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# Updates on APREF/APRGP projects

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APREF Central Bureau

12<sup>th</sup> Plenary Meeting of UN-GGIM-AP WG1, 6-10 November 2023, Bali, Indonesia

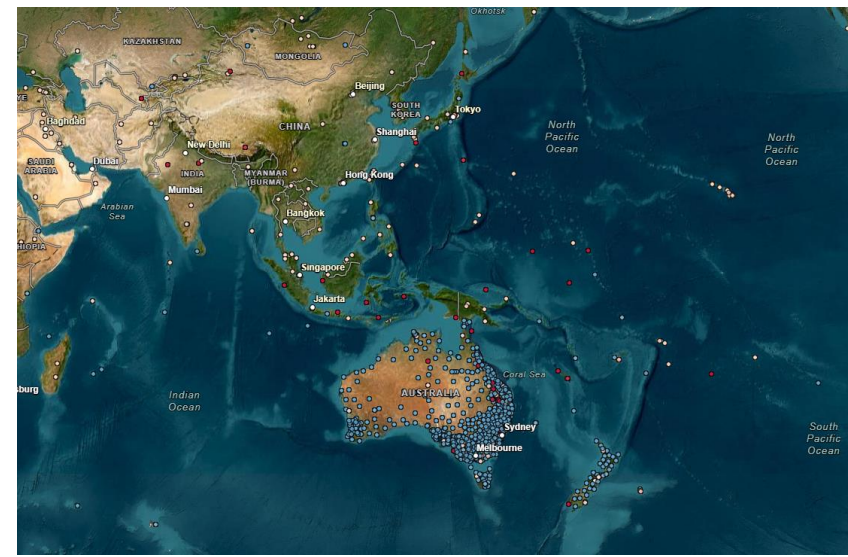


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# Why we need APREF and APRGP projects

