Introduction and Evaluation of JGX Product Performance

B. MIYAHARA, S. ABE, T. MIYAZAKI, K. YOSHINAGA
Geospatial Information Authority of Japan (JGX Team)

IGS 2026 WORKSHOP
SANTIAGO DE CHILE
33°26' S 70°39' O

INTRODUCTION & OBJECTIVES

JGX is one of the IGS Analysis Centers which has jointly established and operated by the Geospatial Information Authority of Japan (GSI) and the Japan Aerospace Exploration Agency (JAXA), two leading organizations in Japan's geospatial and aerospace sectors respectively. The abbreviation "**JGX**" is derived from the initials of **J**apan, **G**SI, and JA**X**A, symbolizing the strong partnership between these institutions. This collaborative framework was established with the primary objective of consistently generating, validating, and publishing the world's most accurate GNSS products, which play a crucial role in supporting Japan's advanced satellite positioning infrastructure. The JGX was adopted as one of the IGS Analysis Centers on December 2023. GSI is responsible for daily operations and evaluations of the generated products performance. In parallel, JAXA continues improvement of the precise orbit and clock determination tool for GNSS software, MADOCA. An overview of the evaluation of JGX products is presented in this poster.

METHODS

Statistical metrics were computed to evaluate the quality of the JGX products, using the IGS final products as the reference. For comparison, the same evaluation was also conducted for products from other Analysis Centers (ACs).

SP3 : RMS values were calculated for the radial, along-track, and cross-track components of all SVs, followed by the computation of the 3D RMS.
CLK : The standard deviation and the RMS were calculated.
SNX : To eliminate the effects of different constraint conditions applied by each AC, Helmert transformation parameters with respect to the IGS solution were estimated. After applying the transformation, the RMS of the differences in the three Cartesian components (X, Y, and Z) was computed.

RESULT

Evaluation Period: 2025-04-13 to 2026-04-18 Reference: IGS0DEMFIN Data is rolling averaged for 7 days

SP3

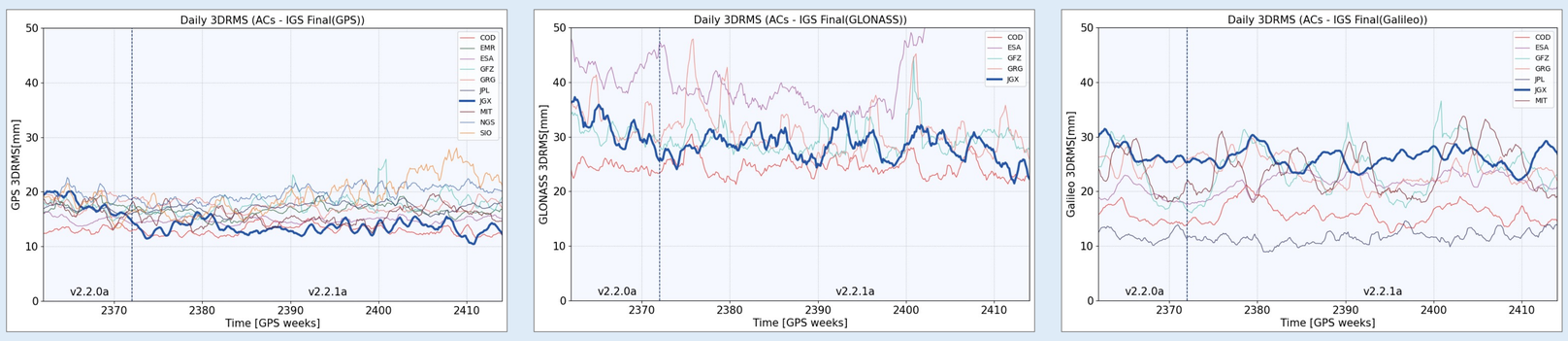

Fig. 1 3D RMS of GPS (left), GLONASS (middle), Galileo (right) orbit difference between final products from individual ACs and IGS products.(no weight)

In each figure, the evaluation results for JGX are highlighted with thicker. In addition, wavy lines indicate the timing of the analysis software MADOCA updates. Particularly GPS, an improvement in the accuracy of the JGX ephemerides is observed around GPS week 2372, which clearly corresponds to updates of the software.

