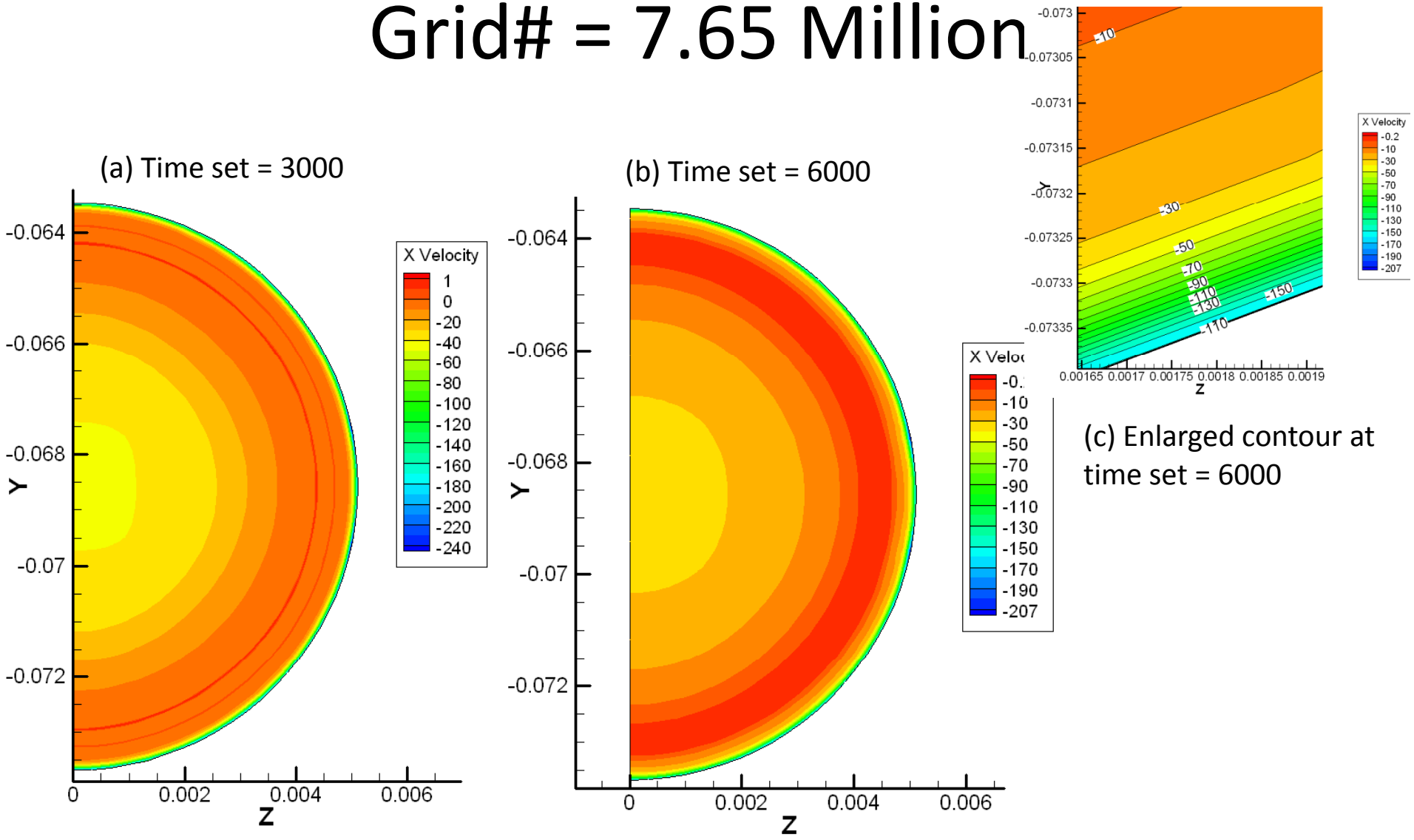


Fig. 2 Axial velocity (in m/s) atthe exit plane (parallel computation) for 7.65 million case (Computation crushes when using the 1st order solver)

