

International Earth Rotation and Reference Systems Service (IERS)

https://doi.org/10.82507/iag-travaux2025_iers

Chair of Directing Board: Adrian Jäggi (Switzerland)
Central Bureau Director: Daniela Thaller (Germany)

IERS website - <https://www.iers.org>



1 Structure

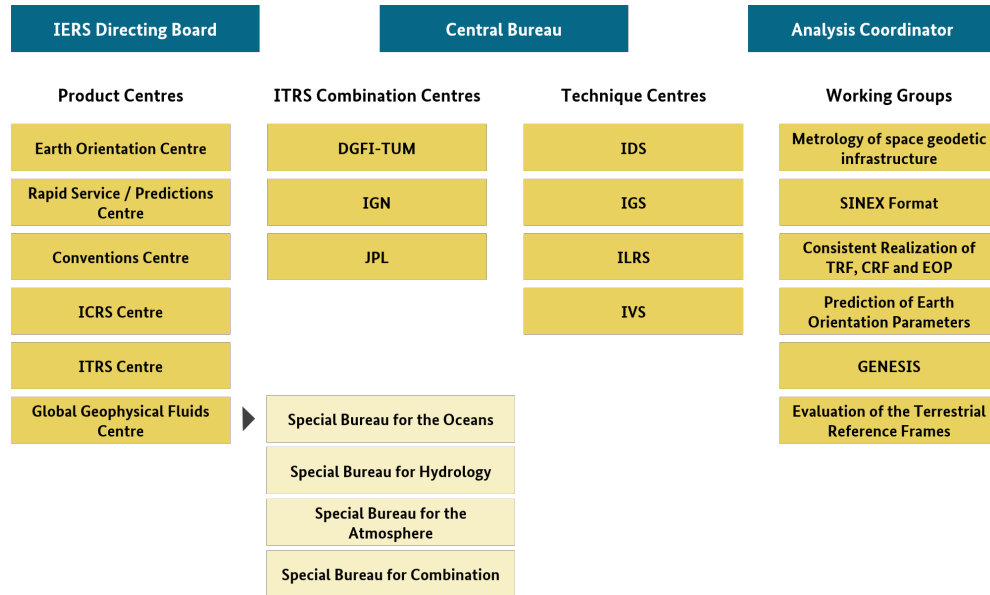
According to the Terms of Reference, the IERS consists of the following components:

- Directing Board
- Technique Centres
- Product Centres
- ITRS Combination Centre(s)
- Analysis Coordinator
- Central Bureau
- Working Groups

The Technique Centres are autonomous operations, structurally independent from the IERS, but which cooperate with the IERS.

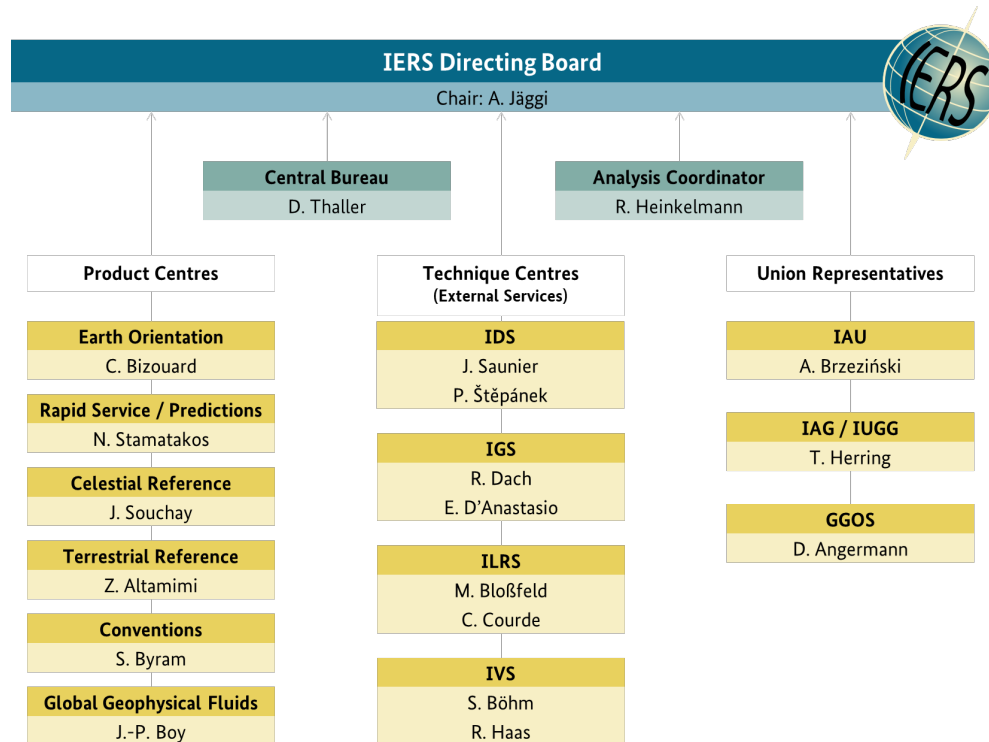
As of August 2025, the IERS consists of the following components: Responsible persons are (as of August 2025):

- Product Centres
 - Earth Orientation Centre: Christian Bizouard (France)
 - Rapid Service/Prediction Centre: Nick Stamatakos (USA)
 - Conventions Centre: Sharyl M. Byram (USA), Christian Bizouard (France)



