

Efforts on establishing an IGS Analysis Center in Japan

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June 30th, 2022



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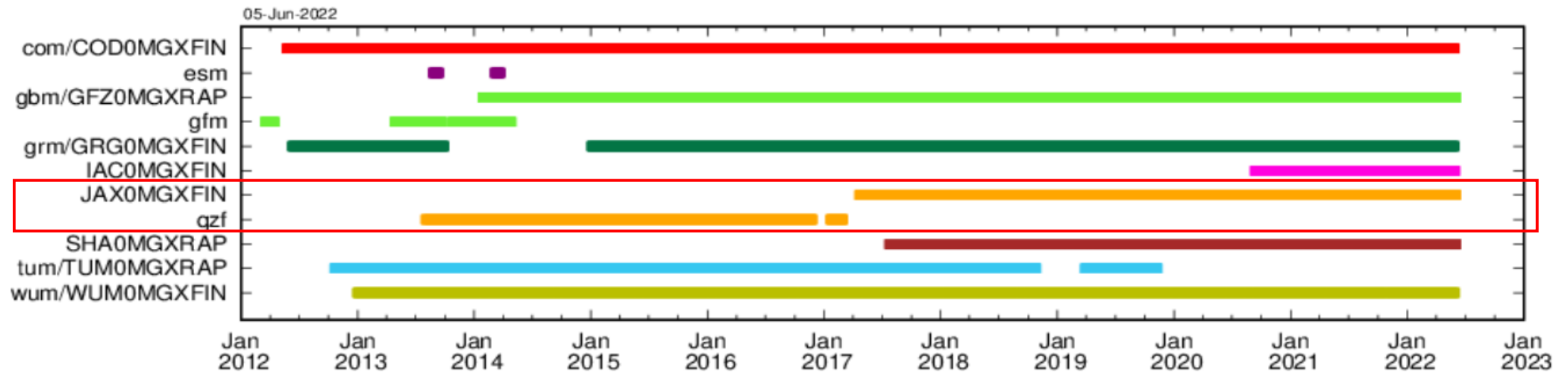
IGS 2022 Virtual Workshop
30 June 2022

JAXA's activity to date

IGS MGEX

- JAXA has provided precise orbit and clock products of GPS, GLONASS and QZSS since 2013 (“qzf” and “JAX0MGXFIN”)

Product Availability



JAXA's activity to date

MADOCA project

- JAXA has routinely generated the final, rapid, and ultra-rapid products of GPS, GLONASS and QZSS on a timeline which is almost consistent with IGS products.
- The products are evaluated internally and published in following web.

Project Web: <https://mgmds01.tksc.jaxa.jp/>



Products: <ftp://mgmds01.tksc.jaxa.jp/>

GSI's activity to date

Contribution to Pilot Project and Working Groups

- GSI operates eight IGS stations and continues to contribute to MGEX PP, TIGA and RTS WGs through the provision of GNSS data.