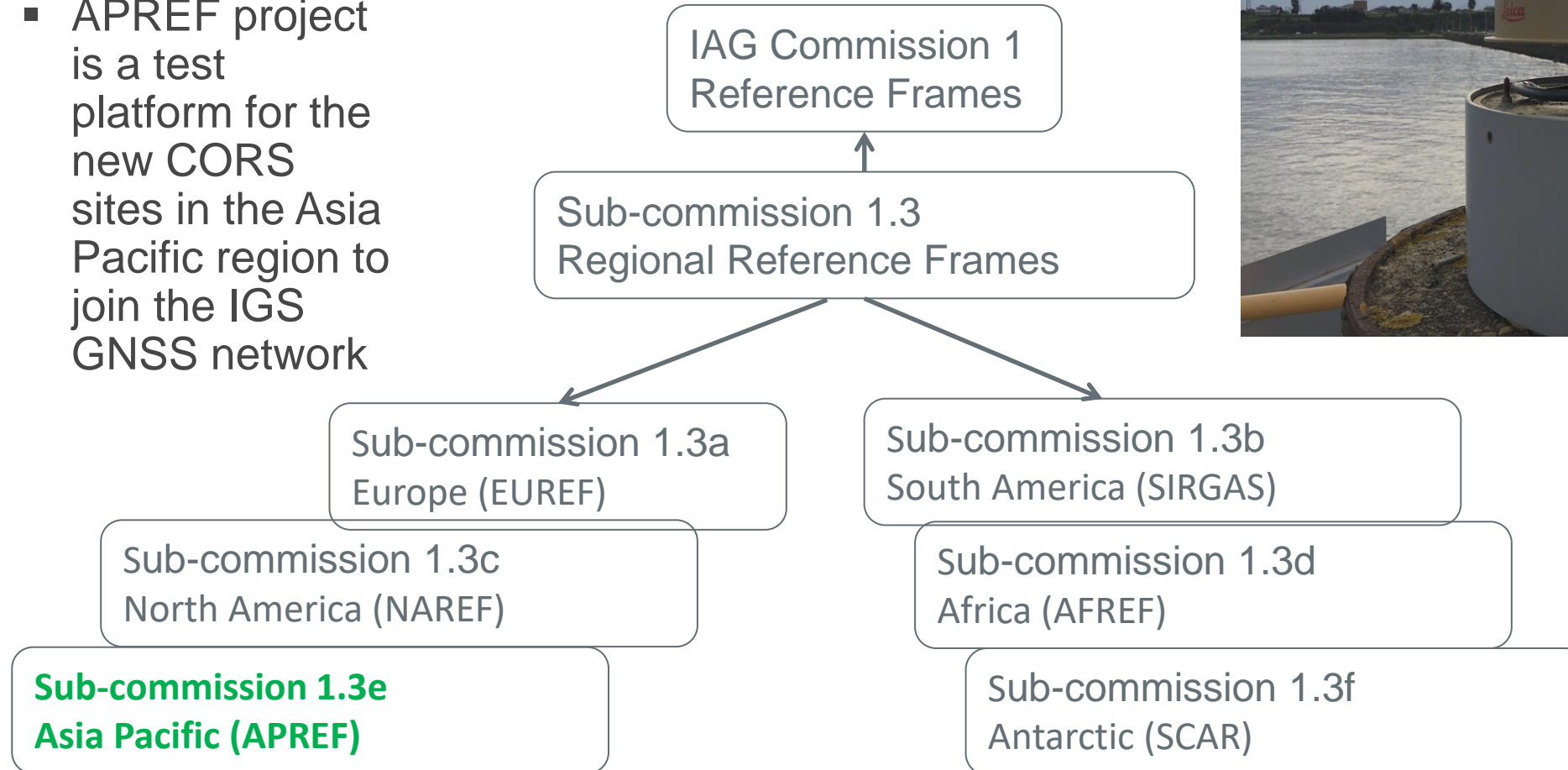
- The goals of the two projects are to:
  - link regional/national geodetic datum to the ITRF;
  - provide access to the ITRF; and
  - densify the ITRF in the Asia Pacific region.
- GNSS CORS based APREF (Asia Pacific Reference Frame) project was initiated in 2010 (**13<sup>th</sup>** year in 2023)
  - Encouraging member countries to share data and join the APREF project where possible
- APRGP (Asia Pacific Regional Geodetic Project) GNSS campaign has run since 1997 (**27<sup>th</sup>** year in 2023)
  - APRGP is an annual GNSS campaign with only one week of data needed each year
  - APRGP project is for those countries unable to participate in the APREF project





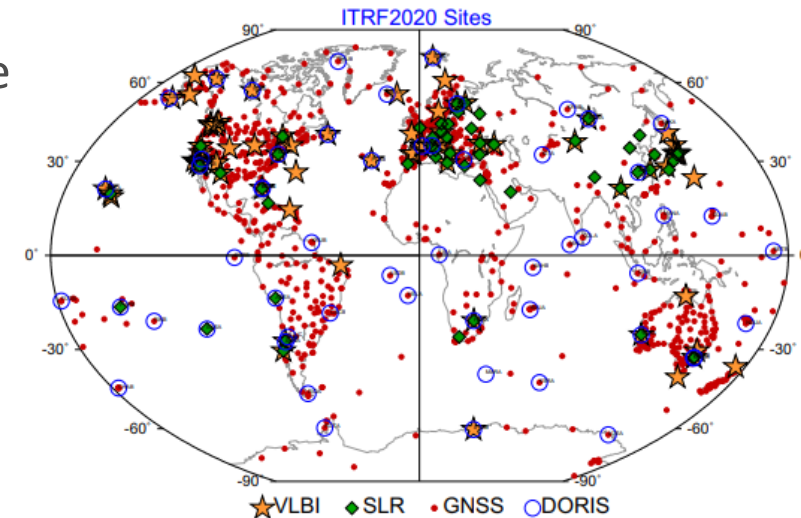
# How APREF densifies the ITRF

- APREF project is a test platform for the new CORS sites in the Asia Pacific region to join the IGS GNSS network



