

# UN-GGIM-AP WG1 - Geodetic Reference Frame – Annual Report

UN-GGIM-AP 13<sup>th</sup> Plenary Meeting  
New Delhi, India  
November 29, 2024



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# UN-GGIM-AP Working Group 1

## - Geodetic reference frame -

### Chair

Mr. Basara Miyahara, Japan

### Vice Chairs

Dr. Guorong Hu, Australia

Dr. Yamin Dang, China

Mr. Asakaia Tabu, Fiji

Mr. Upendra Nath Mishra, India

Mr. Sidik Tri Wibowo, Indonesia

Mr. Seyed Abdoreza Saadat Mirghadim, Islamic Republic of Iran

Mr. Ahmad Sanusi bin Che Cob, Malaysia

Ms. Dalkhaa Munkhtsetse, Mongolia

Mr. Graeme Blick, New Zealand

Mr. Jongsin Lee, Republic of Korea

<- **Nic Donnely**

<- **Seohee Park**



### Members

Mr. Paulino Dacruz, Timor-Leste



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# UN-GGIM-AP Working Group 1 – Focus 2022 - 2024

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Geodesy**



**International  
Height Reference  
Frame (IHRF)**

**Regional  
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(APREF, APRGP)**

**Regional  
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# UN-GGIM GGRF Subcommittee on Geodesy UN Global Geodetic Centre of Excellence (GGCE)

- **Subcommittee on Geodesy** was established in August 2017
- The United Nations **Global Geodetic Centre of Excellence (GGCE)** was established on 29 March 2023
- Working together on sustaining the UN General Assembly Resolution, **“the Global Geodetic Reference Frame (GGRF) for sustainable development”**



Opening Ceremony of UN-GGCE

<https://un-ggim-europe.org/news/important-milestone-in-the-journey-for-global-geodesy/>



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# 2<sup>nd</sup> Meeting of the UN-GGCE International Advisory Committee 4<sup>th</sup> Plenary Meeting of the Subcommittee on Geodesy

- 18-21 March 2024 @ UN Campus in Bonn
- Joint meeting with the SCoG & UN-GGCE IAC
- Member States (India, Indonesia, Japan, Singapore..), IAG/GGOS, FIG, ..
  - ✓ Operating plan of the UN-GGCE
  - ✓ Workshop on the Draft Global Geodesy Needs Assessment  
1st Joint Development Plan for Global Geodesy -> 14<sup>th</sup> UN-GGIM



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# Expert Consultation meeting on Strengthening the Global Geodesy Supply Chain

- 22-23 April 2024 @ UN Campus in Bonn
- NGIAs, Space Agencies, Defense Agencies, Private Sector, Academia..
  - ✓ The importance of the Global Geodesy Supply Chain for science & society
  - ✓ The status of the Global Geodesy Supply Chain
  - ✓ The need to stabilize the Global Geodesy Supply Chain now
  - ✓ 1st Joint Development Plan for Global Geodesy
  - ✓ Draft Decisions from the Expert Consultation meeting on Strengthening the Global Geodesy Supply Chain (22-23 April 2024)



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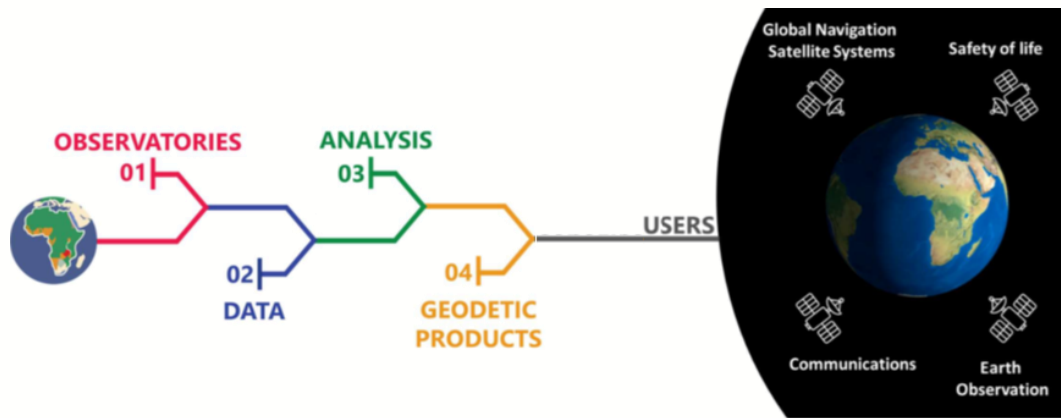
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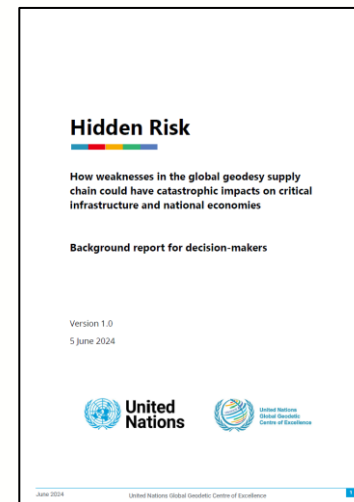
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# UN Global Geodetic Centre of Excellence (GGCE)