CLK

Reference: IGS0DEMFIN

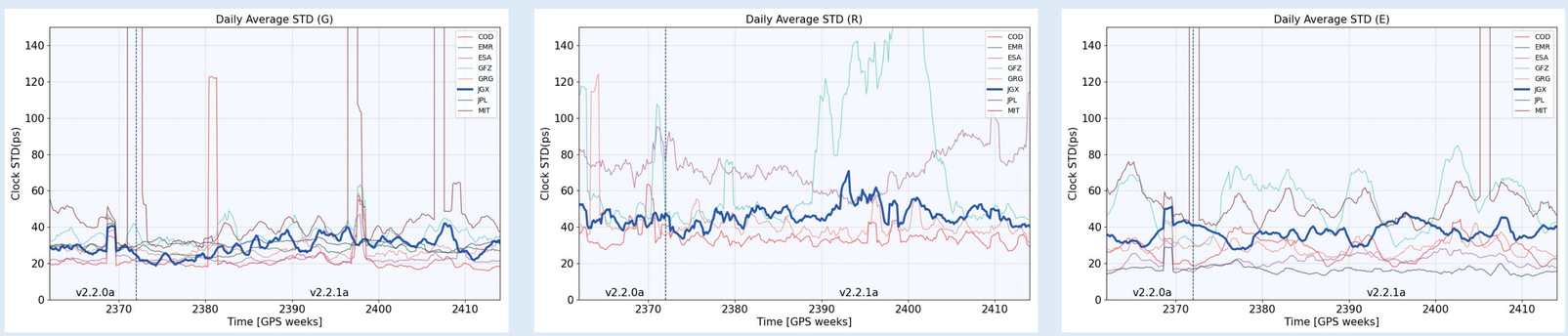

Fig. 2 STD of GPS (left), GLONASS (middle), Galileo (right) satellite clock error difference between final products from individual ACs and IGS products.(no weight)

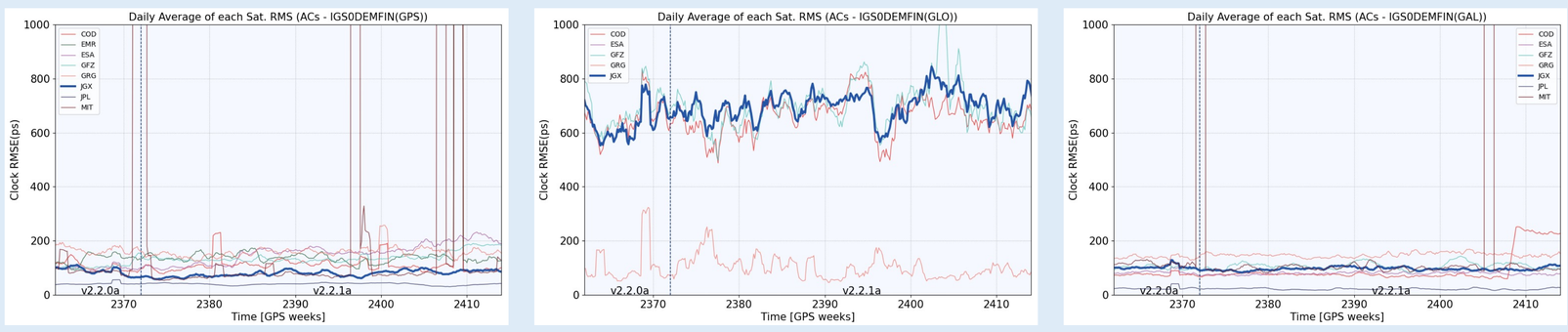

Fig. 3 RMS of GPS (left), GLONASS (middle), Galileo (right) satellite clock error difference between final products from individual ACs and IGS products. (no weight)

