IGS FAQ

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1. General questions

1.1. What is the IGS?

The IGS is a voluntary federation of many worldwide agencies that pool resources and permanent GNSS station data to generate precise GNSS products. In general, you can think of the IGS as the highest-precision international civilian GPS community.

1.2. What *isn't* the IGS?

- The IGS does not manufacture or sell any equipment.
- The IGS does not offer asset tracking services like package or vehicle tracking.
- The IGS does not endorse equipment (there are functional requirements for equipment at IGS sites specified in the IGS Site Guidelines at <http://igscb.jpl.nasa.gov/network/guidelines/guidelines.html>).

1.3. What is GNSS?

GNSS stands for Global Navigation Satellite System. Currently operating GNSS's are GPS (U.S.A.'s Global Positioning System) and GLONASS (Russia's Global Navigation Satellite System). Another GNSS planned for the future is Europe's Galileo.

1.4. Why the name change from International GPS Service?

The IGS Governing Board voted to change the name to the International GNSS Service, to recognize the incorporation of GLONASS and intent to incorporate future GNSS as well.

1.5. What is the status of the GPS satellite constellation?

This is provided by the U.S Coast Guard's Navigation Center. at <http://www.navcen.uscg.gov/-gps/status_and_outage_info.htm>

The results of the latest IGS Ultrarapid analysis at </components/latest_igu.html> indicate how well the IGS was able to determine the GPS satellites' orbits.

1.6. What is the status of the GLONASS satellite constellation?

This is provided by the GLONASS center. at <http://www.glonass-center.ru>

1.7. Can you verify whether a local GPS outage or anomaly occurred?

You are welcome to browse our global network data at <http://igscb.jpl.nasa.gov/network/-netindex.html> and see if nearby IGS stations were recording data from the GPS satellites. Reports of GPS problems are accepted by the U.S Coast Guard's Navigation Center. at <http://www.navcen.uscg.gov/gps/-gpsuserinput.htm>

1.8. What could I read, to learn about the IGS?

- 2002-2007 IGS Strategic Plan (PDF) at <http://igscb.jpl.nasa.gov/igscb/resource/pubs/IGS_sp.pdf>
- G. Beutler, M. Rothacher, S. Schaer, T.A. Springer, J. Kouba, and R.E. Neilan, "The International GPS Service (IGS): An Interdisciplinary Service in Support of Earth Sciences," Adv. Space Res. Vol. 23, No. 4, pp. 631-635, 1999
- J. Kouba, Y. Mireault, G. Beutler, T. Springer, G. Gendt, "A Discussion of IGS Solutions and Their Impact on Geodetic and Geophysical Applications," GPS Solutions (1998) 2:3-15
- Other IGS publications at <http://igscb.jpl.nasa.gov/overview/pubs.html> (particularly the most recent Annual Report)

1.9. How is the IGS funded?

Each participating organization voluntarily brings its own funding according to its own mission. These organizations tend to be public or government institutions or other research organizations. Consequently, the IGS requires redundancy and/or multi-year commitments from important components to ensure reliability. To help IGS agencies justify funding requests, we request that users include a citation when use of IGS data or products results in a publication. We suggest

- G. Beutler, M. Rothacher, S. Schaer, T.A. Springer, J. Kouba, R.E. Neilan, "The International GPS Service (IGS): An Interdisciplinary Service in Support of Earth Sciences," Adv. Space Res. Vol. 23, No. 4, pp. 631-635, 1999

2. IGS Data and Products (General)

2.1. What is the difference between "data" and "products?" How do I get them?

By "data" we mean raw GPS/GLONASS pseudorange and phase observations, broadcast ephemerides, and supporting types of raw data (such as meteorological).

We use the term "products" for things like precise orbit and clock files, which are generated through analysis of the raw site data.

2.2. Are there costs or restrictions?

The IGS has an open data policy. All of the present suite of products are available without charge from the IGS data centers.

Although the IGS strives for the highest quality of data and data products, it can not make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information or product. Use of the IGS data and products is the sole responsibility of the user.

When your use of IGS data or products results in a publication, please include a citation. We suggest

- G. Beutler, M. Rothacher, S. Schaer, T.A. Springer, J. Kouba, and R.E. Neilan, "The International GPS Service (IGS): An Interdisciplinary Service in Support of Earth Sciences," Adv. Space Res. Vol. 23, No. 4, pp. 631-635, 1999

2.3. What formats does the IGS use?

See the list at <http://igscb.jpl.nasa.gov/components/formats.html>.

3. IGS Data

3.1. What types of data are available from the IGS sites?

A table outlining each data type, including sampling intervals, formats, and access details, is kept up-to-date at http://igscb.jpl.nasa.gov/components/data.html.