# How APREF/APRGP projects link to ITRF2020/IGS20

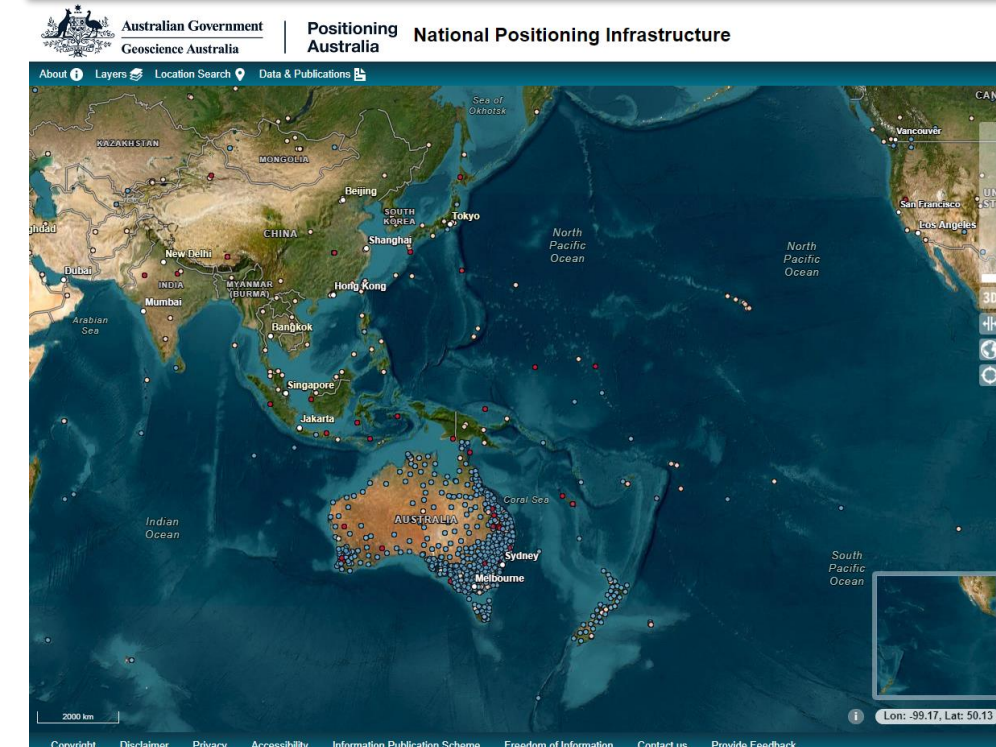
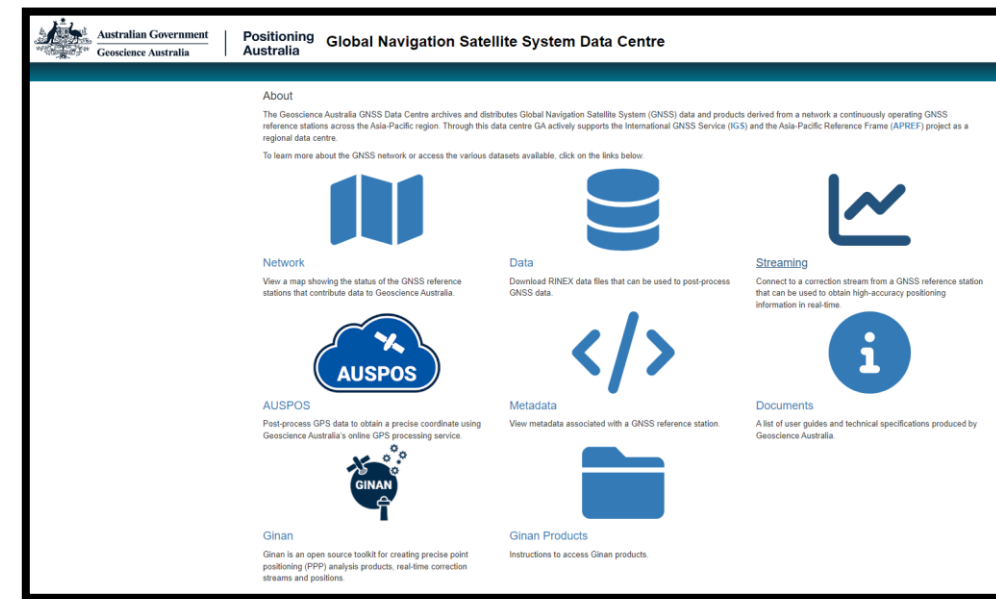
- Processing the APREF/APRGP GNSS network together with more than 300 IGS core sites, where data available
- Scientific software Bernese V5.2 used for both APREF and APRGP projects data processing
- Using IGS20 core sites as reference frame (IGS20 is the IGS realization of ITRF2020)
- Conforming to the IERS2010 conventions
- Accounting for solid earth tide displacements (TIDE2000) and Ocean tide loading displacements (FES2014b model)
- Troposphere corrections estimated with wet-NIELL mapping function in intervals of 1 hour
- Using absolute antenna calibration PCV models (IGS20.atx, <https://files.igs.org/pub/station/general/igs20.atx>)