For GPS, the standard deviation (STD) appears to be slightly higher than the average level when compared with other ACs. Over the past year, the STD shows noticeable variability, fluctuating between approximately 20 and 40 ps, indicating less stability compared to COD, which maintains a more consistent behavior. On the other hand, the root mean square (RMS) values exhibit a similar level of temporal variation as the STD, generally ranging between about 70 and 100 ps. Despite this variability, the RMS values remain relatively low among the ACs, suggesting a high level of consistency with the IGS reference products.

For GLO, the STD shows large variability across ACs; however, the overall level appears relatively good compared to most centers. In the RMS, GRG provides the best agreement, whereas clear systematic offsets are seen relative to JGX, COD, and GFZ. For GAL, the STD is relatively higher compared to other ACs, whereas the RMS shows stable approximately 90–110 ps throughout the analysis period.

SNX

Reference: IGS0OPSFIN

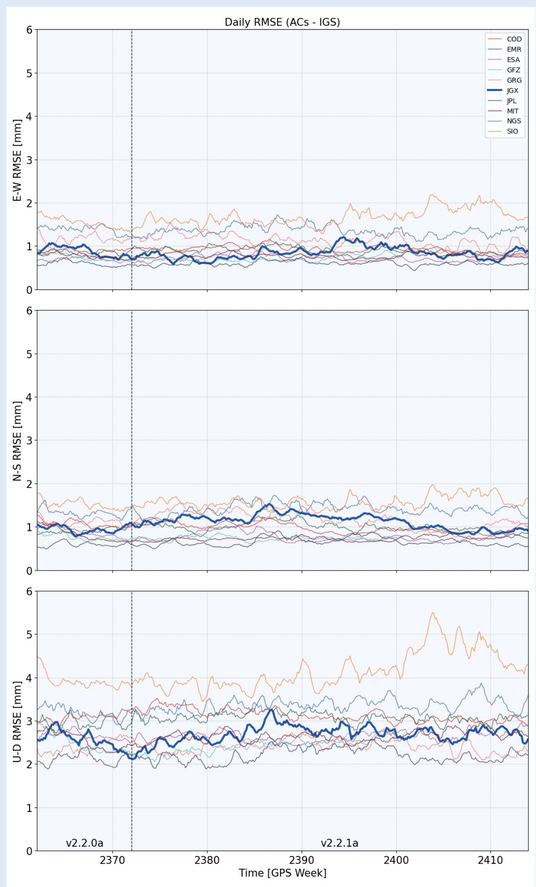

Fig. 4 RMS Error of station position differences between final products from individual ACs and IGS final products.

This figure shows the RMSE calculated from the differences between the Helmert-transformed AC products and the corresponding IGS products.

CONCLUSIONS

SP3(GPS) SP3(GLO) SNX SP3(GAL) CLK

JGX began operations as an IGS Analysis Center in December 2023. In this study, SP3 and CLK products were compared with the IGS0DEMFIN products, while the SNX products were evaluated against the IGS0OPSFIN products. For GPS and GLONASS, high-precision orbit estimation was achieved, resulting in small differences with respect to the IGS combined products. In contrast, for Galileo, the differences from the combined products are relatively larger compared to other AC solutions. For the clock products, the results for GPS and Galileo show good agreement with the reference products. Although GLONASS is inherently more challenging to estimate, the obtained accuracy can be considered moderate. The SNX results exhibit relatively good accuracy overall. With upcoming software updates, the products will be generated using minimum constraints based on NNR+NNT. The JGX analysis center will continue to work toward improving the estimation accuracy and aims to provide higher-quality products in the future.

gsi-jaxa_jgx@gxb.milt.go.jp

ABSTRACT ID 6920