4. IGS Products

4.1. What are the IGS products?

A table of products with their update schedules, formats, accuracies, access details, etc. is available at http://igscb.jpl.nasa.gov/components/prods.html" at <http://igscb.jpl.nasa.gov/components/prods.html>

From the Charter for IGS Analysis Centers and Associate Analysis Centers" at <http://igscb.jpl.nasa.gov/-organization/acccharter.html>:"IGS products are formed from a combination of independent results submitted by the IGS Analysis Centers. 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."

The IGS Analysis Center Coordinator's page at <http://www.gfz-potsdam.de/pb1/igsacc/index_igsacc.html> is also an informative source about recent performance of the classic IGS products.

4.2. Are JPL orbits, NGS orbits, SIO orbits, etc., considered IGS orbits?

These are the submissions to the IGS combined product generated by each IGS Analysis Center (AC), but the official IGS products are the combinations formed by coordinators from the solutions submitted by each AC. IGS products can be recognized by their filenames, as detailed in the product access information available from the rightmost column of the product table. at <http://igscb.jpl.nasa.gov/components/prods.html>

4.3. What software, models, and conventions do the Analysis Centers use?

See the files in http://igscb.jpl.nasa.gov/igscb/center/analysis, which are submitted by the ACs.

4.4. How do I use IGS products? What corrections must I apply?

See "A Guide to Using IGS Products" at <http://igscb.jpl.nasa.gov/igscb/resource/pubs/-GuidetoUsingIGSProducts.pdf> by J. Kouba in the publications area of the IGS website.

4.5. What about satellite antenna offsets?

IGS Analysis Centers use

- Block II/IIA: 0.279 0.000 1.023 X, Y, Z in meters
- Block IIR: 0.000 0.000 0.000 X, Y, Z in meters

This is covered in "A Guide to Using IGS Products" at <http://igscb.jpl.nasa.gov/igscb/resource/pubs/-GuidetoUsingIGSProducts.pdf>. An archive of the discussion leading to this decision is available. Please note that this convention is subject to change as the IGS refines its antenna offset treatment.

All IGS orbits and clocks refer to the satellite center of mass (CM).

4.6. How do I interpolate between points in the IGS orbits?

Here are a couple references on interpolation methods:

- Hofmann-Wellenhof, Lichtenegger, and Collins, "GPS: Theory and Practice," 5th edition, Springer (2001), p. 69.
- Schenewerk, "A brief review of basic GPS orbit interpolation strategies," GPS Solutions (2003) 6:265-267 DOI:10.1007/s10291-002-0036-0

4.7. What reference frames were used during what periods? How do I transform between them?

Here are a couple references.

- The ITRF web page's Transformation Parameters page, http://itrf.ensg.ign.fr/trans_para.php
- Kouba, "The GPS Toolbox ITRF Transformations," GPS Solutions (2002) 5:88-90
- GPS Toolbox files at http://www.ngs.noaa.gov/gps-toolbox/trnfsp3.htm
- Tables near the bottom of NGS' CORS Coordinates page, http://www.ngs.noaa.gov/CORS/metadata1/

5. Stations

5.1. What is an IGS station?

An IGS station conforms to the IGS Site Guidelines at <http://igscb.jpl.nasa.gov/network/-guidelines/guidelines.html> and is listed on IGS network maps and lists at <http://igscb.jpl.nasa.gov/network/-netindex.html>

5.2. What is the relation of the IGS network to regional networks like EUREF, SCIGN, CORS, etc?

These are dense regional networks composed of stations that in most cases meet the IGS Site Guidelines. They are considered to be related networks and the IGS works closely with the agencies which operate them. Typically, a subset of a regional network's stations is designated also as IGS stations. The choice of which stations should also be IGS stations is motivated by their benefit to the IGS products at <http:/-/igscb.jpl.nasa.gov/components/prods.html>, according to location and instrumentation.

5.3. May I propose a new IGS station?

If it is expected to be beneficial to an IGS product at <http://igscb.jpl.nasa.gov/components/-prods.html> or project at <http://igscb.jpl.nas.agov/projects/projindex.html>, please do. See the IGS new station checklist at <http://igscb.jpl.nasa.gov/network/guidelines/checklist.html>.

5.4. Where can I find coordinate/velocity solutions for a site?

Approximate coordinates for each site are listed on the Station list at <http://igscb.jpl.nasa.gov/-network/list.html> page. Precise coordinates, in the ITRF reference frame, are available from the ITRF at <http://itrf.ensg.ign.fr>. Weekly station solutions in SINEX format can be located via the "Geocentric Coordinates of IGS Tracking Stations" part of the product table at <http://igscb.jpl.nasa.gov/components/-prods.html>

5.5. How do I transform station coordinates to another reference frame?

See Q: 4.7.

