Turbulent Flow over Backward-Facing Step

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Methodology

- **Modified the Header File:** Updating its content to reflect the following details for OpenFOAM. The updated header file introduces version information (v2212) and identifies OpenFOAM as the open-source CFD toolbox, including a reference to its official website (www.openfoam.com).

```
/*--------------------------------*- C++ -*----------------------------------*\
| =========                 |                                                 |
| \\      /  F ield         | OpenFOAM: The Open Source CFD Toolbox           |
|  \\    /   O peration     | Version:  v2212                                 |
|   \\  /    A nd           | Website:  www.openfoam.com                      |
|    \\/     M anipulation  |                                                 |
\*---------------------------------------------------------------------------*/
```

Header File

- **Reran Simulation :** Executed simulation rerun adhering to the procedural instructions outlined in the report/readme file.

- **Post-processed Simulation Results :** Performed post-processing operations to acquire results that precisely correspond to the contours and plots outlined in the report.

Conclusions

- In this report, comparison is done for the contours, plot. residuals obtained in simulation with **kEpsilon Turbulence Model i.e Case A1**.
- Rest of the 5 cases, have been upgraded to latest versions.
- To keep a short and concise report, only one case was considered.
- Contours are obtained for final timestep that is 4000s.
- For comparison purposes, the plot available in the report of the case already i.e solved previously has been bordered with Red Color with thickness 1.
- Black bordered plot represents plots obtained after rerunning the simulation.
- From the simulation, we infer that the contours of old and new simulations match. Thus, case has been migrated to new version of openfoam errorfree.
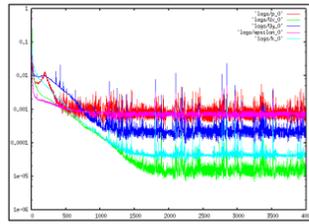
- CASE A1 - kEpsilon Turbulence Model
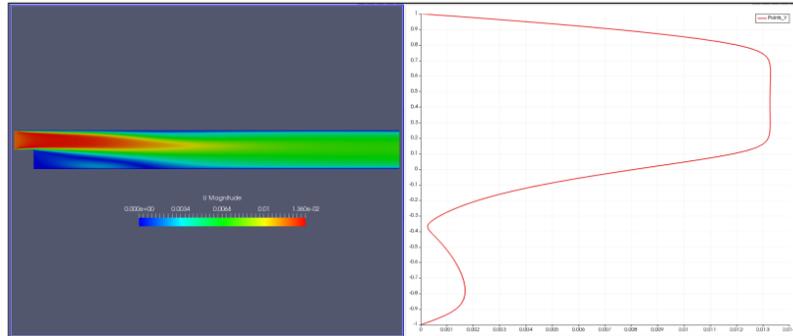

