

## Active Flow Control using Plasma Actuators

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### ● Abstract

Study of Separation Flow Control using Plasma Actuators

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

The reason for using a JAXA supercomputer is to understand the detailed flow field around the wings and flaps and to clarify the control effects in order to construct a flow control technology using a plasma actuator and improve its efficiency. Large-scale numerical simulations are required to realize them, and detailed analysis of the data has the potential to lead to new control methods and clarification of physical phenomena.

### ● Achievements of the Year

The results of this fiscal year are as follows: (1) Knowledge on basic flow field characteristics of NACA0012 wing with flap and (2) Fundamental understanding on its control effect obtained from flow control simulations with a plasma actuator attached to the trailing edge of the main wing. The conditions for calculating the flow around the wing with the flap are a chord-based Reynolds number of 130,000 and angles of attack of 0 and -3 degrees. Under these conditions, the flow field separates on the upper and lower surfaces of the wing regardless of control. Separation occurs near the trailing edge of the main wing on the upper surface side, and near the half chord length of the main wing on the lower surface side, and vortices are released from the separated shear layer, causing the vortices to collapse. In the case with control, the vortex emitted from the separated shear layer on the upper surface side of the flap was affected by the control effect of the plasma actuator. In the future, we would like to investigate the effects of the operating conditions of the plasma actuator, such as the effects of the burst frequency, based on the results of this analysis.

### ● Publications

N/A

● Usage of JSS2

● Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	1563
Elapsed Time per Case	200 Hour(s)

● Resources Used

Fraction of Usage in Total Resources\*1(%): 0.14

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
SORA-MA	1,245,586.03	0.15
SORA-PP	6,137.56	0.04
SORA-LM	235.98	0.10
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	51.66	0.04
/data	2,223.65	0.04
/ltmp	569.66	0.05

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	0.48	0.01

\*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.