



# **UN-GGIM Asia-Pacific Geodesy Working Group Updates**

**Basara Miyahara**  
**Chair**

**UN-GGIM-AP Working Group on  
Geodetic Reference Frame**



# 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 Sandeep Shrivastava, India <- Mr. Neeraj Gurjar

Mr. Febrylian Fahmi Chabibi, Indonesia <- Mr. Sidik Tri Wibowo

Mr. Seyed Abdoreza Saadat Mirghadim, Islamic Republic of Iran

Mr. Ahmad Sanusi bin Che Cob, Malaysia

Ms. Dalkhaa Munkhtsetse, Mongolia

Dr. Nic Donnely, New Zealand

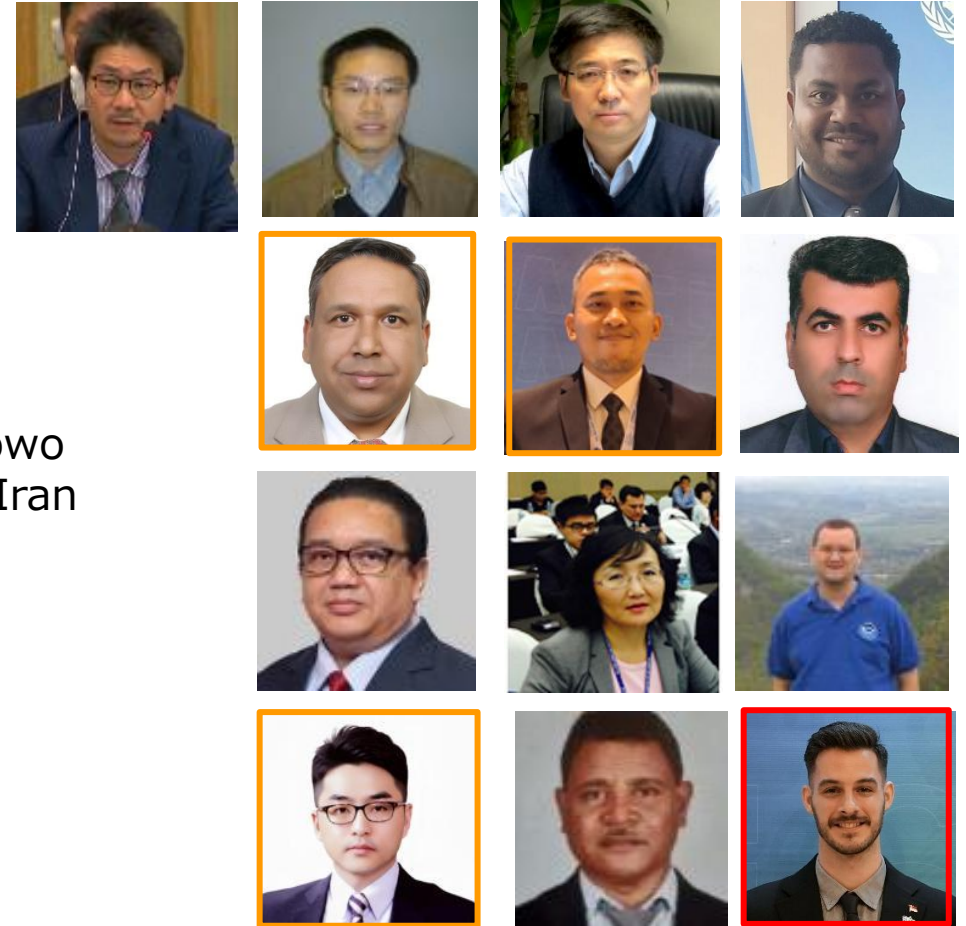
Mr. Sangoh Yi, Republic of Korea <- Ms. Seohee Park

Mr. Evert Mulder, Singapore

**New!**

## Members

Mr. Paulino Dacruz, Timor-Leste



**Updated**

**New!**

# UN-GGIM-AP Working Group 1 – Focus

**UN-GGIM  
Geodesy**

**Regional  
Reference Frame  
(APREF, APRGP)**



**Height System  
Modernization**

**Regional  
Capacity  
Building**

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# UN-GGIM Global Geodesy

## ■ Participate in /Contribute to activities of the UN-GGCE & the Subcommittee on Geodesy

- UN-GGCE International Advisory Committee & Subcommittee on Geodesy Annual meetings
- UN-GGCE Geodesy Capacity Development Workshop for Asia-Pacific on Transitioning to a Modern Geospatial Reference System