Altamimi et al., 2023

# The status of APREF project – Data Centre

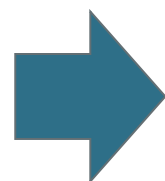
- Accessing APREF data centre has changed since 01 Oct 2020:  
<https://gnss.ga.gov.au/>
- All RINEX version 2 data files on the new access points have been converted from .Z compression to .gz compression
- Moving RINEX data format from v2 to v3 with long-name conventions following IGS guidelines
- Encouraging contributions of real-time data stream to the APREF if possible
- Call for participation for new nominations of regional APREF data centres in the Asia Pacific



# The status of APREF project - Analysis

- Currently three Local Analysis Centres (LACs) of APREF project:
  - Geoscience Australia (Aus);
  - Department of Environment, Land, Water and Planning, Victoria, Australia (Vic)
  - The Institute of Geodesy and Geophysics, Chinese Academy of Sciences (IGG)
- We welcome more LACs joining the APREF project

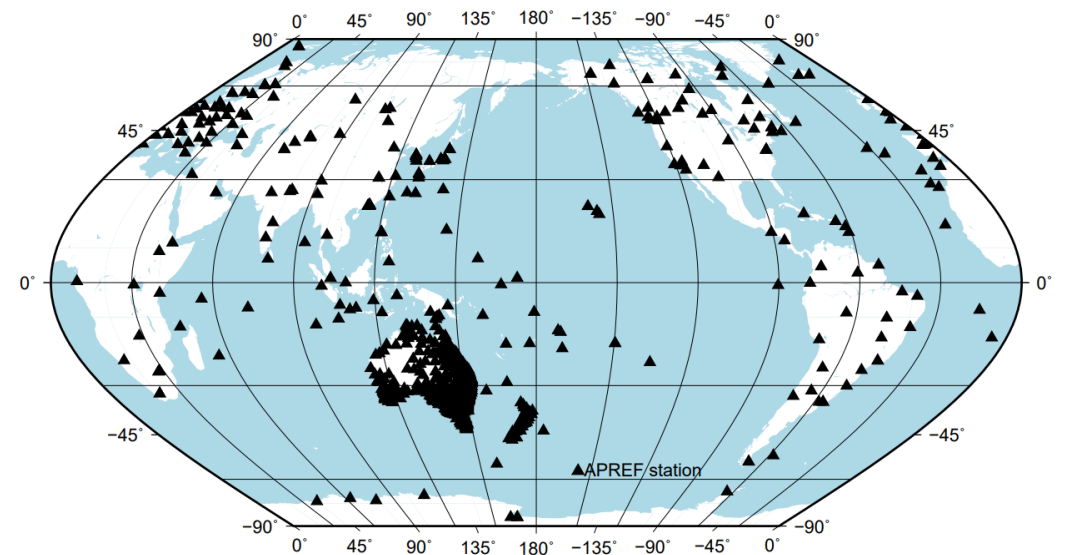
The comparison of the LACs solutions with the published IGS weekly solutions for common IGS stations for the GPS week 2274 (06 Aug – 12 Aug, 2023)