Fig.4 Monitoring convergence using residual logs

Fig.5 Velocity profile at a cross-section created by a line (3 m from the inlet)
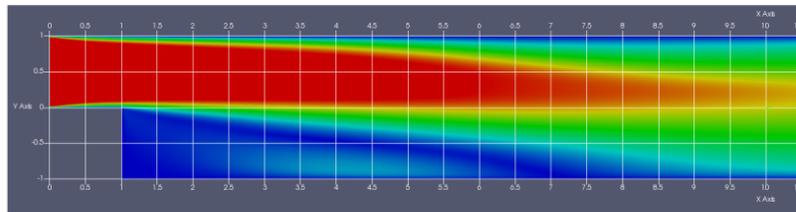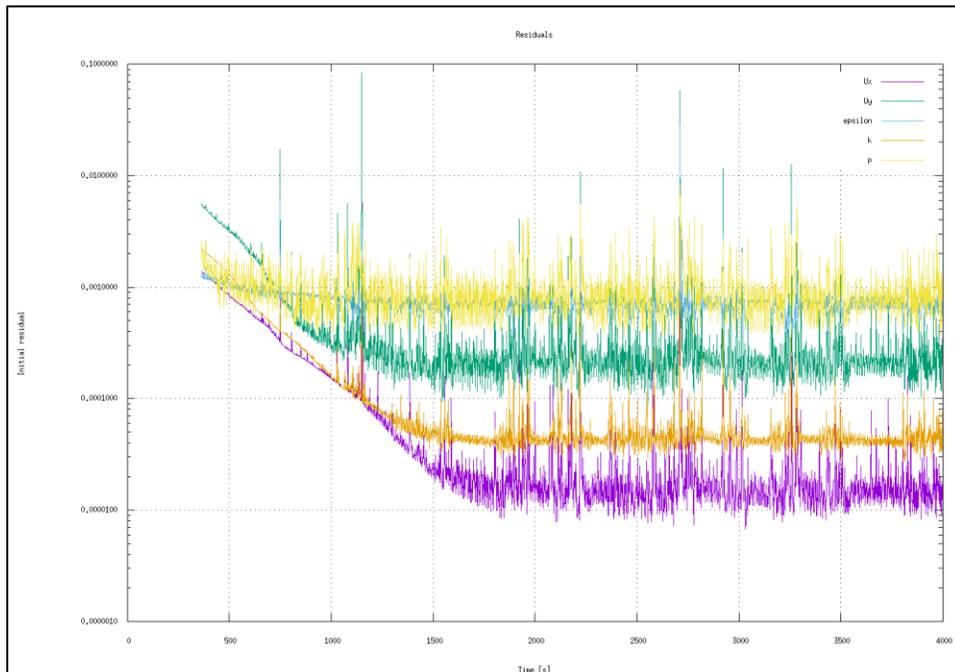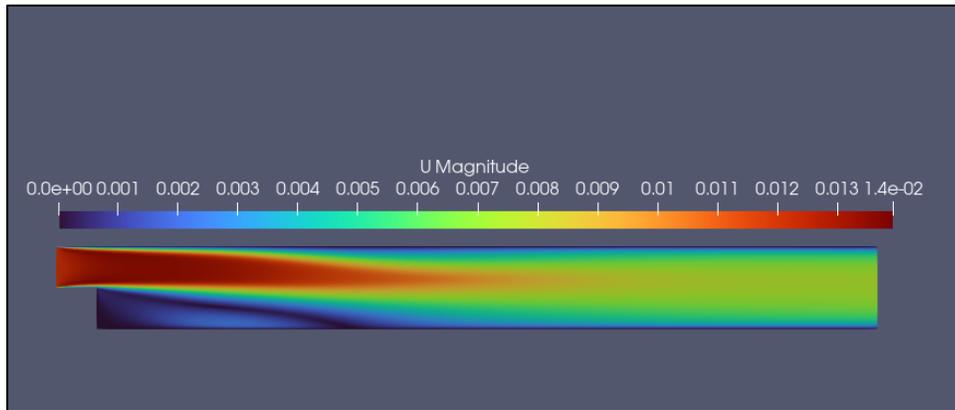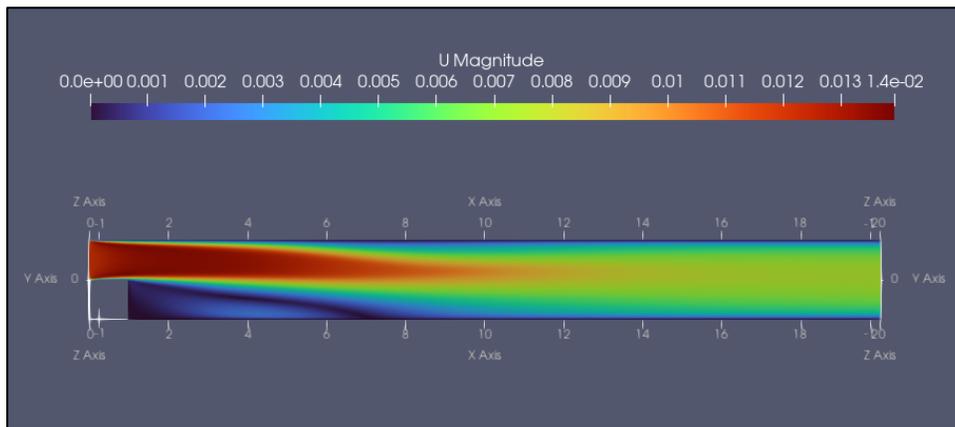

Fig.6 Velocity contour (t = 4000s) with Grids enabled

Residual vs Time

Velocity across the Step

Velocity across the Step (data grid enabled)