## ■ Report activities of UN-GGCE/SCoG to the UN-GGIM-AP

## ■ Invite speakers from UN-GGCE/IAG/FIG to the UN-GGIM-AP meetings

- ✓ UN-GGIM-AP geodetic WG annual sessions
- ✓ UN-GGIM-AP/IAG/FIG capacity development workshops/seminars

**Act as a contact point / gateway to the global geodetic community**

# UN-GGCE Geodesy Capacity Development Workshop

- ✓ Series of Geodesy Capacity Development Workshops by the UN-GGCE
- ✓ How to transition National Systems to a Modern Geospatial Reference System

## “Geodesy Capacity Development Workshop for Asia-Pacific on Transitioning to a Modern Geospatial Reference System”

For Asia Pacific, 30 June - 4 July 2025, Thailand, Bangkok

Topics: Geodetic techniques for Modern Geospatial Reference Systems  
Capacity to explain the value of geodesy to policy makers

- ✓ Provide opportunities of **Interactive Sessions, Expert Discussions, Technical Assistance** and **Networking events**



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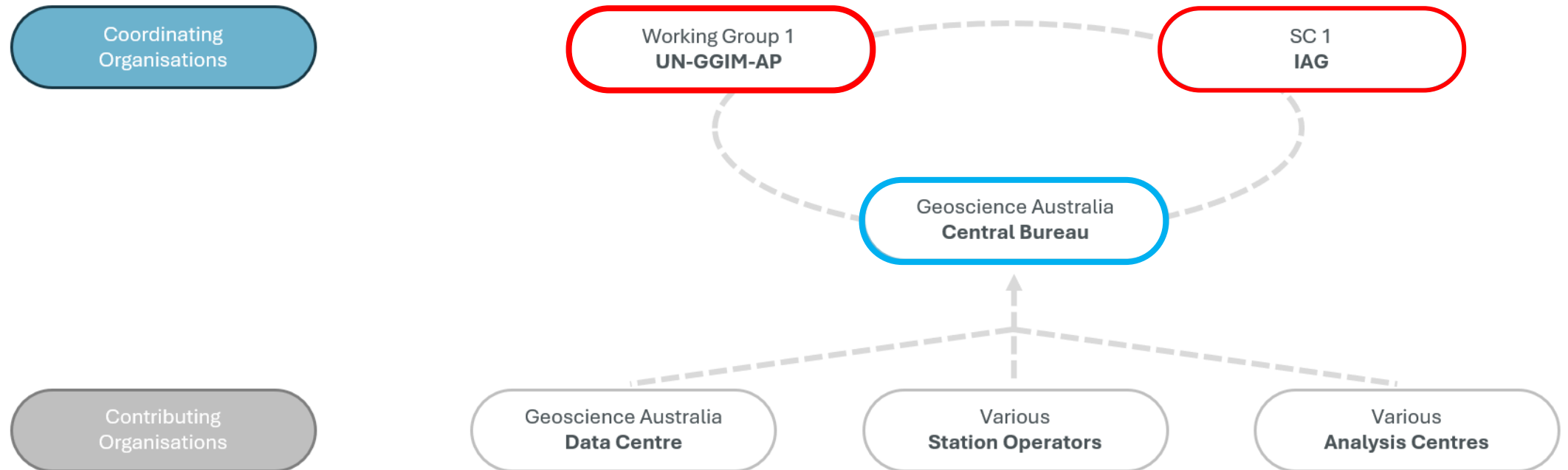
**Regional  
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# APREF - Background

- ✓ The use of positioning technology is growing rapidly in industries such as mining, agriculture, and construction and there is **an increasing demand for positioning services** to inform emergency services, hazard modelers, and land, utility and asset managers.
- ✓ These users have **a need for centimetre level or better geodetic infrastructure**. To provide this, the Asia-Pacific region **needs a consistent, continually refined and easily accessible reference frame**.
- ✓ APREF was mandated by Resolution 1 (Regional Geodesy) of the 18th UN Regional Cartographic Conference (UNRCC) for Asia and the Pacific in October 2009, Bangkok, Thailand. APREF is also endorsed by the IAG/IGS, UNOOSA, and the FIG.
- ✓ The broad objective of APREF is **to create and maintain a densely realised and accurate geodetic framework**, based on **continuous observation and analysis of GNSS data**.
- ✓ APREF aims to encourage the sharing of GNSS data from CORS in the region **providing authoritative coordinates**, and their respective velocities.