Solutions of LACs	Number of common IGS stations	Weighted RMS (mm)		
		North	East	Up
AUS	175	1.2	1.3	8.5
VIC	31	1.8	0.9	0.8
IGG	201	0.5	0.5	6.3

# The status of APREF project - Products

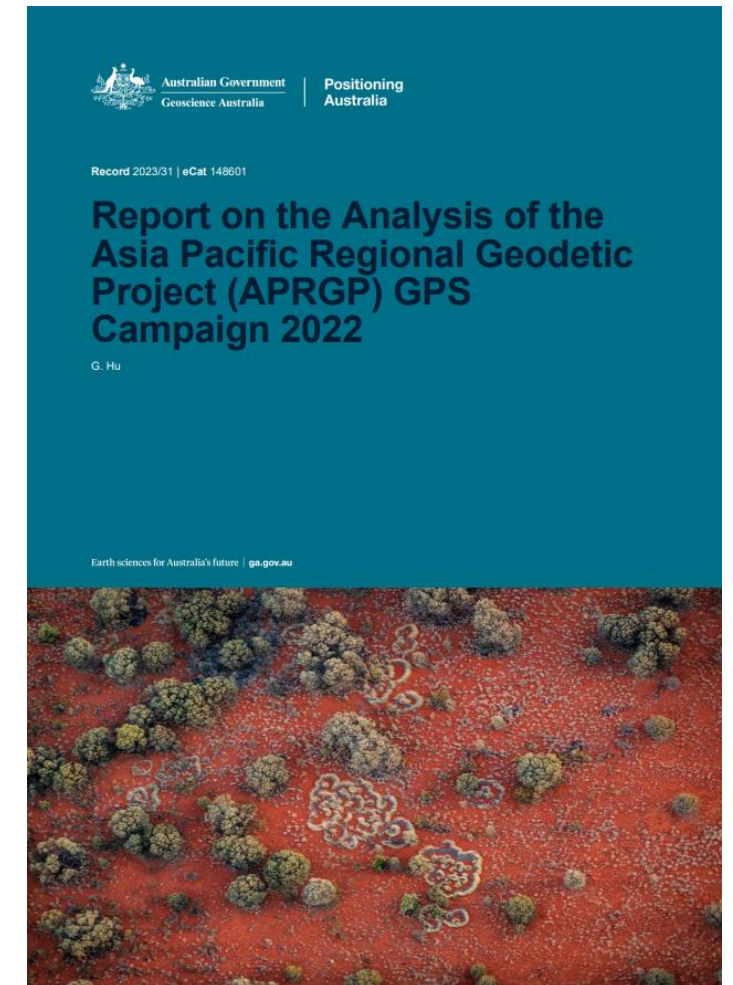
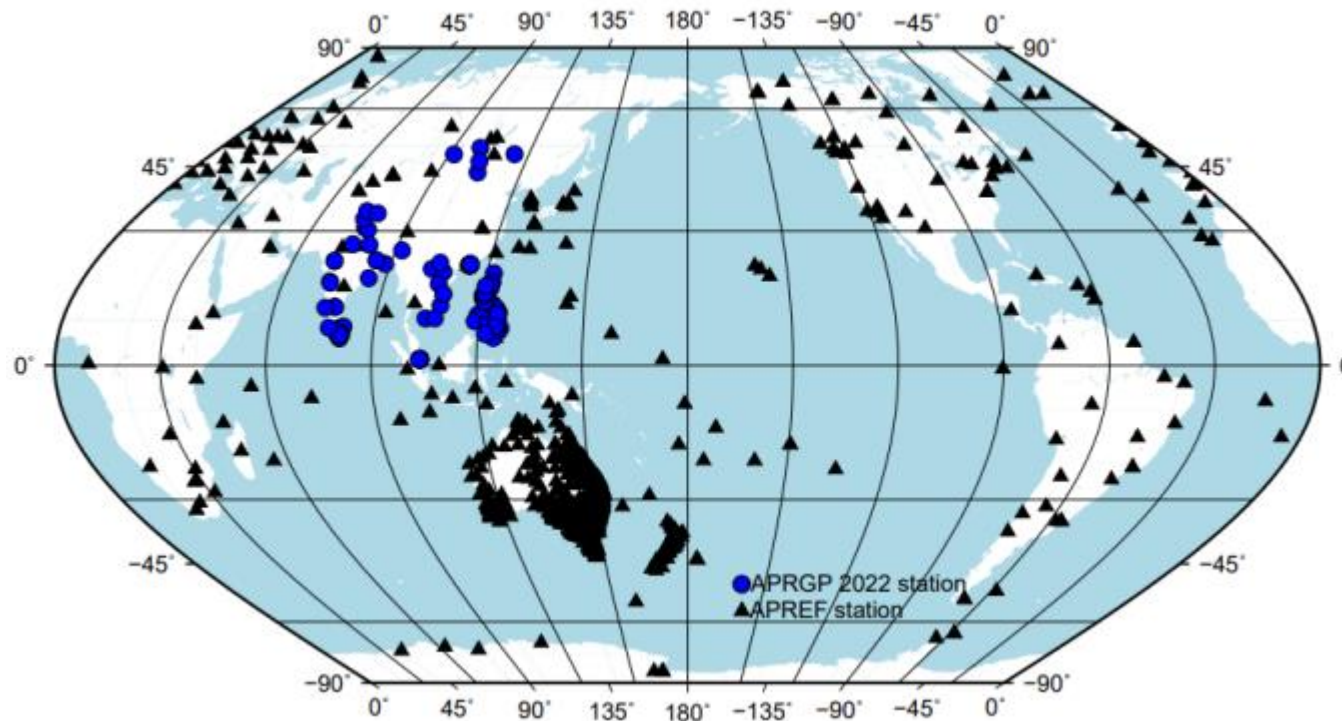
- ~1050 stations in the APREF weekly routine analysis including ~332 IGS20 core sites (as of Oct 2023)
- time series plots via the link: <https://portal.ga.gov.au/persona/pa>, using search function to find the site, then click "Coordinate Timeseries"
- the weekly solutions in SINEX format for the APREF sites from the link: [https://ga-gnss-products-v1.s3.amazonaws.com/index.html#public/\(gpsweek\)](https://ga-gnss-products-v1.s3.amazonaws.com/index.html#public/(gpsweek))





