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IGS Constellations

The Newsletter of the International GNSS Service

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Recent Updates in the IGS

New IGS CORS Guidelines

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The IGS tracking network is a collaborative effort of Continuously Operating Reference Stations (CORS) managed by various organizations, united under the IGS umbrella for the common good. While flexibility is valued, the Infrastructure Committee has established essential standards to ensure consistent, fit-for-purpose data for the global IGS community.

Stability is paramount for IGS products, especially for reference frame stations supporting the International Terrestrial Reference Frame (ITRF). To maintain a high-quality network, the IGS Infrastructure Committee has updated guidelines for CORS, enhancing their value to the IGS.

The “[Guidelines for Continuously Operating Reference Stations in the IGS](#)” is now available to assist station owners and operators in planning and maintaining CORS. Additionally, a revised process for proposing

new IGS stations has been outlined in the “[Procedure for Becoming an IGS Station](#)” document, clarifying responsibilities for contributing organizations.

Candidate stations will be reviewed by the IGS Infrastructure Committee, which considers the station's location, instrumentation, operational characteristics, and relevance to IGS projects in its decision to accept a new station into the network. The IGS has focused their attention to utilize all available satellite systems and signals and making data available in real-time. Therefore, particular attention in the evaluation will be drawn to stations supporting multi-GNSS and real-time capabilities.

New stations are welcome to join the IGS in maintaining the stability and quality of the IGS tracking network for the benefit of the global geodesy community, science, and society.

IGS in the News

“[IGS Reference Frames and Their Relationship to the ITRF](#)”

by Paul Rebischung

[Read on Springer's Encyclopedia of Geodesy](#)

[New type on the block: Generating high-precision orbits for GPS III satellites](#)

by Florian Dilssner, Tim Springer, Francesco Gini, Erik Schönemann and Werner Enderle

[Read on GPS World](#)

2023 International Reference Ionosphere Workshop

Andrzej Krankowski¹, Manuel Hernandez-Pajares¹

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Andrzej Krankowski and Manuel Hernández-Pajares participated and promoted the IGS ionospheric products at the 2023 International Reference Ionosphere Workshop “Improved Real-Time Ionospheric Predictions with Data from Spaceborne Sensors and GNSS”, 8 – 19 May 2023, Daejeon, South Korea. This workshop is hosted by Korea Astronomy and Space Science Institute (KASI).

The International Reference Ionosphere (IRI) is an international project sponsored by the Committee on Space Research (COSPAR) and the International Union of Radio Science (URSI). These organisations formed a Working Group in the late sixties to produce an empirical standard model of the ionosphere, based on all available data sources. Several steadily improved editions of the model have been released. For given location, time and date, IRI provides monthly averages of the electron density, electron temperature, ion temperature, and ion composition in the ionospheric altitude range.



Figure 4: Andrzej Krankowski and Manuel Hernandez-Pajares at the IRIW workshop

Technical Seminar on Reference Frames in Practice at the FIG Working Week 2023 in Orlando, United States

Ryan Keenan¹

¹Positioning Insights, Australia

In late May, the International Federation of Surveyors (FIG) held its annual Working Week in Orlando, Florida, with more than 1,900 attendees. As part of the pre-event schedule to this working week, FIG's Commission 5 “Positioning & Measurement” hosted the popular annual Reference Frames in Practise (RFIP) Workshop on 27-28 May, and it marked yet another successful joint event between FIG and the International GNSS Service (IGS)

The RFIP Workshops, which have become a regular feature of the more recent annual FIG events, focus on reference frames in general with a specific focus on international initiatives, global and regional frames as well as



selected national case studies. Their format is typically a mix of presentations, discussions and trainings, ultimately helping to better educate, promote

and build capacity on reference frames amongst those who attend.

This year in Orlando, the RFIP's Opening Session was around International Geodesy Initiatives with Keynote Speakers representing the United Nations Office for Outer Space Affairs (UNOOSA), the UN-GGIM Subcommittee on Geodesy and Education, Training, and Capacity Building Working Group, and the International GNSS Service and International Association of

Geodesy. In particular, Ms. Allison Craddock, Director IGS Bureau presented on “The International GNSS Service and International Association of Geodesy (IAG): Serving Surveyors”, sharing insights of these organisations long-term contributions to the global geodesy and GNSS communities.

Further Sessions included speakers presenting around the following themes:

- Introduction to Geodetic Reference Frames
- IGS & Open Geospatial Consortium (OGC)
- Case Studies I & II (South Pacific Communities, United States, Taiwan, Uruguay, The Philippines and the Moon)
- Panel Discussion

With more than 35 attendees and 15 presenters from 6 continents, the RFIP Workshop in Orlando was another very well attended and regarded event. Together with FIG Commission 5 and IGS, the full list of co-organisers included NSPS (National Society of Professional Surveyors), United Nations International Committee for GNSS (ICG) and the IAG, with extra special thanks and acknowledgement to Trimble for their generous support of this event.