# APREF Organisational Structure

- ✓ A collaboration of **the UN-GGIM-AP Geodetic Reference Frame Working Group (WG1)** and **the IAG Sub-Commission on Asia-Pacific Regional Reference Frame (SC1.3)**
- ✓ “Day-to-day” coordination of APREF by **the Central Bureau within Geoscience Australia**
- ✓ The Central Bureau ensures availability of APREF products to the global geodetic community.



A. Riddell, R. Ruddick, G. Hu and B. Miyahara (2025): The Asia-Pacific Reference Frame (APREF) project - Learnings from operation over 15 years and the recent progress (IAG Science Symposium 2025)

# APREF - Overview

- Joint initiative between UN-GGIM-AP and IAG
- Regional geodetic reference frame
- Realized by continuous GPS observation of over **1,100 stations in 39 countries**
- Densify and improve access to ITRF
- Routine processing by 3 Local Analysis Centres\* and combination by Geoscience Australia
- Weekly coordinates, long-term time series (coordinates and velocity with uncertainties) for all contributing stations can be accessed at:

<https://data.gnss.ga.gov.au/docs/home/index.html> (SINEX)

<https://portal.gnss.ga.gov.au/timeseries>

- APREF solutions aligned to **ITRF2020/IGb20** since Feb. 2025 (GPS week 2352)
- Planned changes: upgrade from Bernese software version 5.2 to 5.4 in March 2026

transition to ITRF2020/IGc20 in May 2025

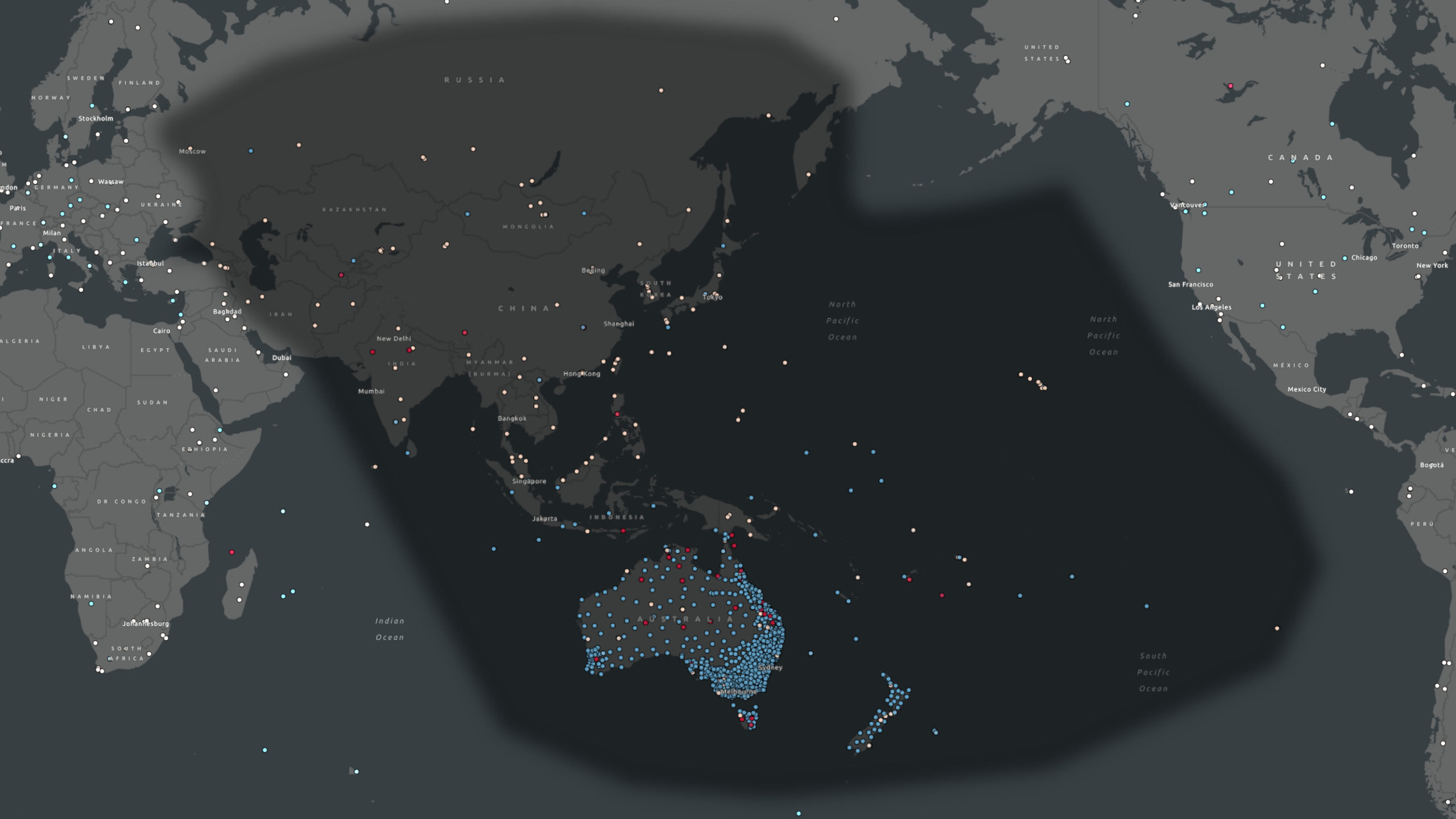
- Information on APREF and how to participate:

<https://www.ga.gov.au/scientific-topics/positioning-navigation/positioning-australia/geodesy/asia-pacific-reference-frame>

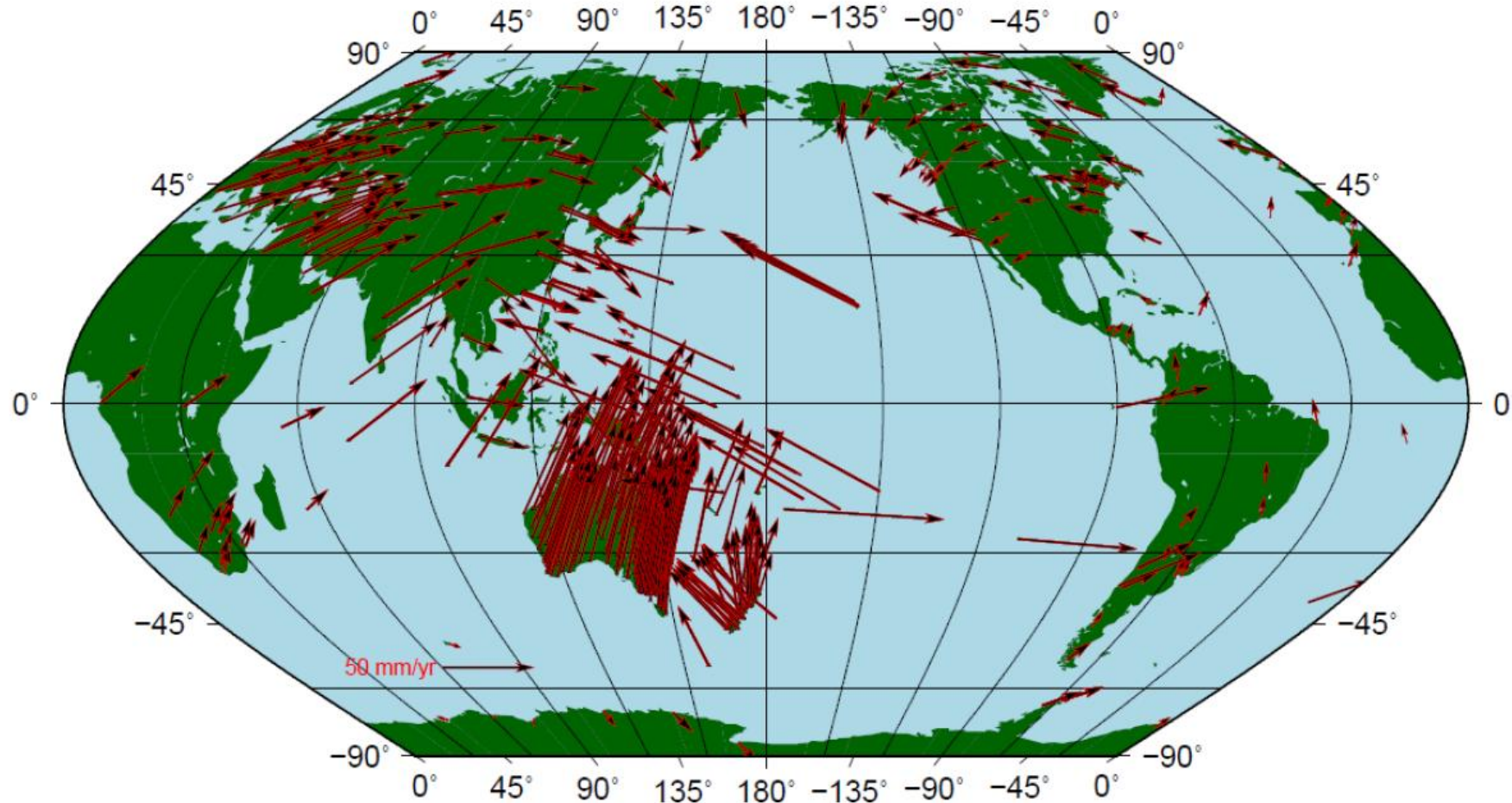
- \* Geoscience Australia  
Office of Surveyor-General Victoria, Australia  
Institute of Geodesy and Geophysics, Chinese Academy of Sciences  
Geospatial Information Authority of Japan (under evaluation)

