

CHARTER FOR IGS ANALYSIS CENTERS AND ASSOCIATE ANALYSIS CENTERS

Definition of Analysis Center and Associate Analysis Center Activities

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Background

The IGS analysis products are formed from a combination of the results submitted by the IGS Analysis Centers (ACs). To the extent that the effect of data and mismodeling among different Analysis Centers are independent, properly weighted combinations of results can be superior. In this way, the IGS products benefit in precision, accuracy, stability, reliability, and robustness compared to the results of any individual AC.

It is thus advantageous to encourage participation by a new AC whenever its results would improve the quality and/or robustness of the combination. The ACs which produce the IGS Final Products are particularly important because their results are essential for the formation and maintenance of a highly accurate and consistent IGS Reference Frame, and hence the contribution of the IGS to the ITRF (International Terrestrial Reference Frame).

Since combination strategies normally assume that the weighted average result is preferred, it is important for the IGS and the ACs to be aware of potential common mode errors, which can degrade the accuracy of the IGS combined products compared to those of an individual AC. For this reason, the IGS must continuously encourage efforts to calibrate and test the absolute performance of its products.

Core Products

The IGS core products currently consist of:

- Weekly Final products, which are:
 - GNSS (GPS and GLONASS) satellite ephemerides and clock values, tabulated at specified intervals for each day (in standard formats)
 - Earth orientation parameters (polar motion, polar motion rate, and length-of-day, estimated at daily intervals, in SINEX format)
 - Station clock values, tabulated at specified intervals for each day (in standard format)
 - Station coordinate and velocity values for the global tracking network from a combination of weekly data sets (SINEX format)

Final products are determined for each GPS week of data and delivered to the IGS within a specified deadline (currently 10 days after the end of that week). The Final products are reprocessed regularly based on the most up-to-date models and analysis strategies.

- Daily Rapid products, which are:
 - GPS satellite ephemerides and clock values, tabulated at specified intervals for each day (in standard formats)
 - Earth orientation parameters (polar motion, polar motion rate, and length-of-day, estimated at specified intervals)
 - Station clock values, tabulated at specified intervals for each day (in standard format)

Rapid products are determined for each day of data and delivered to the IGS within a specified deadline (currently 17 hours after the end of that day).

- Ultra-rapid products which are:
 - GNSS (GPS and GLONASS) satellite ephemerides and clock values, tabulated at specified intervals (in standard format)
 - Earth orientation parameters (polar motion, polar motion rate, and length-of-day (in standard format)

Ultra-rapid products are determined several times per day (currently four times per day) and delivered to the IGS within a specified deadline (currently 3 hours after the last epoch of the adjusted time interval). They include a 24 hours adjusted and a 24 hours predicted part.

The Final products from each AC must be fully self-consistent. The detailed specifications for the Final products are established by the Analysis Center Coordinator, in consultation with the ACs. The Final products, when combined with proper weighting, allow for the definition and maintenance of the IGS Reference Frame [Kouba et al., 1998].

The Rapid and Ultra-rapid products from each AC must apply the current IGS Reference Frame. The detailed specifications for the Rapid and Ultra-rapid products are established by the Analysis Center Coordinator, in consultation with the ACs.

Other Products

In addition to the Core Products listed above, the IGS generates other analysis products such as tropospheric zenith delay and ionospheric products, IGS time scale, satellite and receiver differential code biases, satellite antenna offsets and phase center calibrations, etc.

Analysis Centers (ACs)

The IGS Analysis Centers are those groups, recognized by the Governing Board, which commit to deliver to the IGS some or all of the Core Products listed above promptly and reliably. (Satellite clock estimates are not strictly required of those ACs which process differenced observables, but they are nevertheless encouraged.) The ACs make available and keep up-to-date an information file describing analysis

strategies and models. They inform the community (e.g. through IGS Mail) of any significant processing changes they have made.

It is the Final Products of the ACs which are combined by the IGS Analysis Center Coordinator and the Reference Frame Coordinator to form the IGS Reference Frame accessed by the user community. All other IGS products must be maintained consistent with this frame; and they in fact facilitate the realization of the IGS Reference System.

Associate Analysis Centers (AACs)

Associate Analysis Centers are those groups, recognized by the Governing Board, which produce specialized or derived products. AAC functions will be designated as the scope of the IGS evolves and new products emerge.

Currently, the following types of AACs are recognized:

- Regional Network Associate Analysis Centers (RNAACs)

RNAACs contribute station coordinate and velocity values for regional sub-networks of tracking stations from a combination of weekly data sets (in SINEX format). The RNAAC products must adopt the current IGS Reference frame, including appropriate GNSS ephemerides.

- Global Network Associate Analysis Centers (GNAACs)

GNAACs combine the station coordinate and velocity covariance information contributed by the ACs and RNAACs (in SINEX format) to form global combinations for each week of data. A specified GNAAC combines the global combinations to form the official IGS combined network result, an essential element of the IGS Reference Frame: the IGS Reference Frame Coordinator has responsibility for this latter combination.

- AACs are responsible for contributing to products such as ionospheric maps and tropospheric zenith biases. Such AACs also contribute to a Working Group or a Pilot Project and support the corresponding Product Coordinator.

Product Coordinators

Product Coordinators with their associated Working Groups augment the IGS products with an important, on-going, long term product, e.g., timing products, ionospheric maps. Such products are obtained by appropriately weighted combination of the corresponding inputs provided by the individual AAC's contributing to the product.

New IGS Analysis Centers or Associated Analysis Centers

An aspiring AC/AAC must demonstrate a long-term commitment as well as satisfactory performance of product delivery and solution quality. In particular, the solution precision and reliability must be commensurate to the quality of the current

AC/AAC solution products. The AC Coordinator will, by mutual agreement with AC/AAC candidates, evaluate and test the quality and timeliness of the prospective AC/AAC products. This evaluation should be based on a long test period of at least three months. An AC/AAC officially attains the IGS AC/AAC status only when accepted by the IGS Governing Board, upon recommendation of the AC Coordinator. Similarly, a Product Coordinator must demonstrate this commitment and solution quality for specialized products of the IGS.

A new AC /AAC must supply the CB with contact information and a completed AC/AAC information file.

Reference:

Kouba, J., J. Ray and M.M. Watkins, *IGS Reference Frame Realization*, Proceedings of the 1998 Analysis Workshop held at ESA/ESOC, Darmstadt, Germany, February 9-11, 1998.

Kouba, J. and T. Springer. 2001, *New IGS Station and Clock Combination*, GPS Solutions, Vol. 4, No. 4, pp. 31-36.