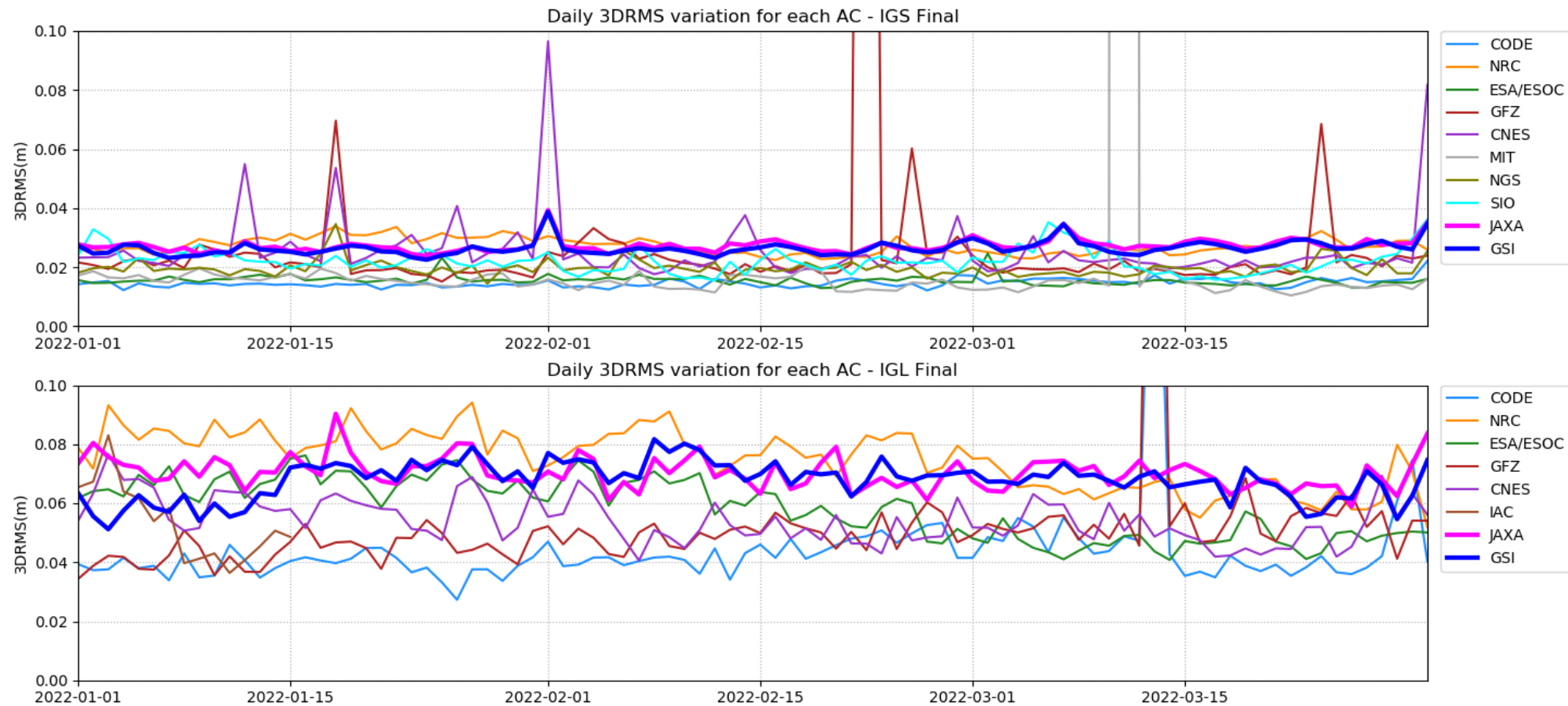
MADOCA products

- GSI has been working with JAXA to improve the MADOCA products and has been generating the products spanning roughly recent 2 years with the same quality as JAXA.
- GSI utilizes MADOCA products for crustal deformation monitoring and other applications.
- GSI has provided MADOCA products to a collaborating agency to help with weather forecasting through realistic estimation of PWV (Precipitable Water Vapor).

1. Provide **independent** results from other ACs via our original analysis software MADOCA.
2. Provide precise **multi GNSS** products, e.g., GPS, GLONASS, Galileo, and QZSS.
3. Provide more **detailed information** regarding the POD of the QZSS, e.g., SRP and thermal radiation models.
4. Provide a **stable** supply of products through years of experience in product generation.