Grid# = 4.0 Million

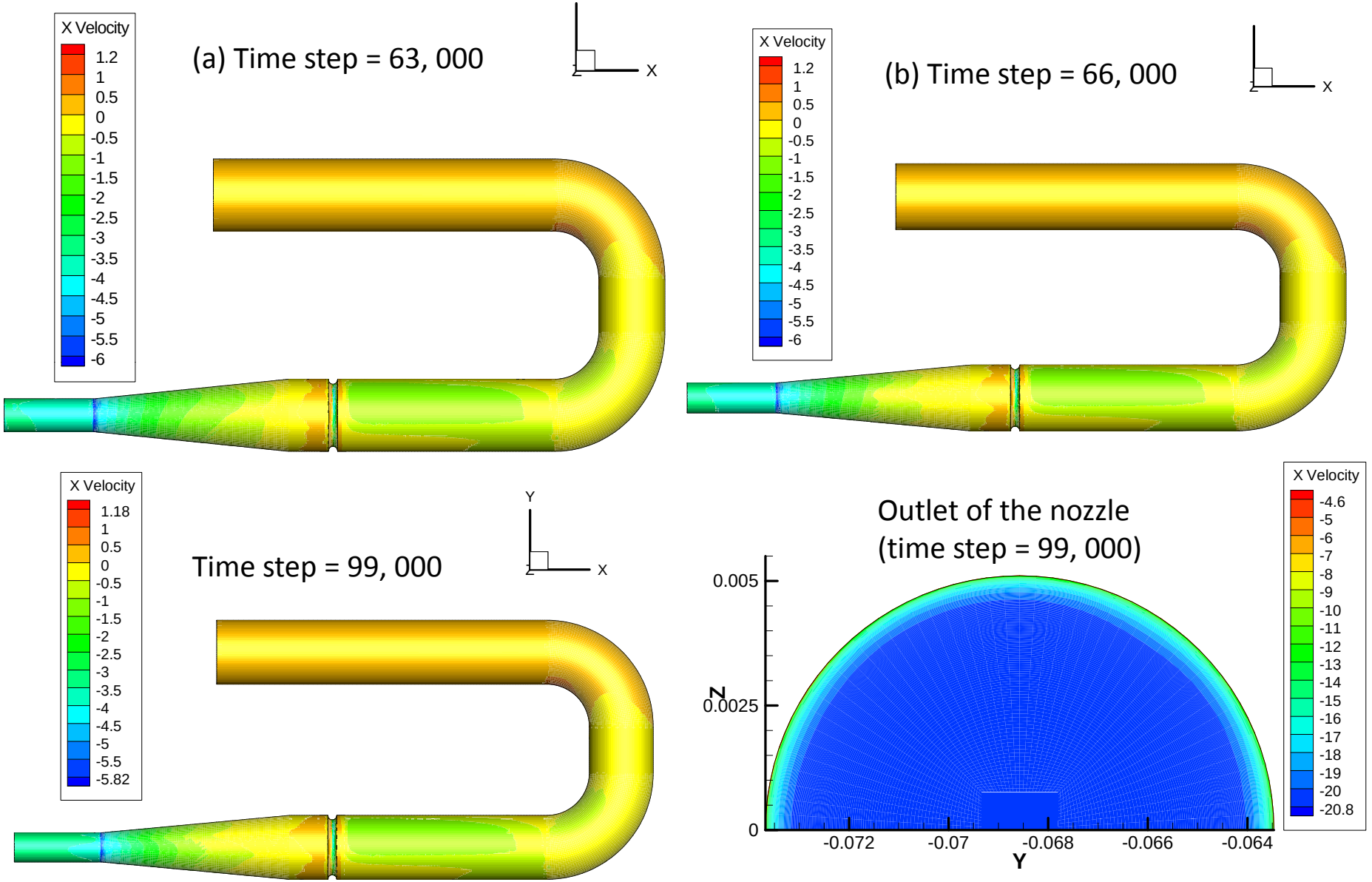
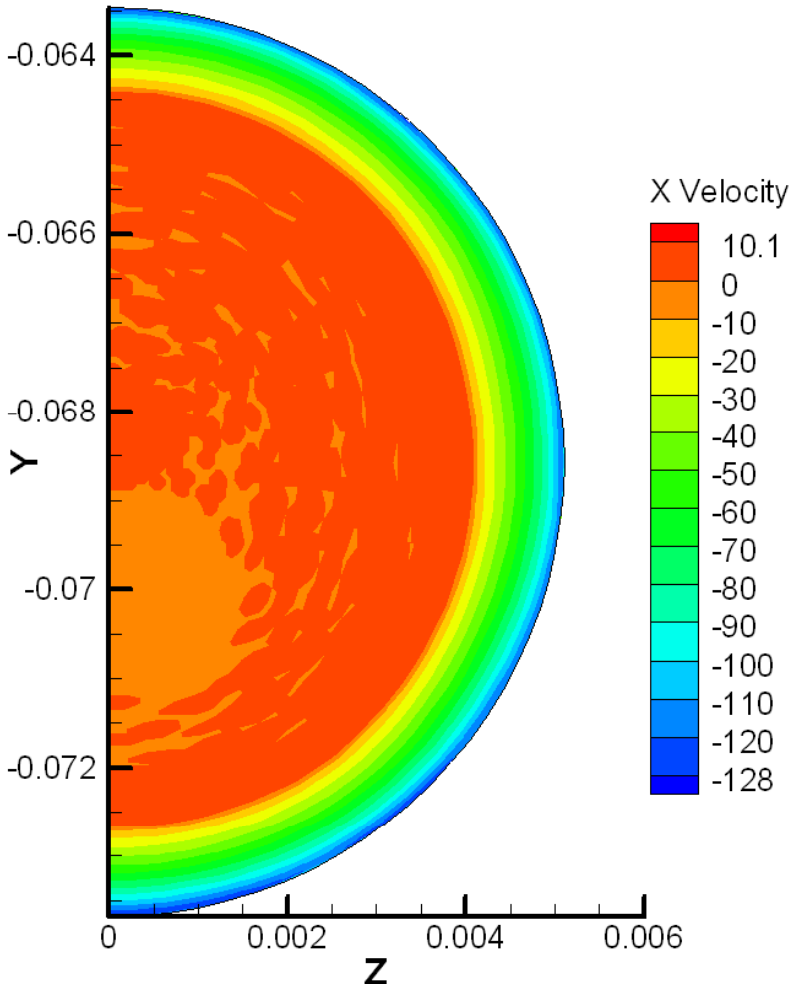
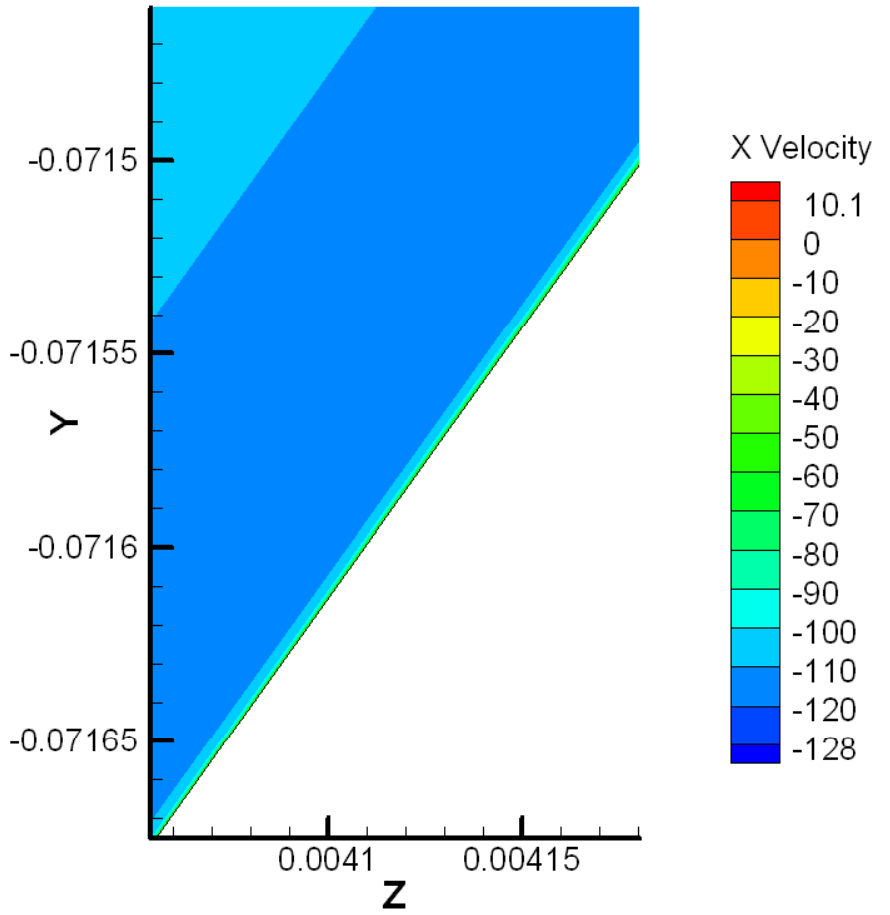


Fig. 3 Axial velocity at the exit plane (parallel computation) for 4.0 million case (No computation crush at 3rd order solver)

Grid# = 5.5 Million



(a) Time step = 28, 000



(b) Enlarged contour at outlet (time step = 28, 000)

Fig. 4 Axial velocity at the exit plane (parallel computation) for 5.5 million case (No computation crush at 1st order solver but very unstable at 3rd order solver)

Discussion

- Refine the mesh of the nozzle part
  - More grids in the streamwise direction
  - More grids near the wall
- Unstable simulation for fine mesh
  - Small under-relaxation factor (α) $\Phi = \Phi_{old} + \alpha \Delta \Phi$
  - First lower order solver then higher order solver