APREF webpage





# APREF – Station distribution and velocity field



**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

# Value in Contributing to APREF



## For Countries / Regions

- Supporting a stronger regional positioning capability (strengthening the supply chain).
- Alignment of national datums to the ITRF.
- Support understanding of Earth system processes in the Asia-Pacific (e.g. sea level, earthquakes).



## For Agencies / Station Operators

- A framework to facilitate the open sharing of geodetic data.
- A framework to manage station information (metadata).
- Provides validation and verification (as a gateway for IGS acceptance).
- Station coordinates and uncertainties provided in alignment to ITRF.

A. Riddell, R. Ruddick, G. Hu and B. Miyahara (2025): The Asia-Pacific Reference Frame (APREF) project - Learnings from operation over 15 years and the recent progress (IAG Science Symposium 2025)

# APREF - How to contribute

To contribute to APREF you need to contact Geoscience Australia on [gnss@ga.gov.au](mailto:gnss@ga.gov.au) and GA will guide you through the process. This will typically start with **providing a letter of intent to contribute**.

## Types of contributions:

- Contribute data from a GNSS station on an ongoing basis (Station Operator).
- Provide access to GNSS data from GNSS stations across a region (Data Centre).
- Routinely analyze some, or all, of the APREF GNSS station data (Analysis Centre).

R. Ruddick, A. Riddell and G. Hu (2025): Asia-Pacific Reference Frame Project  
- fifteen years of regional geodetic collaboration (Reference Frame in Practice Seminar)