- ICRS Centre: Jean Souchay (France), Claire E. Cramer (USA)
- ITRS Centre: Zuheir Altamimi (France)
- Global Geophysical Fluids Centre: Jean-Paul Boy (France), Tonie van Dam (USA)
 - * Special Bureau for the Oceans: Henryk Dobslaw (Germany)
 - * Special Bureau for Hydrology: Jianli Chen (Hong Kong)
 - * Special Bureau for the Atmosphere: David Salstein (USA)
 - * Special Bureau for Combination: Tonie van Dam (USA)
- ITRS Combination Centres
 - * Deutsches Geodätisches Forschungsinstitut, Technische Universität München (DGFI-TUM): Manuela Seitz (Germany)
 - * Institut National de l'Information Géographique et Forestière (IGN): Zuheir Altamimi (France)
 - * Jet Propulsion Laboratory (JPL): Richard Gross (USA)
- Analysis Coordinator: Robert Heinkelmann (Germany)
- Central Bureau: Daniela Thaller (Germany)
- Working Groups
 - * IAG/IERS Working Group "Metrology of space geodetic infrastructure": N.N., Cornelia Eschelbach (co-chair)
 - * IERS Working Group on SINEX Format: Daniela Thaller
 - * IAG/IAU/IERS Joint Working Group on the Consistent Realization of TRF, CRF, and EOP: Robert Heinkelmann, Manuela Seitz (co-chair)
 - * IERS/IAG/IAU Working Group on the Prediction of Earth Orientation Parameters (PEOP): Jolanta Nastula, Robert Dill (co-chair)
 - * IAG/IERS Joint Working Group on GENESIS: Johannes Böhm
 - * IAG/IERS Joint Working Group "Evaluation of the Terrestrial Reference Frames": Guilhem Moreaux, Andreja Susnik (co-chair)

The current members of the Directing Board (representatives of scientific unions and of IERS' components) are:



2 Overview

The International Earth Rotation and Reference Systems Service (IERS) continued to provide accurate and consistent Earth orientation parameters (EOP), terrestrial and celestial reference frames (TRF and CRF), and geophysical fluids data to scientific and operational communities worldwide.

Between 2023 and 2025, the IERS Product Centres provided routine updates to EOP and reference frame products. The Earth Orientation Centre updated the C04 EOP series in alignment with ITRF2020 and its updates. No leap seconds were introduced during the reporting period. The Rapid Service/Prediction Centre continued producing Bulletin A and enhanced prediction methods for UT1–UTC and polar motion using improved atmospheric models and processing software.

The IERS maintained and improved its reference frame products. Updates to ITRF2020 were released, including ITRF2020-u2023 by the ITRS Centre. Complementary frames – DTRF2020 and JTRF2020 – were released and updated by DGFI-TUM and JPL respectively. These efforts enhance the modeling of nonlinear station motion and geophysical deformations. The ICRF3 celestial reference frame remains in operational use, with ongoing comparisons to Gaia DR3 and improvements in source characterization. The ICRS Centre launched initiatives such as the FRIDA database and the ELIXIR network to support CRF evolution.

The IERS Conventions Centre advanced the full revision of the IERS Conventions, co-ordinating new content across multiple chapters, with a new release (version 2.0.0) planned

for 2026. A versioning and editorial system was introduced to improve transparency and traceability.

A major IERS publication milestone was the release of IERS Technical Note No. 42, documenting the Second Earth Orientation Parameters Prediction Comparison Campaign (2nd EOP PCC). The responsible working group transitioned into the Joint Working Group on the Prediction of Earth Orientation Parameters (PEOP), which continues coordinating prediction intercomparisons and now also includes machine learning-based forecasts.

The IERS Directing Board made several strategic decisions in this period, including the formation of new joint working groups on GENESIS and on the Evaluation of Terrestrial Reference Frames, as well as the continuation of EOP prediction activities. Adrian Jäggi was elected Chair of the IERS Directing Board for the 2025–2029 term.

Preparations for the next Unified Analysis Workshop (UAW) are underway, scheduled for March 2026 in Munich. Key topics will include the integration of GENESIS data and the consistency between ITRF, ICRF, and EOP.

The IERS Central Bureau improved data accessibility via the IERS Data and Information System (DIS), introduced Digital Object Identifiers (DOIs) for IERS products, and continued development of a modernized website to better serve users. IERS publications, including Bulletins A–D, Technical Notes, Annual Reports, and Messages, were regularly issued during the period.

Overall, IERS activities during 2023–2025 focused on ensuring consistency across geodetic products, improving prediction services, and preparing for future reference frame developments.

3 Publications

The following IERS publications and newsletters appeared between mid-2023 and August 2025:

1. IERS Technical Note No. 41 (2024): Z. Altamimi, P. Rebischung, X. Collilieux, L. Mé-tivier, K. Chanard: Analysis and results of ITRF2020
2. IERS Technical Note No. 42 (2025): J. Śliwińska-Bronowicz, J. Nastula, T. Kur, H. Dobslaw, M. Wińska, M. Michalczak, A. Partyka: Second Earth Orientation Parameters Prediction Comparison Campaign
3. IERS Annual Report 2019
4. IERS Bulletins A, B, C, and D (daily to half-yearly)
5. IERS Messages Nos. 478 to 536

4 IERS Directing Board

The IERS Directing Board (DB) met twice each year to decide on important matters of the Service such as structural changes, overall strategy, creating working groups, launching projects, changing Terms of Reference, etc.