- **Hidden Risk Report** (published on 5 June 2024)
  - ✓ Background report for decision-makers
  - ✓ How weaknesses in the global geodesy supply chain could have catastrophic impacts on critical infrastructure and national economies
  - ✓ Why geodesy is important for society
  - ✓ How geodesy underpins space missions



YouTube Video  
Hidden Risk - The importance of geodesy  
in our everyday lives.



Report



Policy  
Brief

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# UN-GGCE Upcoming Events 2024-

- **UN-GGCE - International Workshop on Joining Land and Sea with BIG Indonesia**
  - ✓ How land and sea domain are integrated including reference frames
  - ✓ 2–5 December 2024 @ Bogor, Indonesia
- **3<sup>rd</sup> Meeting of the UN-GGCE International Advisory Committee**  
**5<sup>th</sup> Plenary Meeting of the Subcommittee on Geodesy**
  - ✓ 10-14 March 2025 @ UN Campus in Bonn
- **Asia-Pacific Capacity Development Workshop**
  - ✓ Geodetic capacity development for five regions by UN-GGCE
  - ✓ How member countries can modernize geodetic reference frame in their countries
  - ✓ Not only technical topics but also governance and other challenges
  - ✓ **7-11 July 2025 @ UN Campus in Bonn (TBD)**

**Save the date!**



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# Asia Pacific Reference Frame (APREF)

- Regional geodetic reference frame
- Realized by continuous GNSS observation of over **700 stations**  
**28 countries**
- Densify ITRF and improve access to ITRF
- Data are routinely processed by 3 Local Analysis Centres\*
- Station coordinates made openly available
- APREF solutions have been transitioned to **ITRF2020/IGS20** since 27 November 2022 (GPS week 2238)
- Participation from countries in the region is welcome!
- Report on APREF available at  
<https://www.un-ggim-ap.org/wg/working-group-1-geodetic-reference-frame>

\* Geoscience Australia

Office of Surveyor-General Victoria, Australia

Institute of Geodesy and Geophysics, Chinese Academy of Sciences

Geospatial Information Authority of Japan (under evaluation)