# Asia Pacific Regional Geodetic Project (APRGP)

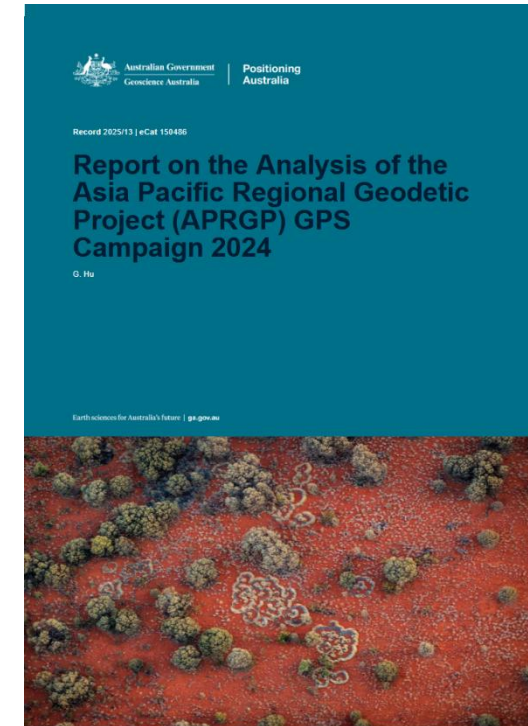
- Annual GNSS campaign
- Densify ITRF and improve access to ITRF
- Data are analysed by Geoscience Australia

## **APRGP2024:** 8 to 14 September 2024

- Processed by Guorong Hu, Geoscience Australia
- 74 GPS campaign sites in 11 countries:  
Brunei, Cambodia, Laos, Myanmar, Papua New Guinea, Philippines, Singapore, Sri Lanka, Timor-Leste, Tonga and Vietnam
- RMS reputability of station coordinates:  
2.4 mm, 2.7 mm and 6.8 mm in NS, EW and UP
- Final report is available at UN-GGIM-AP website

## **APRGP2025:** 7 to 13 September 2025

- Data submission from 10 countries:  
Bhutan, Brunei, India, Mongolia, Myanmar, Papua New Guinea, Philippines, Singapore, Sri Lanka, and Viet Nam
- Under processing by Guorong Hu, Geoscience Australia