- Meeting No. 77, video conference, November 20, and November 30, 2023;
- Meeting No. 78 in Vienna, April 13, 2024;
- Meeting No. 79, video conference, November 07, and November 15, 2024;
- Meeting No. 80 in Vienna, April 27, 2025

Among the most important decisions made by the DB in 2023–2025 were the following:

- Elected Adrian Jäggi as Chair of the Directing Board (2025–2029).
- Confirmed extended list of IERS Associate Members.
- Established IAG/IERS Joint Working Group on GENESIS.
- Established IAG/IERS Joint Working Group "Evaluation of the Terrestrial Reference Frames"
- Continued the activities of the former IERS Working Group on the 2nd Earth Orientation Parameter Prediction Comparison Campaign (2nd EOP PCC) under the new IAG/IERS/IAU Joint Working Group on the Prediction of Earth Orientation Parameters (PEOP)

5 Technique Centres

The Technique Centres (TC) are autonomous independent services, which cooperate with the IERS:

- International GNSS Service (IGS)
- International Laser Ranging Service (ILRS)
- International VLBI Service for Geodesy and Astrometry (IVS)
- International DORIS Service (IDS)

For details about the work of the TCs, see their individual reports to IAG.

6 Product Centres

6.1 Earth Orientation Centre

Primary scientist: Christian Bizouard (France)

Overview

According to the IERS Terms of Reference, the IERS Earth Orientation Centre (EOC) is responsible for monitoring Earth Orientation Parameters including long-term consistency, publications for time dissemination (DUT1) and leap second announcements. Earth Rotation Parameters (ERPs: Polar motion, Universal Time (UT1), Length of Day (LOD) and Celestial pole offsets) are available to a broad community of users in various domains such as astronomy, geodesy, geophysics, space sciences and time. ERPs are initially collected in the form of combined solutions derived by the Technique Centres (IGS, IVS, ILRS and IDS). Two main solutions are computed: a long-term solution (IERS C01) that starts in 1846 and extends until the end of the previous year and the Bulletin B / C04 given at one-day intervals, which is published monthly with a 30-day. The EOC is located at Paris Observatory.

Activities during the period 2023-2025

- The IERS C04 EOP series has been updated as follows:
 - The **C04 20** series has been aligned with ITRF2020 since February 2022. No further updates have been made since 5 June 2025. This version has been archived at: https://hpiers.obspm.fr/iers/eop/eopc04_20_v2
 - The **C04 20u23** series has been aligned with ITRF2020-u2023 as of 5 June 2025. The pole coordinates and rates (xp, yp, xrt, yrt) were updated for the period from 1 January 2021 to 24 February 2024 using values from ITRF2020-u2023.

- A final decision on the discontinuation of the 14 C04 series is still pending. Continued production has been requested at least through November 2024.
- No leap seconds have been issued via Bulletin C during the reporting period due to the acceleration of Earth's rotation.
- New models for ocean tide effects on UT1 and polar motion have been developed and were presented at EGU 2025.
- Two meetings of the CCTF held in March 2025 focused on UT1–UTC predictions and the planning of future leap seconds.

6.2 Rapid Service/Prediction Centre

Primary scientist: Nick Stamatakos (USA),

Production director and lead project scientist: Sharyl Byram (USA)

Overview

The Rapid Service/Prediction Centre (RS/PC) provides high-quality Earth orientation estimates/predictions on a rapid turnaround basis, primarily for real-time-users. It issues the weekly IERS Bulletin A and corresponding data files, as well as daily and four-times-daily EOP estimate/prediction values. The centre also conducts research toward improving the accuracy and/or production robustness of its products. Lastly, the centre maintains a web-based Earth orientation matrix calculator that provides the full direction cosine matrix between celestial and terrestrial reference frames based on IERS conventions and given calendar date and time inputs.

Activities during the period 2023–2025

- The improved Kalman Smoother / Weighted Cubic Spline (KS/WCS) software continues to be used for UT1–UTC prediction.
 - This method has significantly reduced outlier errors.
 - Operational deployment of the new version is expected within one year.
- Atmospheric Angular Momentum (AAM) pre-processing and combination methods have been further improved and were presented at EGU 2024.
- Daily UT1–UTC and polar motion predictions have maintained high accuracy throughout 2023 and 2024.
 - The RMS error for UT1–UTC predictions over 0–1 days is approximately 0.07–0.11 milliseconds.
 - The RMS for polar motion (PM-X and PM-Y) is approximately 0.04–0.39 milliarcseconds.
- An e-transfer fiber outage at Kokee Park (KPGO) has been ongoing since July 2024.
 - This has caused latency increases of 2–4 days in data integration.
 - Repairs to the KPGO fiber were completed 18 July 2025 and e-transfers from KPGO resumed the same day.
 - Alternative baselines, such as HnMk, have been used to mitigate the impact.
- The VLBA P-series was added to the EOP combination on 23 January 2025.
 - Initial results are encouraging; a full evaluation is ongoing.
- Lifecycle replacement of the KPGO 20-meter telescope backend has been initiated to ensure VGOS capability and system redundancy.
- Gaps in VLBI Intensive observations during major holidays have been addressed.
 - An ad hoc working group was formed to mitigate outages during the Christmas and New Year period.

- The internal UTGPS product was suspended in July 2024 due to increasing residuals; a revision is currently in progress.
- The transition to the 20 C04 series was completed on 29 June 2023, with full alignment to ITRF2020.
- VGOS Intensives, such as K2Ws, have been integrated into the operational processing of the RS/PC since April 2023.

6.3 Conventions Centre

Primary scientists: Christian Bizouard (France), Sharyl Byram (USA), Nick Stamatakos (USA)

Overview

The Conventions Centre is continuing work on technical updates to the IERS Conventions (2010), with updates of existing content, expansion of models, and introducing new topics as needed. The Conventions site is located at:

<http://iers-conventions.obspm.fr>, Observatoire de Paris.