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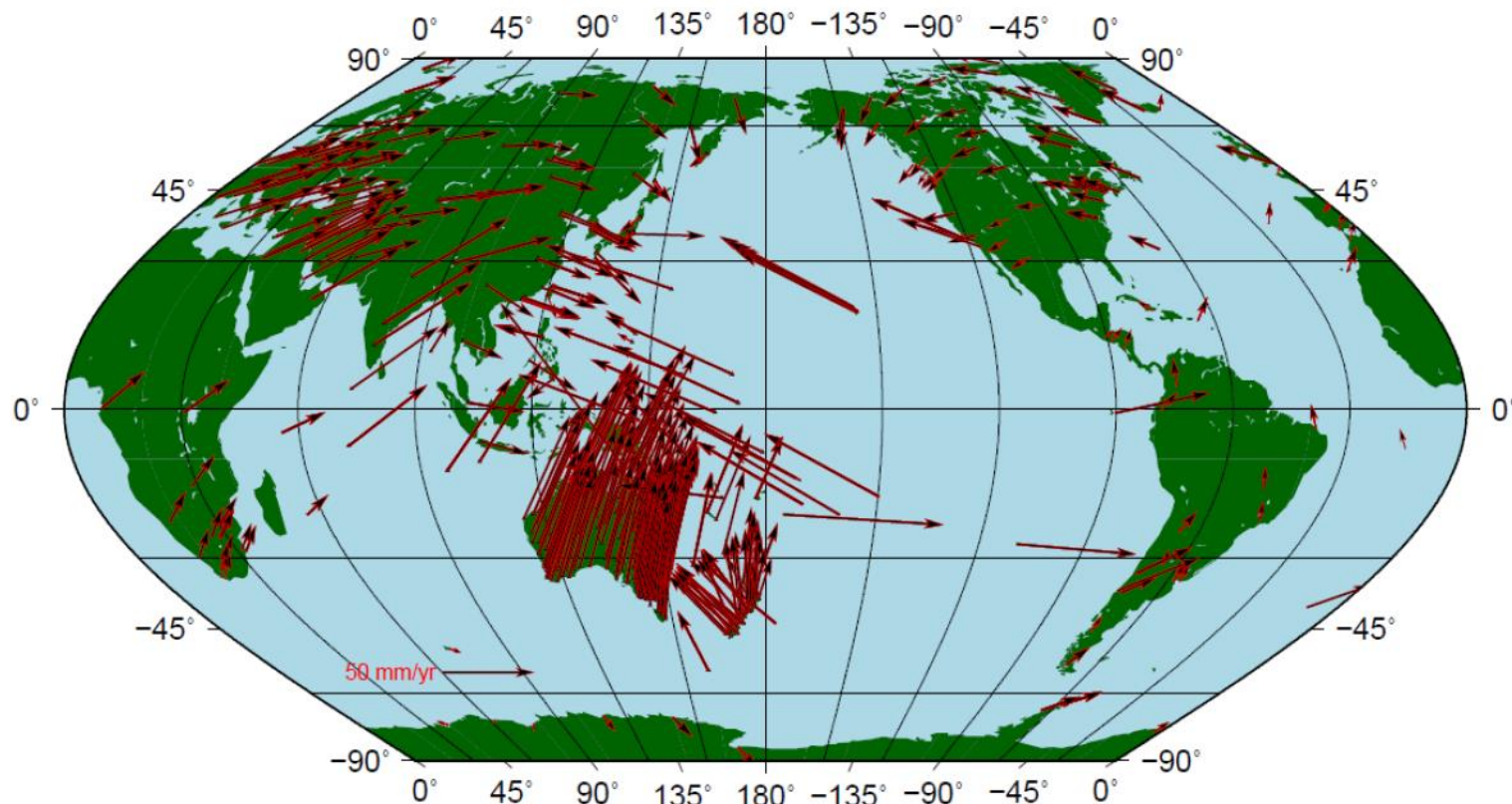
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# Asia Pacific Reference Frame (APREF)



**Figure 1.** The distribution of APREF CORS network along with the IGS core stations. The arrows represent the GPS-derived velocity field.

G. Hu, M. Moore and J. Dawson (2019): Report on the Asia Pacific Reference Frame (APREF) Project



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# Asia Pacific Regional Geodetic Project (APRGP)

- Annual GNSS campaign
  - Densify ITRF and improve access to ITRF
  - Data are analysed by Geoscience Australia
  - Analysis report is distributed each year
- 
- **APRGP2023:** 10 to 16 September 2023
  - Processed by Guorong Hu, Geoscience Australia
  - Participation from Brunei, India, Korea (Republic of), Laos, Mongolia, Philippines, Singapore, Tonga and Vietnam
  - Final report is available at UN-GGIM-AP website
- 
- **APRGP2024:** 8 to 14 September 2024
  - Under processing by Guorong Hu, Geoscience Australia

APRGP2023



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# Asia Pacific Regional Geodetic Project 2023