APRGP2024

# Asia Pacific Regional Geodetic Project (APRGP)

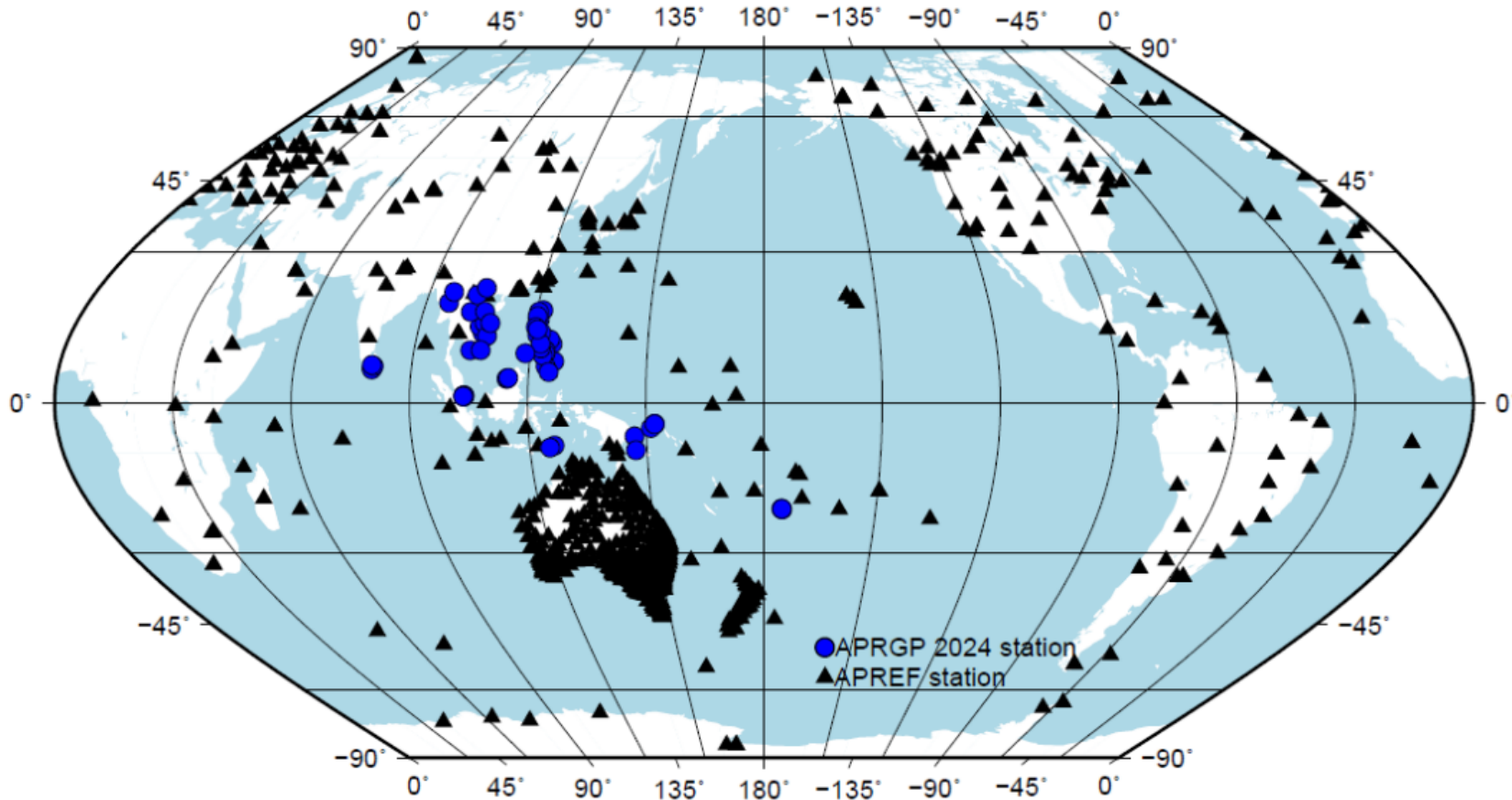


Figure 1. APRGP stations in the APRGP 2024 GPS campaign analysis along with the APREF stations and IGS stations, blue circles are APRGP campaign sites, and black triangles are APREF stations.

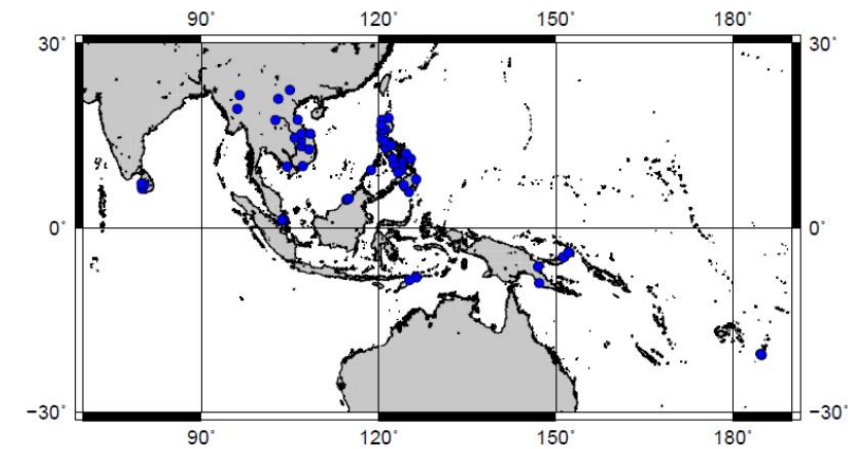


Figure 2. APRGP stations location distributions in the APRGP 2024 GPS campaign.

G. Hu: Report on the Analysis of the Asia Pacific Regional Geodetic Project (APRGP) GPS Campaign 2024

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**Height System  
Modernization**

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# Height System Modernization

- Strong needs to height system modernization in countries in the region
- The WG discussed possible activity on this challenge at the WG annual session in 2025
- First step is to capture situation in the region, country needs, challenges and issues regarding height system in the member countries
  
- Questionnaire on height system to the AP member countries
  - ✓ Height related geodetic data in countries
  - ✓ barrier to share them with other countries
  - ✓ Challenges related to national height datum
  - ✓ Requirements to height systems and their priorities
  - ✓ Benefits by modernized height systems
  - ✓ Value for member countries to establish regional geoid model
  - .....
  