5.6. How do I stay informed about station status?

Each site has a web page reachable from the clickable map at <http://igscb.jpl.nasa.gov/network/-complete.html> and station list at <http://igscb.jpl.nasa.gov/network/list.html>. This has daily-updated graphs of how the station's latency and data compare with that of other IGS sites. Significant data outages will be flagged on these pages as well.

Site operators are to send significant station event notices to the IGSStation mailing list at <http://-igscb.jpl.nasa.gov/mail/igsstation/igsstation.html>.

6. Equipment

6.1. What equipment is acceptable for use in the IGS?

See the IGS Site Guidelines. at <http://igscb.jpl.nasa.gov/network/guidelines/guidelines.html>

6.2. Does the IGS endorse equipment?

No, the IGS maintains vendor neutrality and instead publishes functional requirements.

6.3. Does the IGS certify equipment as meeting the guidelines?

We do not issue certifications, but we can ask an IGS analyst to examine sample data sets from new equipment types and comment.

6.4. What kind of support from equipment manufacturers do IGS users expect?

The data is archived permanently and used in long-term studies. There are therefore questions that arise about models which are no longer current, and it is helpful to have familiarity with historical products.

It is also necessary for the IGS to establish what observables are directly tracked by each receiver type. We can determine this from data, but appreciate information from the manufacturer as well. Please see IGSMail #2320 (24 Jun 1999) in the archives at http://igscb.jpl.nasa.gov

6.5. Does inclusion in the rcvr_ant.tab naming table mean the equipment may be used in the IGS?

Not necessarily. The IGS Site Guidelines at <http://igscb.jpl.nasa.gov/network/guidelines/-guidelines.html> establish functional requirements for equipment in the IGS network. The Central Bureau can arrange for an analysis center to examine sample data from new equipment types and comment on its suitability for the IGS.

6.6. What should equipment manufacturers keep in mind in product planning stages?

Please read over the IGS Site Guidelines at <http://igscb.jpl.nasa.gov/network/guidelines/-guidelines.html> and take note of things like the necessary antenna calibration, and requested settings such as recording data from satellites marked unhealthy.

6.7. What do equipment manufacturers need to know about antenna and radome calibration?

Please see the IGS Site Guidelines at <http://igscb.jpl.nasa.gov/network/guidelines/-guidelines.html>.

6.8. How should equipment manufacturers communicate with the IGS?

The Network Coordinator at the Central Bureau, igscb@igscb.jpl.nasa.gov can be your point of contact any time you are not sure where to turn.

6.9. Will you please add my company's new antenna model to igs_01.pcv

Only antennas which are in use in the IGS or a related network are typically added to this file.

6.10. And what of radome calibration?

Please see IGSMail #4463. at <http://igscb.jpl.nasa.gov/mail/igsmail/2003/msg00241.html>

6.11. Why does the official IGS igs_01.pcv table differ from the NGS and Geo++ calibration tables? Which one should I use?

igs_01.pcv is the official table to be used in IGS analysis. And yes, it does differ from NGS' latest table, and even if you look closely, also from NGS' previous table. The history is that some years back, NGS and other groups doing calibrations collaborated to make a definitive IGS table by averaging the various measurements available. Some time later the NGS table you see now came out. We have not updated the IGS values to NGS' latest in all cases for a few reasons:

- we want to limit changes in IGS analysis to avoid jumps
- need new effort to determine "best" values to use (it is thought now that averaging might mask some information)

We currently have an ad-hoc committee which is working to obtain quality satellite pcv tables, which would enable use of absolute rather than relative calibrations in a future update of the igs_01.pcv file.

At present, when we get an antenna not yet in igs_01.pcv, we inquire with a few regional networks such as EUREF whether they have any calibrations for it, and if not, we add the current NGS value.

In short, if you are doing IGS analysis you should be using igs_01.pcv. If not you should just be certain whatever you choose is consistent with your requirements.

7. Mailing lists

7.1. How do I send email to the mailing lists?

Follow the link(s) from the Mail area at <http://igscb.jpl.nasa.gov/mail/mailindex.html> and confirm that your message meets the subject guidelines for that list.

To send a message to an IGS mailing list, email it to *listname*@igscb.jpl.nasa.gov , substituting the listname (igsmail, igsstation, igs-rtwg, etc.) for *listname*.

Please ensure the first line of the body of your message starts with the string "Author: " followed by the names of the author(s) of the message. Also, the Subject field of the email should not be blank.

- Send plain ASCII text only
- Do not send attachments
- Do not use color, italics, or HTML mail

For example, the following text meets the format (if not content) requirements for IGS Mail if sent in a plain text email with a non-null Subject field.

Dear IGS Colleagues:

Please be informed that the Sun and Moon revolve around the Earth immobile.

Sincerely, Claudius Ptolemy