Activities during the period 2023-2025

- The IERS Conventions Centre continued coordinating the comprehensive update of the IERS Conventions, last officially released in 2010 (IERS Technical Note 36).
- A versioning system was implemented to allow minor, update, and major revisions, with clear criteria for review and release. The proposed release of version 2.0.0 is scheduled for 2026.
- A significant portion of the chapter rewrites has been submitted:
 - Chapter 1: Multiple updates cataloged in GitLab.
 - Chapter 2: Fully rewritten by Sergei Kopeikin and James Hilton.
 - Chapter 5: Proposed nutation model under review by Maria Karbon.
 - Chapter 8: High-frequency EOP and tidal UT1/LOD updates discussed by Dennis McCarthy and Sigrid Böhm.
 - Chapter 10: Draft submitted by Sergei Kopeikin and James O’Leary, with formatting under revision.
- The editorial team was strengthened with Dr. Sharyl Byram taking over as primary USNO Co-Chair, alongside Christian Bizouard (Paris Observatory) and Nick Stamatakos (USNO, secondary role).
- Coordination between the Paris Observatory and USNO continues, including parallel hosting of the Conventions website and FTP archive.
- The Centre also handled over 50 submitted suggestions and corrections, tracked via GitLab, and began internal consultations with the IERS Analysis Coordinator to resolve chapter-level conflicts.

6.4 ICRS Centre

Primary scientist: Jean Souchay (France), Claire Cramer (USA)

Overview

The IAU has charged the IERS with the responsibility of monitoring the International Celestial Reference System (ICRS), maintaining its current realization, the International Celestial Reference Frame (ICRF), and maintaining and improving the links with other celestial reference frames. Starting in 2001, these activities have been run jointly by the ICRS Centre (Observatoire de Paris and US Naval Observatory) of the IERS and the International VLBI Service for Geodesy and Astrometry (IVS), in coordination with the IAU.

Activities during the period 2023–2025

- The ICRS Centre continued monitoring and analysis of the ICRF3, with a focus on comparisons with Gaia DR3 and validation through VLBI catalogs.
- The Large Quasar Astrometric Catalogue, version 6 (LQAC-6), was released. It compiles 33 quasar catalogues with over 2 million sources, including multiwavelength photometry and improved cross-identifications. Approximately 84% of sources are found in Gaia DR3.
- Observational and statistical work focused on identifying blazars-quasars with jets aligned along the line of sight-based on photometric variability. These serve as promising candidates for future celestial reference frames.
- Studies of astrometric and photometric variability among ICRF sources were conducted. VLBI variability was found to be inversely correlated with optical variability, guiding the selection of stable reference sources.
- The ELIXIR project, led by the Paris Observatory, advanced toward operational status. Three robotic 0.6-m telescopes were built for monitoring ICRF3 sources. First light was expected in the first half of 2024.
- A new online resource, FRIDA (Fundamental Reference Image Data Archive), is being developed. It will provide radio images and associated optical spectroscopy of ICRF sources.
- USNO and Paris Observatory strengthened their collaboration, with joint activities focused on ICRF source characterization, Gaia-ICRF comparison, and support for the ICRF-4 Working Group.
- A meeting of the ICRS Centre members took place in Paris in June 2024 to define future collaborative goals.

6.5 ITRS Center and ITRS Combination Centre

Three ITRS Combination Centres (CCs) are responsible for providing ITRF products by combining ITRF inputs.

ITRS Centre / ITRS CC at IGN

Primary scientist: Zuheir Altamimi (France)

Overview

The main activities of the ITRS Centre during the period 2023–2025 include the maintenance of the ITRF network, database and website. The ITRS Centre, according to the IERS ToR, is responsible, among other duties, for the maintenance and update of the ITRF network database and its provision to the users through the ITRF website. The ITRS Centre assigns DOMES numbers to geodetic tracking stations or markers as unambiguous identifications of points in space, independently from the technique of their tracking instruments. The ITRF

web site, available at <http://itrf.ign.fr>, provides an interface to consult the IERS network database. Site and point information can be requested online; it contains approximate coordinates of the sites, the list of their points as well as their descriptions, their DOMES numbers and the list of ITRF versions in which they have been computed. Subsets of points can be selected and their ITRF coordinates can be requested at any epoch in any ITRF version if their coordinates are provided in the requested ITRF version.

Activities and selected publications during the period 2023-2025

• ITRF2020 Publications

- An open-access article describing the ITRF2020 realization was published in the *Journal of Geodesy* (Altamimi et al., 2023).
- A companion article on the ITRF2020 plate motion model was accepted for publication in *Geophysical Research Letters*.

• ITRF2020 Updates

- The first update, **ITRF2020-u2023**, was released on 6 December 2024.
 - * Alignment to ITRF2020 preserved over 42 defining parameters.
 - * No changes to defining parameters (origin, scale, orientation).
 - * Added 3 more years of data.
 - * Origin uncertainty (SLR): 1 mm at epoch 2015.0 and 0.1 mm/year.
 - * Scale uncertainty (SLR+VLBI): 0.18 ppb (~ 1 mm), no drift.
 - * Polar motion uncertainty: $\sim 2 \mu\text{as}$ and $0.5 \mu\text{as}/\text{year}$.
- The second update, **ITRF2020-u2024**, is under preparation:
 - * All contributions received, including new local ties (e.g., Japan: Koganei, Ishioka, and 6 IGN DORIS-related ties).
 - * Analysis ongoing; Preliminary analysis shows no major issues.

