# Data processing, analsys and simulation for the X-ray satellite XRISM

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## Abstract

Process, analyze, and simulate data from the XRISM satellite to maximize the scientific outputs from XRISM data.

Ref. URL: https://www.xrism.jaxa.jp/

## Reasons and benefits of using JAXA Supercomputer System

XRISM has the highest X-ray spectral resolution than ever, and understanding its spectra needs sophysticated modelling. This requires a high performance computing power.

## Achievements of the Year

In the early stages of XRISM satellite operations, calibration information and data processing software were updated within a short period of time. Thus it became necessary to reprocess the large amount of data already acquired up to that point.

By using JSS3, we were able to efficiently reprocess the data and distribute it to the XRISM team members without delay. Additionally, when analyzing detailed X-ray spectra obtained by XRISM, it became necessary to simulate the conditions around black holes and neutron stars.

In addition, compared to previous instruments, the number of spectral elements and the response of the instrument are significantly higher, requiring computational resources for model fitting.

By using JSS3 for those simulations and model fitting, we were able to save real-time and conduct research efficiently.

## Publications

- Oral Presentations

Japan Astronomical Society Meeting, 2024 fall, "XRISM Observation of Nearby Compton Thick AGN in Circinus Galaxy", Yoshihiro Ueda (Kyoto University) and the XRISM team

XRISM Science Meeting #7 Ryosuke Uematsu "Determination of Chemical Abundances near Supermassive Black Hole in Circinus Galaxy with XRISM"

S.Ogawa, Y.Ueda, K.Wada, S.Yamada, S.Baba, Y.Kudoh, "Systematic Study of AGN Clumpy Tori and Polar Dust with Infrared and X-Ray Spectroscopy", AGN across the sky: new windows opened by HSC and other wide-field surveys, Hokkaido Information University, Hokkaido, Japan, August 26-28, 2024 (Oral)

- Poster Presentations

Astronomical Data Analysis Software & Systems 2024 P313 Satoshi Eguchi, "Container-Based Pre-Pipeline Data Processing on HPC for XRISM"

## Usage of JSS

### Computational Information

| | |
|---|---|
| Process Parallelization Methods | N/A |
| Thread Parallelization Methods | Automatic Parallelization |
| Number of Processes | 1 |
| Elapsed Time per Case | 10 Hour(s) |

### JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 0.22

Details

| Computational Resources | | |
|---|---|---|
| System Name | CPU Resources Used (core x hours) | Fraction of Usage[*2](%) |
| TOKI-SORA | 1.52 | 0.00 |
| TOKI-ST | 1,882,625.77 | 1.93 |
| TOKI-GP | 0.00 | 0.00 |
| TOKI-XM | 0.00 | 0.00 |
| TOKI-LM | 34.12 | 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 | 1,702.00 | 1.15 |
| /data and /data2 | 171,228.00 | 0.82 |
| /ssd | 32,761.33 | 1.76 |

| Archiver Resources | | |
|---|---|---|
| Archiver Name | Storage Used (TiB) | Fraction of Usage*2 (%) |
| J-SPACE | 10.22 | 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) | 0.00 | 0.00 |

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