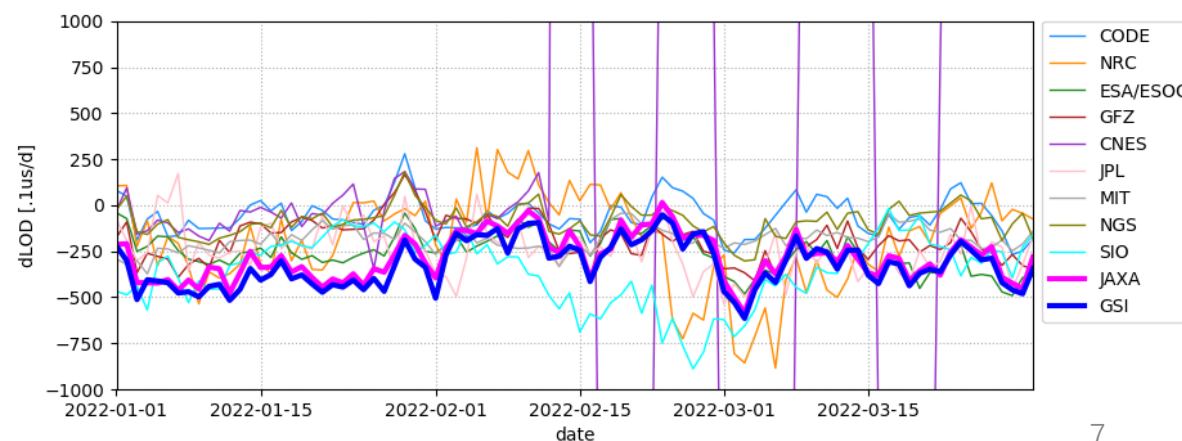
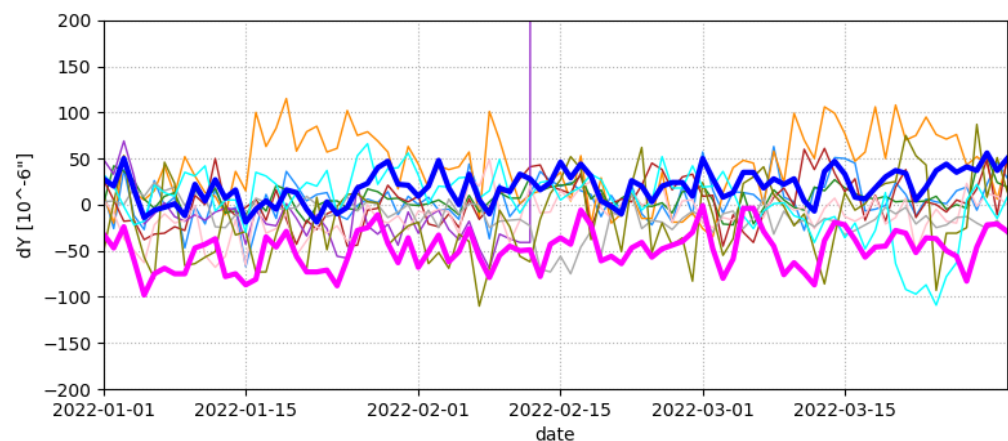
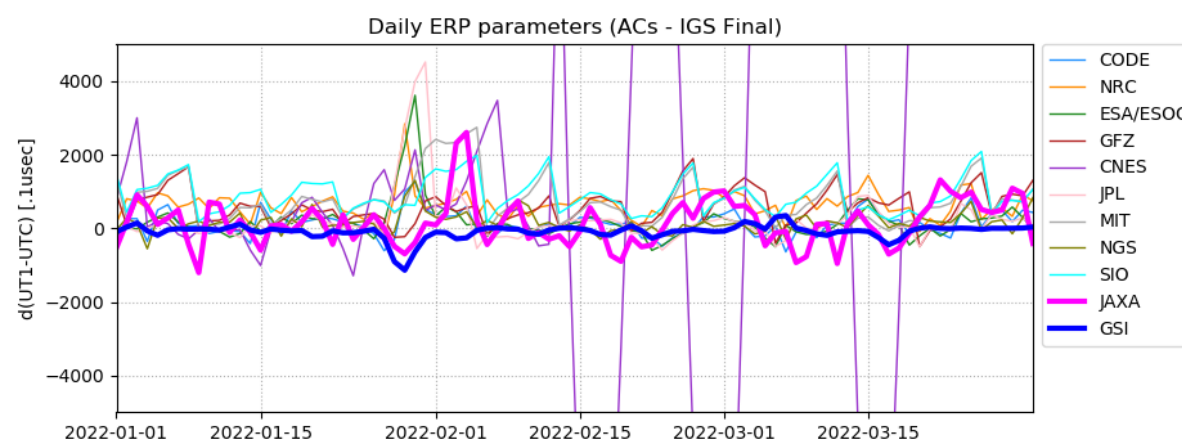
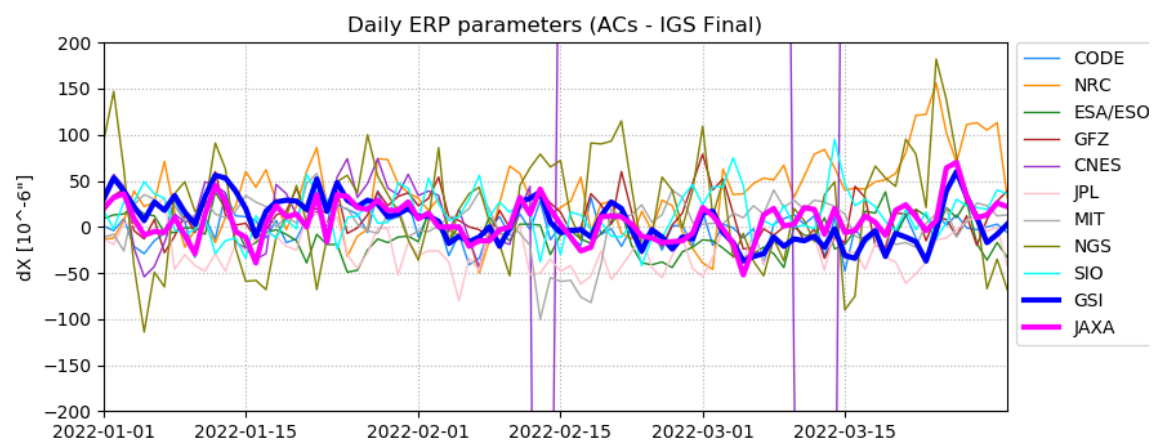
MADOCA Products evaluation (internal)

GPS and GLONASS orbit (daily 3drms w.r.t. IGS Final from Jan-2022 to Mar-2022)



MADOCA Products evaluation (internal)

Earth Orientation Parameters (daily difference w.r.t. IGS Final from Jan-2022 to Mar-2022)



Evaluation with IGS ACC

- With the great cooperation of **Salim Masoumi(GA)** and **Paul Rebischung (IGN)**, we are evaluating the consistency between the products processed by JAXA and the IGS products.
- Issues found
 - 1. Need to improve orbit prediction accuracy.**
 - Improvements of the EOP extrapolation method and GNSS force model are expected to reduce orbit prediction error both in cross-track and along-track.
 - 2. Some station-specific biases are found in station coordinates.**
 - Need further evaluation after the implementation of minimum constraints (MCs) for station coordinates.

- Models and functions that are high priority to improve the product quality are being implemented in MADOCA.
 - *SINEX format issues*
 - *Alignment to a reference frame using Minimum Constraints (MCs)*
 - *Add on the Earth Radiation Pressure(ERP) model*
 - *Add on the Antenna Thrust model*
 - *Box-wing model for Solar Radiation Pressure(SRP) and Thermal Radiation*
- We plan to re-evaluate the products after implementation of the above model by the end of this year.

We are aiming at starting to provide our products as "unweighted/for comparison only" in the IGS combinations at some point.