• IERS Conventions (Chapter 4)

- Chapter 4 was revised and restructured by the ITRS Center to include ITRF2020 models and methodology.
- Reviewed by six international experts; comments incorporated.
- Final version submitted to the Conventions Center in May 2024.

• IERS Technical Notes

- **IERS TN No. 41** on ITRF2020 published in November 2024.
- A second Technical Note is in preparation on the intercomparison of xTRF2020 solutions (ITRF, DTRF, JTRF).

• Presentations and Community Engagement

- Regular progress reports were presented at IERS Directing Board meetings (DB77–DB80), and at AGU and EGU assemblies.
- Early results and update strategies were discussed with Technique Centers and stakeholders throughout 2024.

References

1. Altamimi, Z., Rebischung, P., Collilieux, X., Métivier, L., Chanard, K. (2023). ITRF2020: An augmented reference frame refining the modeling of nonlinear station motions. *Journal of Geodesy*, 97(47). <https://doi.org/10.1007/s00190-023-01738-w>
2. Altamimi Z., Rebischung P., Collilieux X., Métivier L., Chanard K. (2024): Analysis and results of ITRF2020. (IERS Technical Note ; 41) Frankfurt am Main: Verlag des Bundesamts für Kartographie und Geodäsie, 82 pp., ISBN 978-3-86482-159-2 (print version), <https://doi.org/10.60599/iers-tn41>

ITRS CC at DGFI-TUM

Primary scientist: Manuela Seitz (Germany)

Overview

DGFI-TUM has been acting as one of the ITRS Combination Centres within the IERS since 2001. The related activities are embedded into DGFI-TUM's research on the realization of Global Terrestrial Reference Frames within the research area Reference Systems. Realizations of the ITRS are based on the combination of space geodetic observations of the four techniques VLBI, SLR, GNSS, and DORIS at globally distributed geodetic observatories. Respective input data are provided by the corresponding technique services (IVS, ILRS, IGS, IDS). The combination strategy developed at DGFI-TUM is based on the combination of normal equation systems, which allows for a pure physically realization of the origin and scale of the reference frames.

Activities during the period 2023–2025

- The DTRF2020 solution was officially released on 7 August 2023 and is publicly available at <https://zenodo.org/records/8369167> and via the DTRF website <https://dtrf.dgfi.tum.de>.
- The release includes:
 - SINEX files (per technique)
 - Consistent Earth Orientation Parameters (EOP)
 - Non-tidal loading (NTL) and post-seismic deformation (PSD) time series per station/component
 - Residual time series and translation time series (SLR)
 - Detailed solution description
- DTRF2020 realizes the scale using both VLBI and GNSS; for GNSS POD applications, repro3 satellite PCOs (IGSR3.atx) and updated receiver calibrations (igs20.atx) are recommended.
- A new update, DTRF2020-u2023, is nearing completion. It incorporates input data from 2021–2023 from all IAG Technique Services (VLBI, SLR, GNSS, DORIS) and is computed to be as consistent as possible with DTRF2020, including:
 - Consistent use of NTL and PSD models
 - Integration of the VGOS network
 - New GNSS receiver antenna calibrations
 - Continued scale realization from VLBI and GNSS
- Preliminary comparisons between DTRF2020 and DTRF2020-u2023 show:
 - Very small transformation parameters (VLBI scale offset: 0.02 mm, drift: -0.014 mm/yr)
 - Stable time series for VLBI, SLR, and DORIS
 - Detectable GNSS discontinuities at epoch 2021.0, likely due to changes in AC contributions and model updates
- Input data for an additional update (DTRF2020-u2024) have already been submitted. Completion is expected within a shorter time frame, thanks to finalized reprocessing efforts.
- The ITRS CC is also performing extensive analysis of the input SINEX series (2021–2024) to assess:
 - Datum stability
 - Scale consistency (e.g., repro3 vs. IGS operational)
 - Impacts of new receiver antenna calibrations (approx. 280 affected stations)

- Model and AC changes across IGS, ILRS, IDS, and IVS
- A consistent realization of TRF, CRF, and EOP is under development together with the IVS CC, as a contribution to the IAU/IAG/IERS Joint Working Group "Consistent Realization of TRF, CRF and EOP". This includes:
 - A VLBI-only CRF/TRF solution based on 2322 sessions (2010–2023)
 - Multi-technique combination with station coordinates, EOPs, and source positions
 - Promising initial results; small differences with respect to ICRF3
- A scientific paper describing DTRF2020 is in preparation and will accompany the public release and documentation of the frame and its applications.

ITRS CC at JPL

Primary scientist: Richard Gross (USA)

Overview

The ITRS Combination Centre at JPL focused on research regarding the representation of terrestrial reference frames by time series of smoothed positions of reference stations rather than by a parameterized model of the station positions. A square-root information filter for reference frames (SREF) has been developed that can be used to not only determine time series representations of terrestrial reference frames but that can also be used to jointly determine time series representations of terrestrial and celestial reference frames.

