Innovative Green Aircraft Technology (iGreen) : Riblet coating technology

● **Responsible Representative**

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● **Abstract**

By developing a particular riblet pattern that is effective at reducing the turbulence frictional resistance, and by producing and applying an easy-to-coat method that can create an optimum riblet surface on the airframe, reduce friction drag in the turbulence boundary layer.

Ref. URL: https://www.aero.jaxa.jp/eng/research/ecat/igreen/

● **Reasons and benefits of using JAXA Supercomputer System**

CFD analysis is used for developing a particular riblet pattern that is effective at reducing the turbulence frictional resistance. Huge calculation resources and costs are required for the high fidelity and quick response CFD analysis for obtaining the optimum riblet pattern. Use of JSS is indispensable for these requirements; the cost and time on the CFD analysis are drastically saved .

● **Achievements of the Year**

We have performed a series of direct numerical simulations (DNS) of a turbulent channel flow over a blade-type riblet and determined an optimal shape of the riblet. In addition, we have analyzed the effects of deterioration in a riblet sheet and those of a gap between the riblet sheets with the use of DNS.
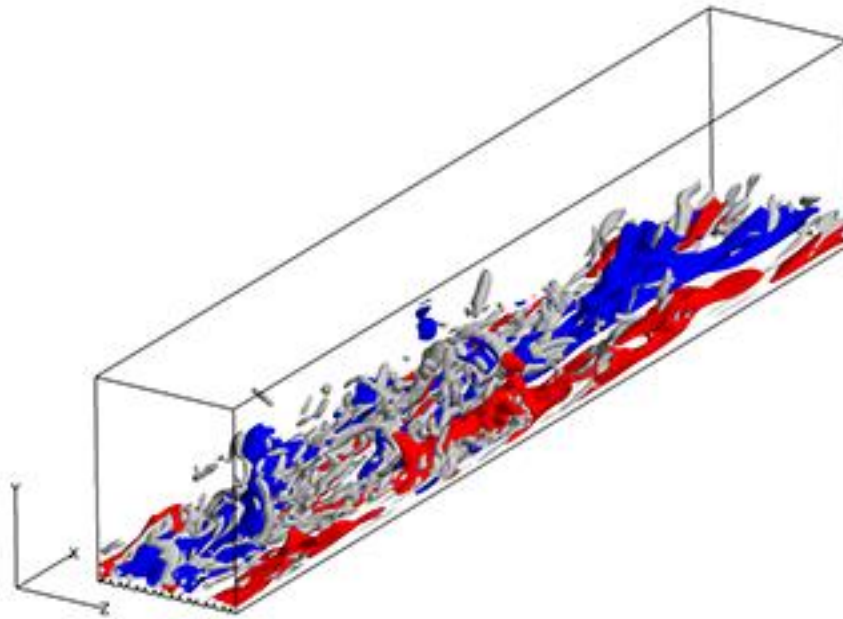
Fig. 1: Near-wall streaks and vortical structures in the blade-type riblet DNS. The white isosurfaces refer to positive values of the second invariant of the fluctuating velocity tensor, whereas the red and blue contours denote the positve and negative values of the streamwise velocity fluctuation.
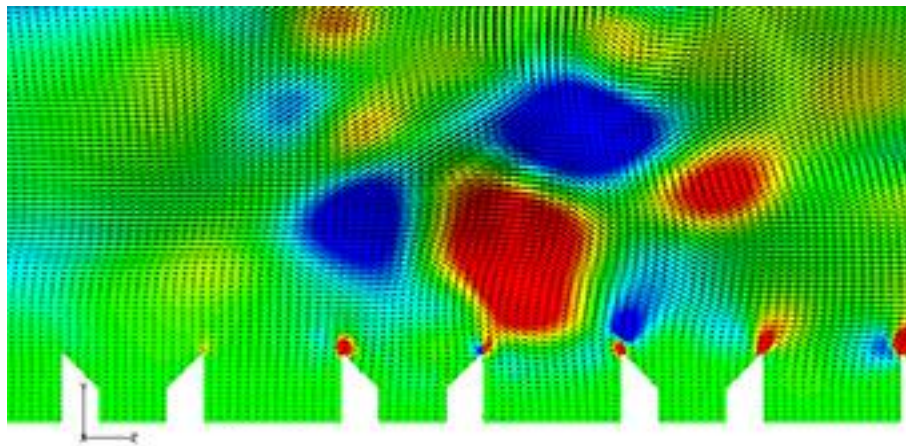
Fig. 2: Contours of the second invariant of the fluctuating velocity tensor in the blade-type riblet DNS. The red and blue contours denote the positve and negative values of the second invariant of the fluctuating velocity tensor.

● **Publications**

N/A

🔵 **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	64 - 256
Elapsed Time per Case	300 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 3.24

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	88,216,227.95	3.85
TOKI-ST	208.91	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2] (%)
/home	8.43	0.01
/data and /data2	34,203.87	0.26
/ssd	70.83	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2] (%)
J-SPACE	6.45	0.03

[*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.

● **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage[*2] (%)
ISV Software Licenses (Total)	1,173.38	0.82

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