FIG Commission 5 is extremely grateful and appreciative of the IGS' continued participation in, and contribution to, its global outreach events, and looks forward to future collaborations at events such as the FIG Working Week 2024 in Accra (Ghana), FIG Working Week 2025 in Brisbane (Australia), and the FIG Congress 2026 in Cape Town (South Africa).



Figure 2: Photo of the some of the FIG RFIP 2023 Presenters and Attendees (Credit: Ryan Keenan, FIG)

The FIG WW24 will be held in Accra, Ghana from 19-24 May 2024, and has the overall theme - Your World, Our World: Resilient Environment and Sustainable Resource Management for all. The Call for Papers has just opened and more information can be found at the FIG website (links below). For those interested in presenting at the next RFIP Workshop which will be held

in conjunction with the Working Week 2024 in Accra, please contact Dr Ryan Keenan, Chair Commission 5 at (ryan@positioninginsights.com.au).

Links:

1. [FIG Website](#)
2. [FIG WW23 Orlando](#)
3. [RFIP 2023 Program](#)



Figure 3: FIG Working Week 2024 - 19-24 May 2024, in Accra, Ghana



Francesco Gini¹, Markus Bradke², Ignacio Romero³

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The RINEX format is the backbone of the IGS as it stores the measurements to all the GNSS satellites from all the IGS stations necessary for the estimation of all the geodetic, atmospheric and other IGS products.

Ensuring the RINEX format remains fit-for-purpose is one of the main duties of the IGS together with the RTCM SC104 as part of the integrated RINEX Working Group.

RINEX 4.00 and 4.01 have been approved in the IGS/ RTCM RINEX Working Group and adopted by the IGS in the Governing Board Meetings of December 2021 and July 2023, respectively.

RINEX 4.00 was necessary to accommodate the modernised GNSS navigation messages. The GNSS community needed a format to store the modern navigation messages from all the GNSS constellations.

RINEX 4.0x navigation files are NOT backward compatible with RINEX 3.0x files and that has caused the version number of RINEX to be increased. We have kept the disruption in the format to a minimum by respecting all the legacy navigation message data blocks and adding extra lines where needed and extra messages as required. RINEX 4.0x observation files are fully compatible with the 3.0x versions in terms of formats but new signals have been included and approved for QZSS, NavIC and GPS. RINEX 4.0x meteorological files remain fully compatible with the 3.0x versions.

RINEX 4.0x is the future-proof format for the navigation messages, and now the RINEX format can properly record and store all of the GNSS observations, navigation messages, and station meteorological files for the future.

The IGS Infrastructure Committee carefully considered the impact these changes may have on the users' end. As announced in [\[IGSMail-8207\]](#) "RINEX 4.00 transition and trial period", the Infrastructure Committee implemented a RINEX 4.00 transition phase and subsequently started a trial phase in 2022.

From the **19th of July 2023** onwards, station-wise RINEX 4.0x data files can be found in the operational archives. From this date onwards, only one of the two versions (RINEX 3.xx or RINEX 4.0x) is allowed to be uploaded. The upload of RINEX 2.11 files is not affected. Station operators are encouraged to switch to the new format version as soon as possible. It is also required that station operators announce the switch prior using the IGS mailing list (IGSMail).

IGS at AGU 2023

Thursday, 14 December

Serving Global Geodesy:
Innovations Enabled by
the IGS and IAG-GGOS

Oral Session [G44A] 16:00-17:30

Posters [G41C] 08:30-12:50
(All times Pacific Standard Time)



6th Associate Member & Working Group Open Meeting "Multi-GNSS for Impact"

Monday 27 November 18:00 to 21:00 UTC
Online Everywhere



We are happy to announce our 6th IGS Open Associate Member and Working Group (AM/WG) Meeting. This online event will be taking place via WebEx on **Monday, the 27th of November 2023 from 18:00 to 21:00 UTC**.

The Open AM/WG meeting is open to all IGS AMs, Governing Board (GB) members, Former GB Members, and any observers who would like to learn more about the IGS. Participants who are new to the IGS, or would like to join an IGS WG, are especially welcome. The intention is for our AMs and community to gather to discuss ideas, and learn about the IGS and its WGs.

Stay tuned for registration info by visiting the [event page](#).

We look forward to seeing you all again!

Upcoming Events

15-20 October 2023

[Seventeenth Meeting of the UN ICG \(ICG-17\)](#)

27 November 2023

[IGS 6th AM/WG Open Meeting](#)

30 November 2023

[65th IGS Governing Board Meeting](#)

CREDITS

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