Activities during the period 2023-2025

- SREF was used to determine JTRF2020-u2022, the first update to JTRF2020. The input data sets used were those submitted by the Services for ITRF2020-u2023, the first update to ITRF2020. SREF was restarted from the saved state vector and full covariance matrix at the last time step of JTRF2020. So only the data after the end of JTRF2020 was processed to determine JTRF2020-u2022 which spans 1 January 2021 to 26 November 2022 and which was determined in a manner fully consistent with the determination of JTRF2020. The JTRF website at <https://www.jpl.nasa.gov/site/jsgt/jtrf> is being updated to include the JTRF2020-u2022 solution. In the meantime, the solution is available upon request.
- The postseismic displacement model used by SREF was extended to include a logarithmic component to the displacement model in addition to an exponential component.
- Presentations about JTRF2020 and JTRF2020-u2022 were given at IERS Directing Board meetings and at AGU, EGU, FIG, and JpGU conferences.
- Journal articles about JTRF2020 and, separately, JTRF2020-u2022 are being prepared.

6.6 Global Geodetical Fluid Centre

Primary scientist: Jean-Paul Boy (France)

Co-chair: Tonie van Dam (USA)

Overview

The Global Geophysical Fluid Centre (GGFC) of the International Earth Rotation and Reference Systems Service (IERS) provides the community with models of geodetic effects (Earth rotation, gravity and deformation) due to the temporal redistribution of the Earth geophysical fluids (<http://loading.u-strasbg.fr/GGFC>). These include fluid motions with the solid Earth

(core and mantle) as well as motions at the Earth's surface (ocean, atmosphere and continental hydrology). The GGFC is composed of four operational entities: the Special Bureau for the Atmosphere (SBA, chair: D. Salstein), the Special Bureau for the Oceans (SBO, chair: H. Dobslaw), the Special Bureau for Hydrology (SBH, chair: J.-L. Chen) and the Special Bureau for the Combination Products (SBCP, chair: T. van Dam). The Atmosphere, Hydrology and Ocean SBs have been firmly established since the creation of the GGFC in 1998. The operational Combination Products SB was established in 2009 to host new datasets that model the mass movement of combined environmental fluids such as atmosphere + ocean. There is finally a non-operational component of the GGFC, the GGFC Science and Support Products, serving as a repository for models and data used regularly in data processing, but that do not change often.

Activities during the period 2023-2025

- The GGFC continued to provide key loading products and geophysical fluid models relevant for reference frame maintenance and Earth rotation studies.
- Updates to ERA5-based products have extended the time series through October 2024. These include:
 - Atmospheric and hydrological loading,
 - 3D surface displacements at 8500 stations,
 - Geocenter motion and time-variable gravity field,
 - Hourly temporal resolution.
- Ocean loading contributions are updated using the TUGO-m model (barotropic response to pressure and wind), with data extended to July 2024.
- All above products are also available using MERRA2 forcing (atmosphere with inverse barometer + hydrology).
- ERA5-land products (offline hydrological reprocessing based on ERA5 atmospheric data) will become available soon.
- GGFC products, including those supporting ITRF2020 and its extensions, are publicly available at:
<http://loading.u-strasbg.fr> and
<http://loading.u-strasbg.fr/ITRF2020>

6.7 Analysis Coordinator

Analysis Coordinator: Robert Heinkelmann (Germany)

Overview

The Analysis Coordinator is responsible for the long-term and internal consistency of the IERS reference frames and other products. He is responsible for ensuring the appropriate combination of the Technique Centres products into the single set of official IERS products and the archiving of the products at the Central Bureau or elsewhere.

Activities during the period 2023-2025

- The Analysis Coordinator continued to support the assessment and comparison of ITRF2020 and the associated solutions from the Combination Centres, DTRF2020 (DGFI-TUM) and JTRF2020 (JPL).
- Particular attention was given to the consistency between Terrestrial Reference Frames (TRFs), Celestial Reference Frames (CRFs), and Earth Orientation Parameters (EOP), in order to ensure the overall consistency of the IERS products.

- In light of the planned redefinition of UTC by the CGPM (no earlier than 2035), the Analysis Coordinator contributed to ongoing assessments of its potential impact on IERS products and services. Particular attention was given to the continuity of UT1–UTC predictions, the implications for leap second handling, and necessary adaptations in IERS data formats and distribution standards. Technical input was provided on the consequences for operational users and format standards.
- The ICRF3 realization remains the operational celestial reference frame, and its consistency with Gaia DR3 continues to be monitored. Higher-frequency VLBI observations (e.g., in X/Ka-band) are seen as a promising avenue for future improvements in the CRF.
- Preparations for the next Unified Analysis Workshop (UAW) are ongoing, with the workshop planned for March 2026 in Munich. The format will focus on structured discussion blocks instead of traditional presentations. Key topics for the 2026 UAW include Genesis effects in IERS products, consistency between ITRF, EOP and ICRF, and the role of EGVs in TRF stability.
- The coordinator participated in several analysis workshops organized by the technique services (VLBI, SLR, GNSS, DORIS), ensuring that IERS-wide standards and consistency goals were represented in technique-specific developments.
- In addition to technical oversight, the Analysis Coordinator maintains regular engagement with the IAG, GGOS, and IERS community to help align analysis strategies with user needs and scientific priorities.

6.8 Central Bureau

Director: Daniela Thaller (Germany)

Overview

The Central Bureau coordinates the work of the Directing Board and the IERS in general, organizes meetings and issues publications. It replies to questions of users regarding IERS products and general topics of Earth rotation and reference systems. It maintains an IERS Data and Information System (DIS) based on modern technologies for internet-based exchange of data and information like the application of the Extensible Markup Language (XML) and the generation and administration of ISO standardised metadata. The system provides general information on the structure and the components of the IERS, serves as a portal to websites of all IERS components and gives access to all products.