- First action is to develop questions
  
- Challenge: No one take a lead role so far
- Continue to seek a person to take the role

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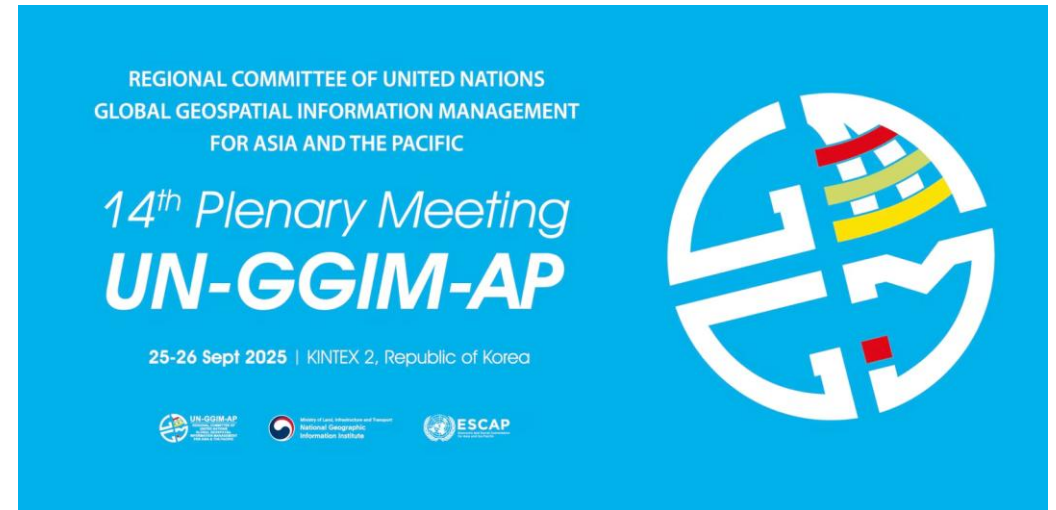
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# UN-GGIM-AP 14<sup>th</sup> Plenary – Republic of Korea



- Global Seminar - Geo Forum for Asia and the Pacific
  - Seminar4: The role and future of the Geodetic Reference Frame for sustainable development
- UN-GGIM-AP 14<sup>th</sup> Plenary Meeting
  - WG Annual Session of the UN-GGIM-AP Geodesy Working Group

# Global Seminar - Geo Forum for Asia and the Pacific

- Geodesy session at the Global seminar on 24 September 2025
- Presentations: UN-GGIM-AP/APREF, UN-GGCE, national reference frame (ROK)..



# UN-GGIM-AP 14<sup>th</sup> Plenary Meeting

## Geodetic WG Annual Session

- 14 participants from 8 countries and IAG
- Report of WG1, focus of WG1 for coming year
- Country report from WG members: Australia, China, India, Iran, Japan, Mongolia, Republic of Korea
  
- Progress and challenges:
- Progress in development of geodetic infrastructure in member countries (i.e. GGOS core site in India, VLBI in Indonesia, GNSS CORS densification in China, ..)
- Best practices to put geodesy in government policy documents as fundamental infrastructure (i.e. Mongolia)
  
- Challenge in utilization and/or integration of GNSS CORS network among government, local government, academia, and private sector
- Crustal dynamics and maintenance of geodetic reference frame are common challenge in such tectonically active countries
- At the same time, geohazards (crustal dynamics) are incentive for these countries to invest geodetic network esp. GNSS CORS
- Discussion on height system modernization, esp. on value of regional geoid and practical solution for the region
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# UN-GGIM-AP 14<sup>th</sup> Plenary Meeting

## Geodetic WG Resolution

- The WG keeps the most of paragraphs in the resolution and continues to recommend the member countries operation/maintenance of geodetic infrastructure, data sharing, capacity development, etc.
- A new paragraph on geodesy in the resolution
- j) Encourage member States to contribute to the Working Group on frequency protection for geodetic observation under the Subcommittee on Geodesy, and work together with their spectrum authorities to take step to protect GNSS and geodetic VLBI through international frameworks and national policies on frequency protection;
- A new preamble on geodesy in the resolution

*Recognizing* the progress in cooperation among broader global geodetic stakeholders achieved by the UN Global Geodetic Centre of Excellence at the UN Campus in Bonn, which is a key enabler for the implementation of the General Assembly Resolution A/RES/69/266;



**UN-GGIM-AP**

REGIONAL COMMITTEE OF  
UNITED NATIONS  
GLOBAL GEOSPATIAL  
INFORMATION MANAGEMENT  
FOR ASIA & THE PACIFIC

**THANK YOU!**

