Efforts on establishing an IGS Analysis Center in Japan

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JAXA’s activity to date

IGS MGEX

- JAXA has provided precise orbit and clock products of GPS, GLONASS and QZSS since 2013 (“qzf” and “JAX0MGFIN”)

Product Availability

https://www.igs.org/mgex/analysis/#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/](https://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.
Products Quality at present

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.
Work in progress and plans

• 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.