Activities and selected publications during the period 2023-2025

- The IERS Central Bureau continued to operate and enhance the Data and Information System (DIS), supporting the collection, formatting, and dissemination of IERS products.
- The CB is in the process of standardizing transformed versions of Earth Orientation Parameter (EOP) products. All EOP product files are reformatted by the CB into various formats (CSV, HTML, XML, JSON) to enhance accessibility and usability. Ongoing efforts aim to harmonize the structure, content, and visual representation of these products across all formats and datasets published on the IERS website.
- Versioning mechanisms are being implemented, primarily for EOP products, to track changes across all transformed formats (CSV, XML, HTML, JSON) and ensure transparent update histories.
- A new version of the IERS website (www.iers.org) is currently under development, based on a modern content management system. The goal is to provide a more modern and user-friendly interface and unified access to all IERS products and services.

- The Central Bureau introduced Digital Object Identifiers (DOIs) for IERS publications:
 - DOIs will be assigned to the complete Annual Reports series, individual volumes, and individual chapters.
 - IERS products distributed via the CB will also receive DOIs with maintained hierarchy and traceability.
- Publications during the period include:
 - **IERS Technical Notes:** TN 41 (ITRF2020 Analysis and Results), TN 42 (2nd Earth Orientation Parameter Prediction Comparison Campaign)
 - **IERS Annual Reports:** Finalized report for 2020–2023 (in preparation for publication), Call for 2024 contributions to be issued.

6.9 Working Groups

Reports, meeting summaries, presentations and other documents of all working groups are available at the IERS web site.

IAG/IERS Joint Working Group "Metrology of space geodetic infrastructure"

Chair: Ryan Hippenstiel (USA, until May 2025), N.N. (since May 2025)
Co-chair: Cornelia Eschelbach (Germany)

Overview

The IAG/IERS Working Group "Metrology of space geodetic infrastructure" (formerly: IAG/IERS Working Group on Site Survey and Co-location) will share methodology of existing tie surveys, continued to develop, document recommended procedures, and archive surveys completed by all agencies represented. In addition, efforts will be made to isolate systematic errors of the space geodetic techniques using surveying methods and investigate field procedures that could be completed while a tie survey to provide the operator valuable feedback on potential physical errors found onsite.

Activities during the period 2023-2025

See the report of IAG Commission 1, SC 1.2 (Global Reference Frames), JWG 1.2.2: Methodology for surveying geodetic instrument reference points.

IERS Working Group on SINEX Format

Chair: Daniela Thaller (Germany)

Overview

The SINEX (Solution INdependent EXchange) format is a well-established format used by the technique services of the IERS for several years. The aim of the working group is to maintain the SINEX format according to the needs of the IERS, the technique services (IDS, IGS, ILRS, IVS) and GGOS. The working group is the point of contact if any modifications or extensions are required. In order to have the best possible interaction with the groups working with the SINEX format (either as output or as input), the analysis and combination groups of all the technique services as well as the relevant components of the IERS and GGOS

are represented within the working group.

Activities during the period 2023-2025

- The Working Group focused on refining the SINEX format in support of future multi-technique combination efforts and space missions such as Genesis.
- A proposal to add the number of observations per station, source, and satellite is under discussion.
- Clarifications were made to the use of NUTATION entries:
 - Values should represent corrections to the model, not absolute angles.
 - Units are now explicitly defined as milliarcseconds (mas) and mas/day.
- A proposal was introduced to include DOIs for SINEX products in a standardized meta-data block, facilitating proper citation and traceability.
- The addition of satellite orbit parameters to SINEX is under review to support co-location missions like Genesis. This would enable combination of orbits on the normal equation level.
- Clarifications have been discussed regarding time scale usage in SINEX files. A consistent use of UTC is recommended across all techniques to avoid transformation inconsistencies.

IAG/IAU/IERS Joint Working Group on the Consistent Realization of TRF, CRF, and EOP

Chair: Robert Heinkelmann (Germany)

Co-chair: Manuela Seitz (Germany)

Overview

This IAG/IAU/IERS Working Group will compute multi-technique CRF-TRF solutions together with EOP in one step, which will serve as a basis to quantify the consistency of the current conventional reference frames and EOP as well as to assess the consistency of reprocessed and predicted EOP. From 2016 to 2019 this was an IAG Working Group, since 2020 it has become joint with IAU and IERS.

Activities and selected publications during the period 2023-2025

See the report of IAG Commission 1, SC 1.4 (Interaction of Celestial and Terrestrial Reference Frames), JWG 1.4.3: Consistent realization of TRF, CRF, and EOP.

IERS/IAG/IAU Joint Working Group on the Prediction of Earth Orientation Parameters (PEOP)

Chair: Jolanta Nastula (Poland)(USA, until May 2025)

Co-chair: Henryk Dobslaw (Germany, until Jan. 2025), Robert Dill (Germany, since Jan. 2025)

Overview

Earth orientation parameters (EOP) comprising of celestial pole offsets, terrestrial pole coordinates, and the Earth's spin rate (i.e., UT1-UTC) represent a critically needed link between the terrestrial and the celestial reference frame. Predictions of EOP are important

for a number of operational activities including navigation of deep-space satellite missions, the pointing of astronomical instruments, or satellite-based positioning on Earth. Various agencies and institutions worldwide therefore maintain capacities to rapidly process space geodetic observations to obtain estimates for the Earth orientation parameters with short latencies as a basis for the subsequent prediction. Whereas many users require predictions for only a few days into the future, IERS routinely publishes predictions for up to 1 year ahead within its Bulletin A.