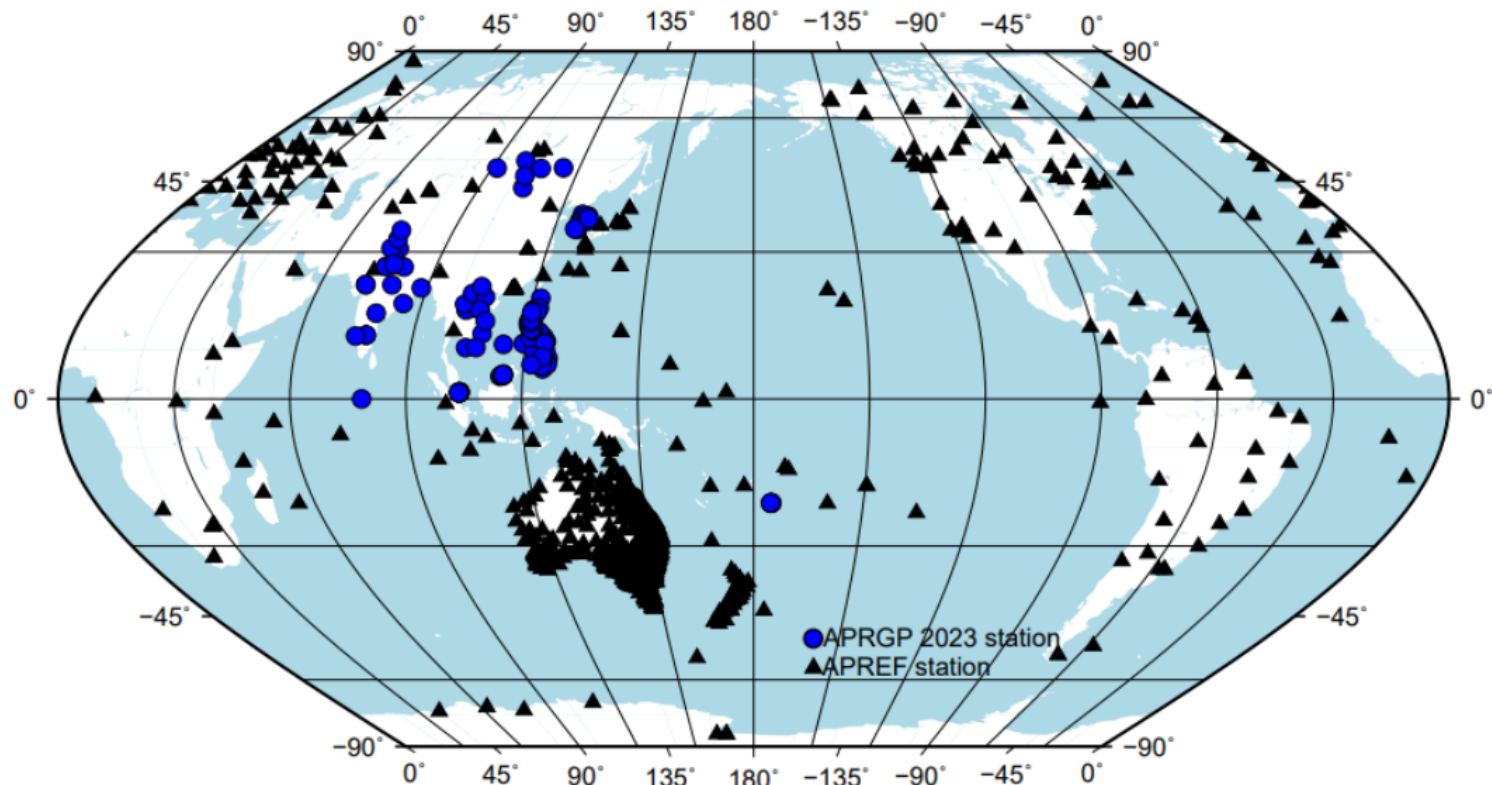


Figure 1 APRGP stations in the APRGP 2023 GPS campaign analysis along with the APREF stations and IGS stations, blue circles are APRGP campaign sites, and black triangles are APREF stations.

