

Precise Orbit Determination by using MADOCA on JSS2

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● Abstract

Satellite Navigation Unit has been generating the precise orbit and clock products of GNSS satellites by using MADOCA (Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis), and been distributing to user via network routinely. On the JSS2, we aim to realize fast computation for the long-term data analysis and simulation.

Ref. URL: https://ssl.tksc.jaxa.jp/madoca/public/public_index_en.html

● Reasons and benefits of using JAXA Supercomputer System

To improve the MADOCA products accuracy, we need to do long-term data analysis. By using JSS2, we have been expecting the reduction of the data analysis time.

● Achievements of the Year

SNU has been generating and providing the precise orbit and clock products of GNSS satellites by using MADOCA on the general-purpose PC routinely.

In this fiscal year, we carried out the following tests related to the improvement of routine precise orbit determination (POD);

1) Generation of the Ultra-Rapid product every single hour.

In routine operation, we generate the Ultra-Rapid product every 6 hours due to the ability of a general-purpose PC, but we confirmed that we could generate it every single hour by using JSS2.

2) Routine real-time POD.

We adjusted the real-time data communication environment between JSS2 and our general-purpose PC, and tried real-time POD. We confirmed that real-time POD was possible without any problem.

3) Identification of malfunction of real-time POD.

We performed the re-analysis and identified the malfunction of real-time POD. We confirmed that by using JSS2

enabled high-speed calculations and reduced time.

4) Validation of the GNSS system combination on simultaneous real-time POD.

In routine operation, we carry out simultaneous real-time POD with the combination of GPS, GLONASS, and QZSS system due to the ability of a general-purpose PC. We confirmed that even if Galileo was added to this combination, it could be done without any problem.

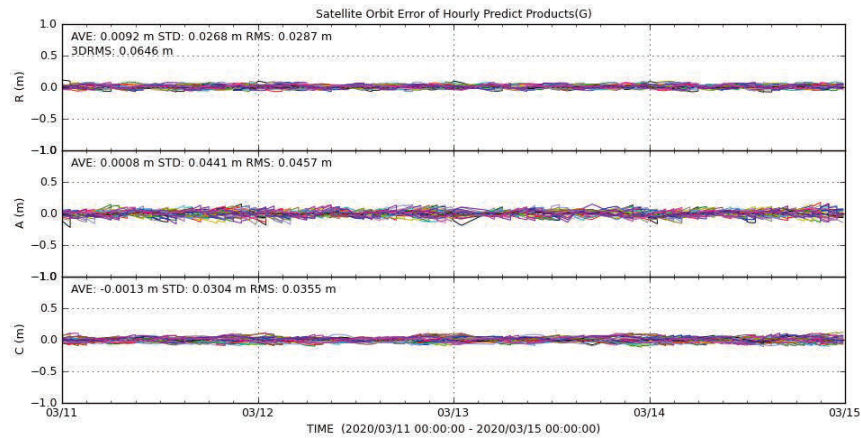


Fig. 1: The evaluation results of the predicted part in the Ultra-Rapid products which generated every single hour with reference to the IGS Rapid products. From the top, Radial, Along and Cross components.

● Publications

N/A

● Usage of JSS2

● Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	OpenMP
Number of Processes	1
Elapsed Time per Case	30 Minute(s)

- **Resources Used**

Fraction of Usage in Total Resources*1(%): 0.05

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
SORA-MA	0.00	0.00
SORA-PP	23.01	0.00
SORA-LM	0.00	0.00
SORA-TPP	71,634.01	4.32

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	100.14	0.08
/data	2,584.46	0.04
/tmp	1,953.13	0.17

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

*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.