Between 2006 and 2008, the 1st EOP Prediction Comparison Campaign (EOP PCC) assessed various EOP prediction methods in an operational setting. The 2nd EOP PCC took place between 2021 and 2022, organized by CBK Warsaw with support from GFZ Potsdam. Building on these results, this working group (formerly: Working Group on the 2nd Earth Orientation Parameter Prediction Comparison Campaign) will study current EOP prediction accuracies and explore ways to combine predictions from different institutions for greater reliability, robustness, and accuracy.

Activities and selected publications during the period 2023-2025

- The former IERS Working Group on the Second Earth Orientation Parameters Prediction Comparison Campaign (2nd EOP PCC) has evolved into the Joint IERS/IAG/IAU Working Group on the Prediction of Earth Orientation Parameters (PEOP).
- The new Joint Working Group was officially established in 2024: endorsed by the IERS (DB#78), IAG Commission 3, and approved by IAU Commission 2 in August 2024.
- The group is chaired by Jolanta Nastula (CBK PAN) with Robert Dill (GFZ) as co-chair. Its goal is to coordinate international efforts in evaluating and improving EOP forecasts, focusing on both traditional and machine learning-based methods.
- The post-operational phase of the 2nd EOP PCC continued in 2023–2024:
 - Predictions continued to be submitted weekly; by November 2024, 97 weeks of additional forecasts had been collected.
 - A transition to the new reference series (IERS 20 C04) was initiated; however, only about one-third of participants had fully switched at that point.
 - Validation tools and comparison metrics were continuously updated and shared with contributors.
- A dedicated post-campaign analysis is ongoing:
 - The focus lies on assessing prediction accuracy across UT1–UTC, LOD, PM, and CPO.
 - Detailed evaluations for short-term forecasts (1–10 days) are performed.
 - Preliminary results were presented at IERS DB meetings and international conferences.
- A new sub-campaign called EOP-PML (Prediction via Machine Learning) was launched in late 2024:
 - Designed to benchmark EOP forecasts produced using machine learning methods.
 - Participants must use only publicly available input data (e.g., IERS 20 C04, IGS final/rapid/ultra) and adhere to a fixed prediction schedule.
 - The first phase (EOP-PML-A) began in October 2024 and focuses on UT1–UTC and polar motion; future phases may include CPO.
- A dedicated PEOP website is being prepared for publication, serving as a central platform for documentation, results, and forecast access.
- Future tasks of the Joint Working Group include:

- Continuing the weekly collection of operational EOP forecasts.
 - Developing strategies for forecast combination and performance evaluation.
 - Organizing workshops and sessions at major conferences (e.g., EGU, IAG, GGOS Days).
 - Supporting the integration of prediction products into future IERS operational services.
1. Śliwińska, J., Kur, T., Wińska, M., Nastula, J., Dobslaw, H., & Partyka, A. (2022): *Second Earth Orientation Parameters Prediction Comparison Campaign (2nd EOP PCC): Overview. Artificial Satellites*, 57(S1), 237–253. <https://doi.org/10.2478/arsa-2022-0021>
 2. Kur, T., Dobslaw, H., Śliwińska, J., Nastula, J., & Wińska, M. (2022): *Evaluation of selected short-term predictions of UT1–UTC and LOD collected in the 2nd EOP PCC. Earth, Planets and Space*, 74(1). <https://doi.org/10.1186/s40623-022-01753-9>
 3. Śliwińska, J., Wińska, M., Nastula, J., Kur, T., Dobslaw, H. (2023): *A combined prediction method of Earth rotation parameters: Assessment using results from the 2nd EOP PCC. Advances in Space Research*, 72(8), 2792–2808. <https://doi.org/10.1016/j.asr.2023.07.005>
 4. Śliwińska-Bronowicz, J., Nastula, J., Kur, T., Dobslaw, H., Wińska, M., Michalczak, M., Partyka, A. (2025): *Second Earth Orientation Parameters Prediction Comparison Campaign. IERS Technical Note No. 42*. Frankfurt am Main: Verlag des Bundesamts für Kartographie und Geodäsie. 152 pp. ISBN 978-3-86482-160-8. <https://doi.org/10.60599/iers-tn42>

IAG/IERS/GGOS Joint Working Group on GENESIS

Chair: Johannes Böhm (Austria)

Overview

The objective of this working group is to explore the array of scientific opportunities presented by GENESIS, a mission of the European Space Agency (ESA), to formulate optimal observing scenarios, and to develop the methodology for a consistent integration of GENESIS data into future ITRF realizations with simulations and considering already existing space ties. This working group aims to maximize the utilization of the mission's capabilities.

Activities and selected publications during the period 2023-2025

See the report of IAG Commission 1, SC 1.1 (Coordination of Space Techniques), JWG 1.1.1: Genesis.

IAG/IERS Joint Working Group "Evaluation of the Terrestrial Reference Frames"

Chair: Guilhem Moreaux (France)

Co-chair: Andreja Susnik (UK)

Overview

This JWG aims at complementing the evaluation of the ITRS realizations by the IERS ITRS Center with a special focus on the intercomparison of different global TRF solutions. The assessment aims at investigating conceptual differences of the three ITRS realizations

with previous realizations based on user and application requirements important for, e.g., the precise orbit determination (POD) of low-, medium- and high-Earth-orbiting satellites and the estimation of Earth Orientation Parameters (EOPs) as well as the (mean) regional/global sea level rise.

Activities and selected publications during the period 2023-2025

See the report of IAG Commission 1, SC 1.2 (Global Reference Frames), JWG 1.2.4: JWG 1.2.4 Evaluation of the terrestrial reference frames.