

Convergence Acceleration with Hyperbolic Navier–Stokes Equations

Report Number : R17ECMP01

Subject Category : Competitive Funding

URL : <https://www.jss.jaxa.jp/ar/e2017/4426/>

● **Responsible Representative**

Takashi Aoyama, Aeronautical Technology Directorate, Numerical Simulation Research Unit

● **Contact Information**

Atsushi Hashimoto hashimoto.atsushi@jaxa.jp

● **Members**

Atsushi Hashimoto, Tsukasa Nagao

● **Abstract**

We evaluate the hyperbolic equations for Navier-Stokes equations.

<https://kaken.nii.ac.jp/en/grant/KAKENHI-PROJECT-15K18286/>

● **Reasons for using of JSS2**

We plan a large scale computation in the future.

● **Achievements of the Year**

We studied a laminar flow over a flat plate. (Fig. 1) shows the drag coefficient convergence. We confirmed that the drag computed with the hyperbolic system converges more rapidly than that with the traditional system. (Fig. 2) shows the residual of the streamwise velocity, u , versus the number of iterations and CPU time. A comparison of the CPU time shows that the time for hyperbolic equations is approximately 75% less than that for traditional equations.

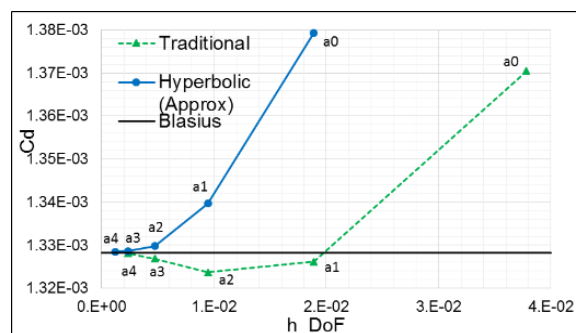


Fig.1 Drag coefficient convergence

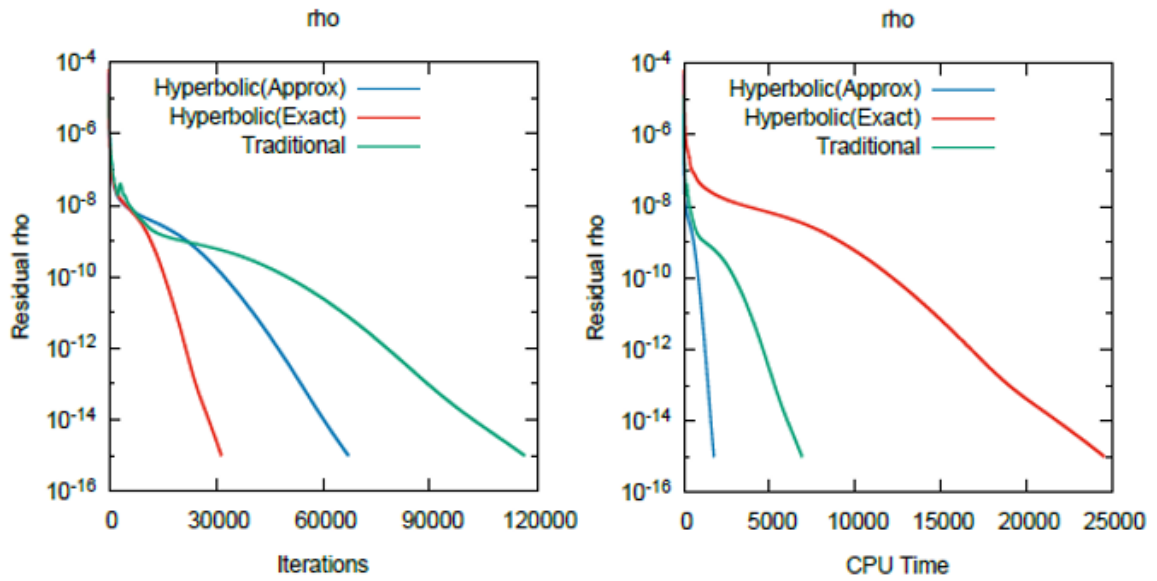


Fig.2 Residual versus number of iterations and CPU time

● Publications

- Non peer-reviewed papers

1) Nagao, et. al., "A Study on Time Evolution Method for Hyperbolic Navier-Stokes System," AIAA SciTech 2018, AIAA 2018-0370.

● Usage of JSS2

● Computational Information

Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	1.00 hours

● Resources Used

Fraction of Usage in Total Resources*1 (%): 0.00

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	0.00	0.00
SORA-PP	0.00	0.00
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage assigned(GiB)	Fraction of Usage*2 (%)
/home	000.52	0.00
/data	488.28	0.01
/ltmp	097.66	0.01

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	0.00	0.00

*1 Fraction of Usage in Total Resources: Weighted average of three resource types (computing, file system, and archiver)

*2 Fraction of Usage: Percentage of usage relative to each resource used in one year