G. Hu: Report on the Analysis of the Asia Pacific Regional Geodetic Project (APRGP) GPS Campaign 2023



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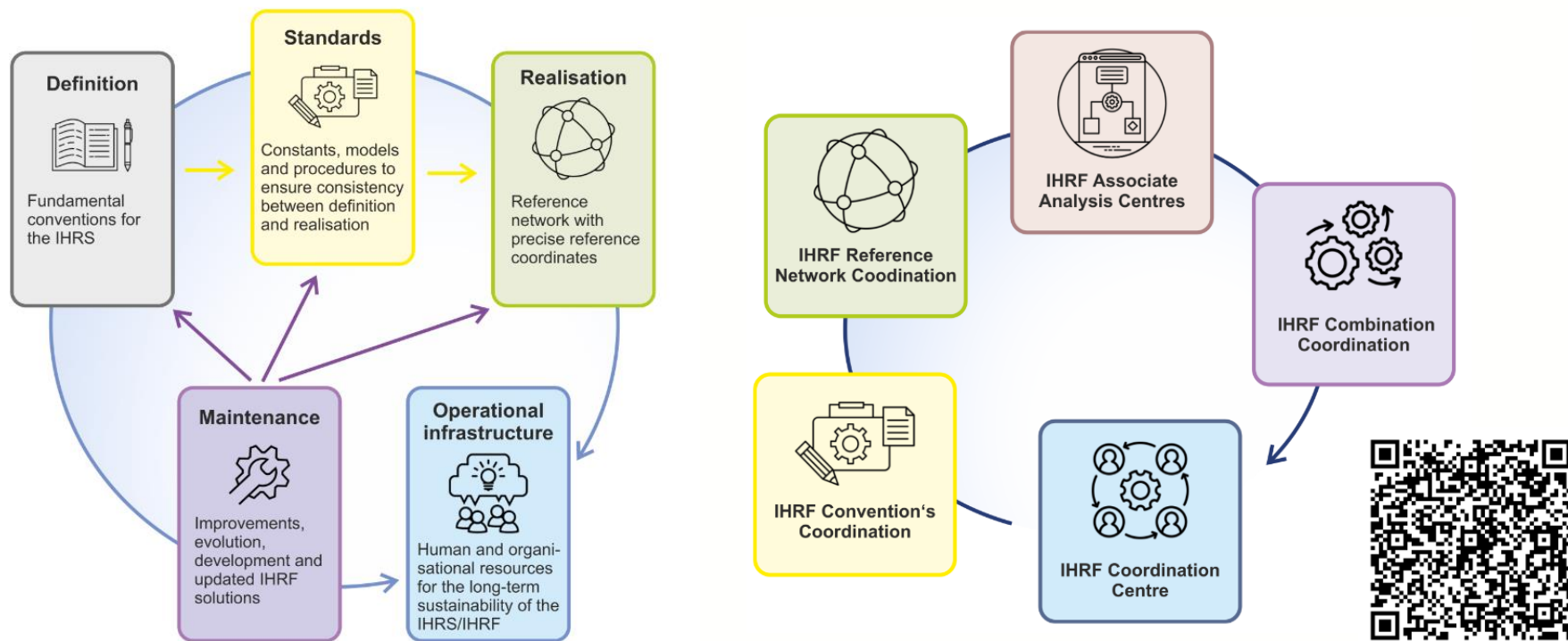
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# International Height Reference Frame (IHRF)

- International Height Reference Frame (IHRF) Coordination Centre was established under the International Gravity Field Service (IGFS)



The objectives, products and goals of the IHRF

The main modules of the IHRF Coordination Centre

IHRF Coordination Centre Terms of Reference <<http://igfs.topo.auth.gr/>>



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# International Height Reference Frame (IHRF)

- **IGAG Workshop on Asia Pacific Gravity, Geoid and Height System**
  - ✓ 6-8 November 2024 @ Manila, Philippines
  - ✓ Gravity, DEMs, geoid modelling, GNSS/leveling, altimetry, Height System in Asia-Pacific, gravity application to hazards and climate change, gravity and GGRF
  - ✓ The chair of IHRF presented IHRF and its coordination centre



IGS Workshop 2024 <<https://iagworkshop2024.dge.upd.edu.ph/>>



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# Capacity Building Opportunities in 2024-

- UN-GGIM-AP/IAG/FIG/SoI Workshop on Sustainable GNSS CORS Operation on November 27<sup>th</sup>, 2024 in New Delhi, India
- WG1 annual session at the UN-GGIM-AP 13<sup>th</sup> Plenary on November 9<sup>th</sup>, 2024 in New Delhi, India
- FIG seminar “Reference Frame in Practice” at FIG2025 on April 2025 in Brisbane, Australia
- PGSC meetings (ex. GETWS Oceania meeting in Suva, 2025)
- Subcommittee on Geodesy and Global Geodetic Center of Excellence in Bonn, Germany on March 2025
- UN-GGCE Asia-Pacific Capacity Development Workshop, on 7-11 July 2025 in Bonn, Germany (TBD)

• Other opportunities?



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# UN-GGIM-AP WG1 - Geodetic Reference Frame – Work Plan

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# Working Group 1: Geodetic Reference Frame

## Annual session at 13<sup>th</sup> Plenary of UN-GGIM-AP

- 15 participants from 12 countries, IAG
- Report of WG1, focus of WG1 for the next intersessional period
- Country report from WG members: Australia, Brunei, Bhutan, China, India, Republic of Korea, Singapore, Thailand, Timor-Leste,
- Findings:
  - ✓ Strong needs to capacity development on height system especially modernized geopotential height system (IHRF)
  - ✓ Development of GNSS CORS network in member countries are progressing, but still a lot of challenges on stable CORS network operation and services
  - ✓ Capacity to connect ITRF/IHRF to “physical” markers is a key to establish national datum consistent to the international frames
  - ✓ Outreach to raise awareness about the value of geodesy as critical social infrastructure



