

## Construction and maintenance of JIANT, a quality engineering tool for Safety&MissionAssurance platform

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### ● Members

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### ● Abstract

JAXA and Kyoto University are researching with quality engineering tools (JIANT) and wallstat, a seismic simulator for wooden buildings.

Our theme is research on the combination of testing and simulation (data assimilation). This study is a joint research of JAXA-Kyoto University-Osaka Institute of Technology.

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

The purpose of using a supercomputer is to speed up calculations.

The calculation of wallstat takes 40 minutes per case on a general PC.

That means that if we perform 6000 calculations in one case study, it takes a total of 160 days, but if we use JSS3, we can complete them in a few hours.

### ● Achievements of the Year

As a research with Kyoto University Research Institute for Humanosphere, we studied data assimilation under multiple design targets/environmental conditions this year (Fig1). This time, we focused on a three-story building and adjusted it for two buildings and two seismic waves. Since good results were obtained, we made a presentation at the 27th Annual Meeting of the Society for Computational Engineering and Science (June 2022). At the conference, we won the 2022 Technology Award.



Fig. 1: Issue of this research: Data assimilation under multiple design targets/environmental conditions

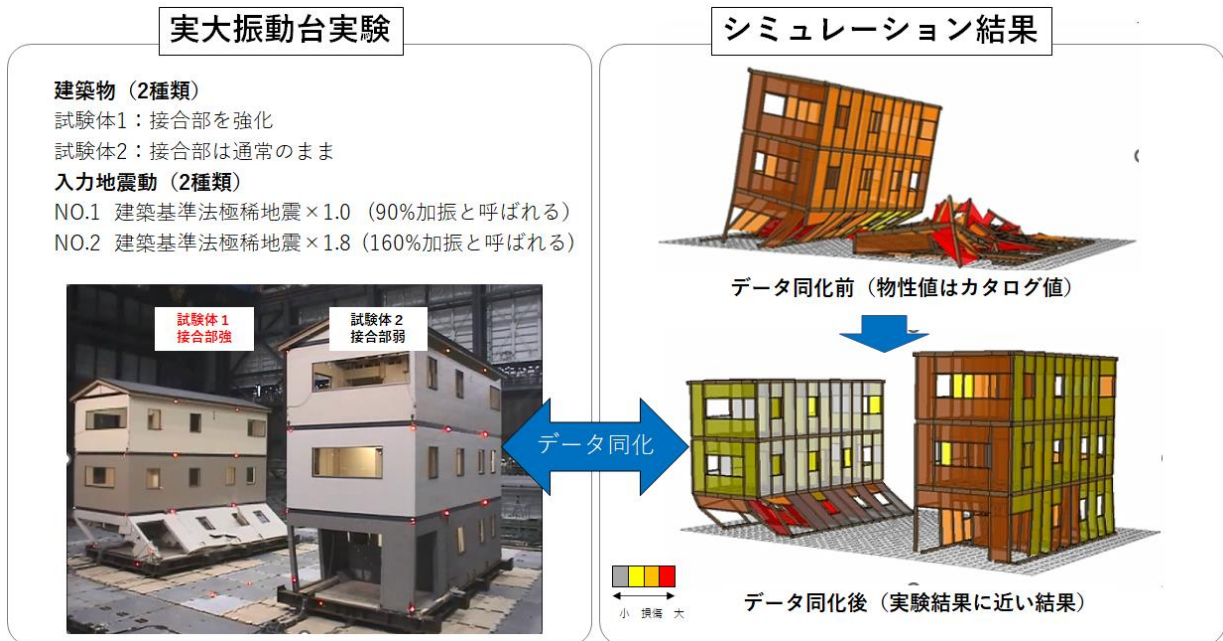
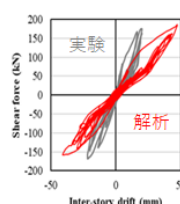