# APRGP GNSS 2022 campaign

- APRGP 2022 campaign ran from 11 September to 17 September 2022
- Data contributions from seven countries and regions
- Analysis report of 2022 GNSS campaign published and circulated





# APRGP GNSS 2023 campaign

- APRGP 2023 campaign ran from 10 September to 16 September 2023
- As of 10 October 2023, data contributions received from the following countries and regions: Korea, Laos, Mongolia, Singapore, and Vietnam.
- Ensuring sending right metadata in particular antenna type and antenna heights information
- Confirming right RINEX name convention and format when submitting data, otherwise no solutions in the analysis report
- Cut off data contributions at the end of Feb 2024

# How to access APREF/APRGP data and products

- Annual APRGP campaign solutions in SINEX format are available from the link: <https://ga-gnss-products-v1.s3.amazonaws.com/index.html#public/APRGP/>
- Annual APRGP campaign analysis reports are available from the link: <https://www.un-ggim-ap.org/wg/working-group-1-geodetic-reference-frame>
- APREF data are available <https://data.gnss.ga.gov.au/docs/home/index.html> , details on how to access the data can be found at <https://data.gnss.ga.gov.au/docs/>
- APREF solutions can be found from the link: <https://ga-gnss-products-v1.s3.amazonaws.com/index.html#public/> (gps week)
- For more information on APREF project, please refer to: <http://www.ga.gov.au/scientific-topics/positioning-navigation/geodesy/asia-pacific-reference-frame>

# Challenges

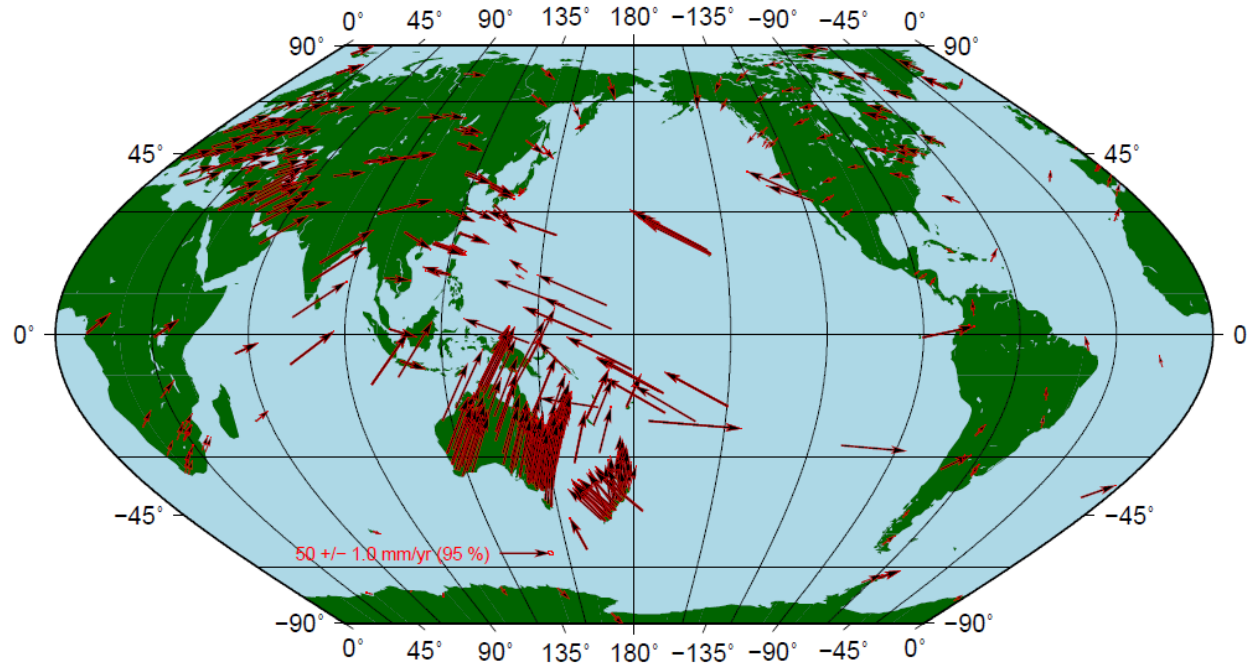
- Issues remain regarding free and open access to data for many Asia-Pacific countries
- APRGP data sets from some countries NOT meet RINEX standards, which may need technical training under the capacity building program of UN-GGIM-AP
- Need to identify additional analysis centres
  - limited redundancy with only 3 analysis groups



# Call to Action

## The APREF Central Bureau

- Welcomes new site additions to APREF
- Encourages data sharing, in particular, contributions of real-time data to APREF
- Encourages member states to consider becoming a regional data centre or local analysis centre
- Encourages member states to participate in the annual APRGP campaigns if they are not able to participate in APREF





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Any feedback/questions?

## Further information

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