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# UN-GGIM GGRF Subcommittee on Geodesy UN Global Geodetic Center of Excellence (GGCE)

- Continue to participate in and work closely with the Subcommittee and UN-GGCE
- Continue to consult with UN-GGCE
  - ✓ UN-GGCE Capacity Development Workshop in 2025
- Participate in the meeting of the Subcommittee and GGCE
  - ✓ Inaugural meeting in Bonn, Germany on March 2025
  - ✓ Informal meeting in NY, August 2025



<https://un-ggim-europe.org/news/important-milestone-in-the-journey-for-global-geodesy/>



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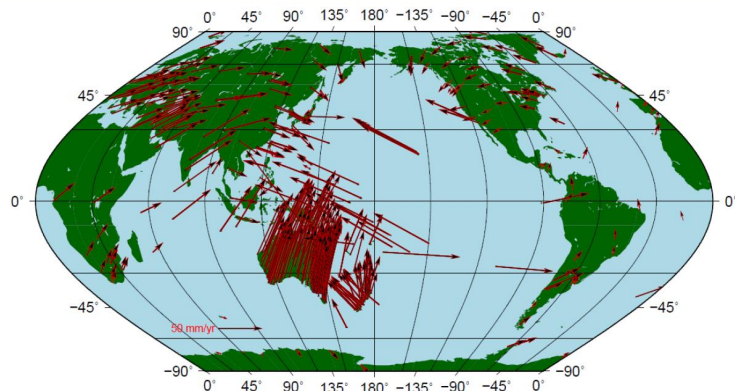
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# Asia Pacific Reference Frame (APREF)

## Asia Pacific Regional Geodetic Project (APRGP)

- Continue realization and densification of Regional geodetic reference frame by APREF and APRGP
- Encourage member countries to participate in continuous and campaign GNSS observations
- Encourage members countries to participate in APREF and/or contribute APREF as data centres and/or analysis centres



**Figure 1.** The distribution of APREF CORS network along with the IGS core stations. The arrows represent the GPS-derived velocity field.

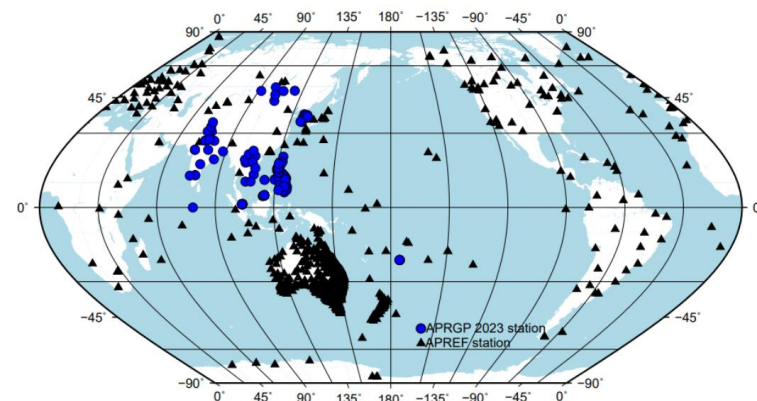


Figure 1 APRGP stations in the APRGP 2023 GPS campaign analysis along with the APREF stations and IGS stations, blue circles are APRGP campaign sites, and black triangles are APREF stations.



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# International Height Reference Frame (IHRF)

- IHRF related geodetic capacity development such as sharing of knowledge and expertise
- Invite IHRF colleagues to capacity development events of UN-GGIM-AP WG1
- Seek possibility to collaborate with regional gravity community in the region, the IAG Subcommittee 2.4e “ Gravity and Geoid in the Asia-Pacific”



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# Capacity Building Opportunities in 2024-

- Organize capacity development events in the region together with IAG, FIG and other stakeholders
- Seminar, workshop and session at the UN-GGIM-AP Plenary in 2025
- Participate in geodetic capacity development events
  - ✓ FIG seminar “Reference Frame in Practice” in Brisbane
  - ✓ PGSC meetings (ex. GETWS Oceania meeting in Suva, 2025)
  - ✓ Subcommittee on Geodesy and Global Geodetic Center of Excellence meeting in Bonn, Germany on March 2025
  - ✓ Geodesy contribution to Disaster risk reduction especially GNSS Early Tsunami Warning systems (ex. GeTEWS meetings)
- Reach out global gravity/geoid community for further opportunities of capacity development in height systems
- Other opportunities?



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