

Sloshing Phenomena under Reduced Gravity

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● Abstract

A series of experiments on the behaviour of liquids in low gravity environments (LBPG) using CBEF will be conducted on the ISS orbit in December 2022. The aim of this study is to characterise sloshing phenomena in sealed containers in a low-gravity environment.

● Reasons and benefits of using JAXA Supercomputer System

When discussing sloshing phenomena, it is necessary to reproduce and evaluate the complex interfacial behaviour caused by low gravity and high frequencies. Large-scale computational resources are essential to study these phenomena on Earth, and the use of JSS allows a large number of calculations to be performed at high speed.

● Achievements of the Year

A numerical model was built to reproduce the fluid behaviour identified in the orbital experiments, under the same conditions as the LBPG test. The results are given below. No resonance occurred at the first order resonance frequency under any gravitational condition (G , $G/6$). These results indicate that the initial liquid level in the vessel influences the presence or absence of resonance(Fig.1)

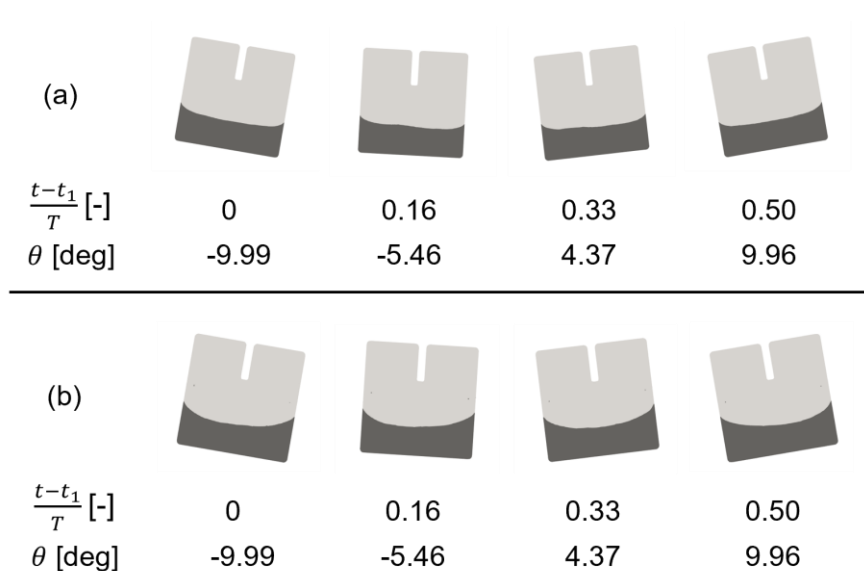


Fig. 1: Liquid behavior obtained by numerical simulation at first order resonance frequency under (a) $g = G$ and (b) $g = G/6$.

Publications

- Poster Presentations

On-orbit Experiments via CBEF aboard the ISS on Sloshing Phenomena under Normal and Reduced Gravity Conditions, JASMAC-35

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	144 - 324
Elapsed Time per Case	72 Hour(s)

● JSS3 Resources Used

Fraction of Usage in Total Resources*¹(%): 0.63

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage* ² (%)
TOKI-SORA	0.00	0.00
TOKI-ST	5,024,940.63	5.43
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	245.00	0.20
/data and /data2	194,260.00	1.20
/ssd	7,530.00	0.71

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	2.73	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.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage ^{*2} (%)
ISV Software Licenses (Total)	0.00	0.00

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