Fig. 2: Data assimilation of shaking table experiments and simulations

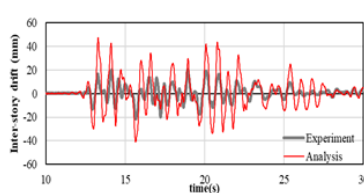
## 2つの地震波のデータ同化（試験体1の場合）

90%加振：NO.1 建築基準法極稀地震×1.0

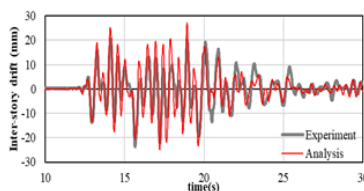
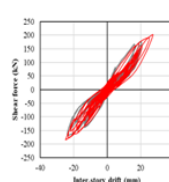
1F荷重変形関係



1F層間変形時刻歴応答

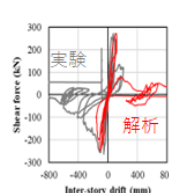


JIANTによるデータ同化

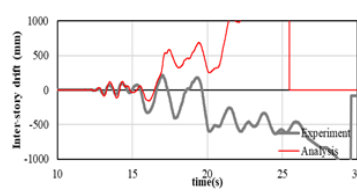


160%加振：NO.2 建築基準法極稀地震×1.8

1F荷重変形関係



1F層間変形時刻歴応答



JIANTによるデータ同化

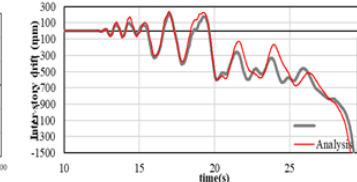
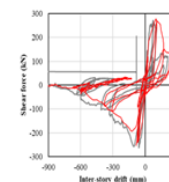


Fig. 3: Data assimilation by two seismic waves (for building 1)

### Publications

- Peer-reviewed papers

Quality Engineering Journal Submission Paper (Refereed), Quality Engineering Journal January 2023

Robust Design Method Based on Parameter Validity Range and its Application to Seismic Design

Yuji Kado and Takafumi Nakagawa

Tokikatsu NAMBA, Takafumi NAKAGAWA, Hiroshi ISODA, Yuji KADO, Ryuki ODANI, Atsuo TAKINO ,  
"Seismic Response Comparison of Full-Scale Moment Resisting Timber Frame and Joint Test Result" , Journal of  
Structural Engineering, STENG-12165R2, 2023.1.

- Non peer-reviewed papers

27th Computational Engineering Conference, 2022.6

Investigation of data assimilation method for seismic simulation of three-story wooden building considering  
multiple seismic waves

Yuji Kado, Chiharu Uematsu, Atsuo Takino, Munekatsu Namba, Takafumi Nakagawa

- Oral Presentations

15th World Congress on Computational Mechanics, 2022.8

Data Assimilation Using the Quality Engineering for the Seismic Response Analysis of 3-Story Wooden Houses

Tokikatsu NAMBA, Takafumi NAKAGAWA, Hiroshi ISODA, Yuji KADO, Atsuo TAKINO

Architectural Institute of Japan, 2022.9

Study of Data Assimilation Method for the Collapsing Simulation of Wooden Houses Using the Quality  
Engineering (Part7: Outline of the data assimilation for 3-story wooden houses with different joint design method)

Tokikatsu NAMBA, Takafumi NAKAGAWA, Hiroshi ISODA, Yuji KADO, Atsuo TAKINO

Architectural Institute of Japan, 2022.9

# Study of Data Assimilation Method for the Collapsing Simulation of Wooden Houses Using the Quality Engineering (Part8: Results of the data assimilation for 3-story wooden houses with different joint design method)

Takafumi NAKAGAWA, Tokikatsu NAMBA, Hiroshi ISODA, Yuji KADO, Atsuo TAKINO

## ● Usage of JSS

### ● Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	7200 Second(s)

### ● JSS3 Resources Used

Fraction of Usage in Total Resources\*1(%): 0.18

#### Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage *2(%)
TOKI-SORA	0.00	0.00
TOKI-ST	1,421,997.37	1.42
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* <sup>2</sup> (%)
/home	150.00	0.14
/data and /data2	52,200.00	0.40
/ssd	1,000.00	0.14

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* <sup>2</sup> (%)
J-SPACE	0.00	0.00

\*<sup>1</sup>: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

\*<sup>2</sup>: 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* <sup>2</sup> (%)
ISV Software Licenses (Total)	0.00	0.00

\*<sup>2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.