The Asia Pacific Reference Frame (APREF)

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UN-GGIM | United Nations Initiative on Global Geospatial Information Management

"Positioning geospatial information to address global challenges"

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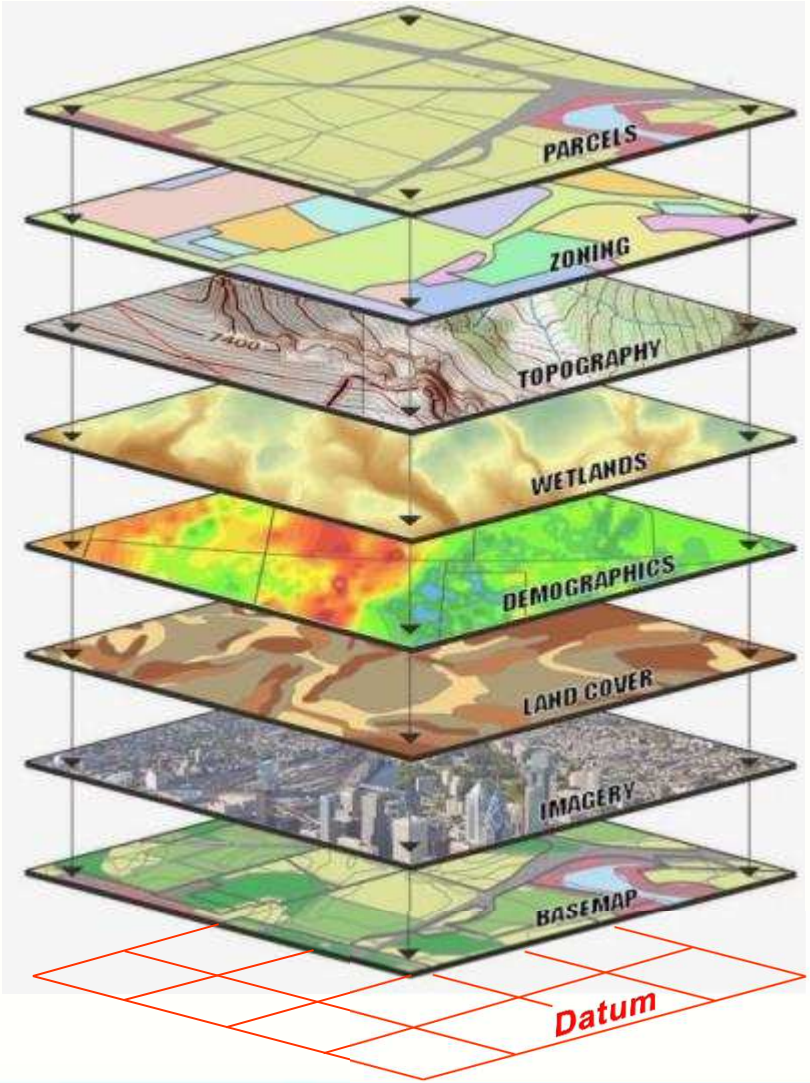
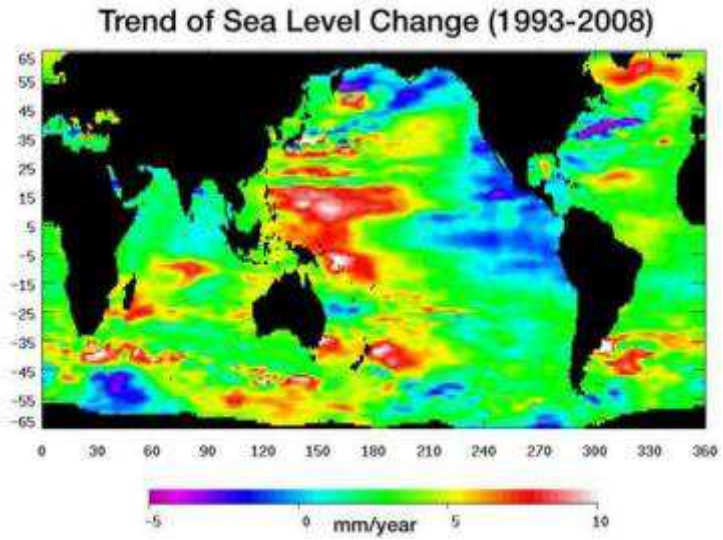
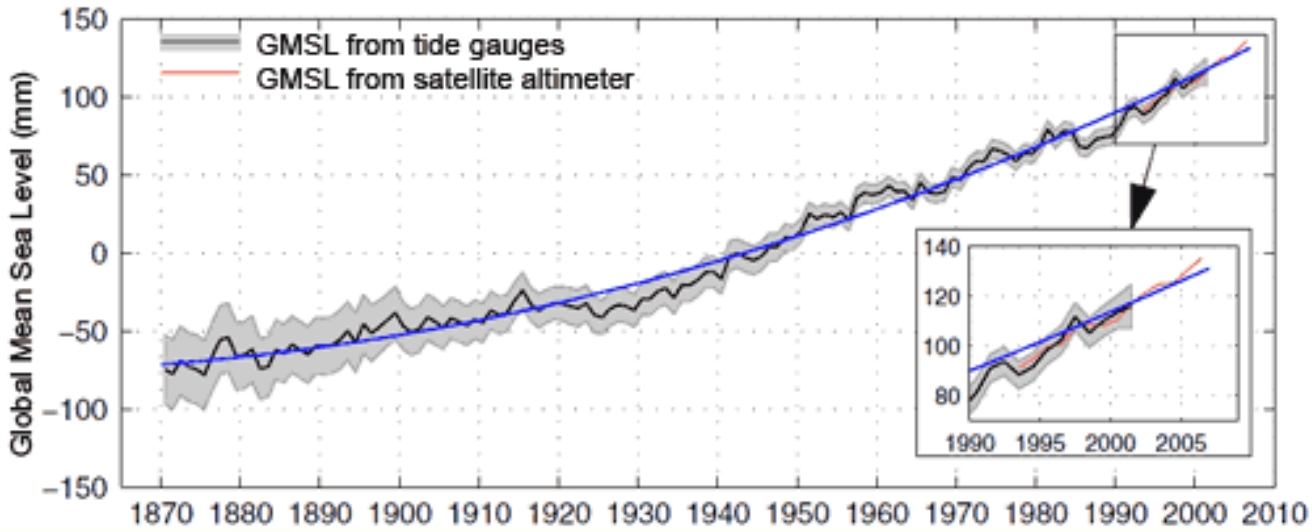
Importance of Datum

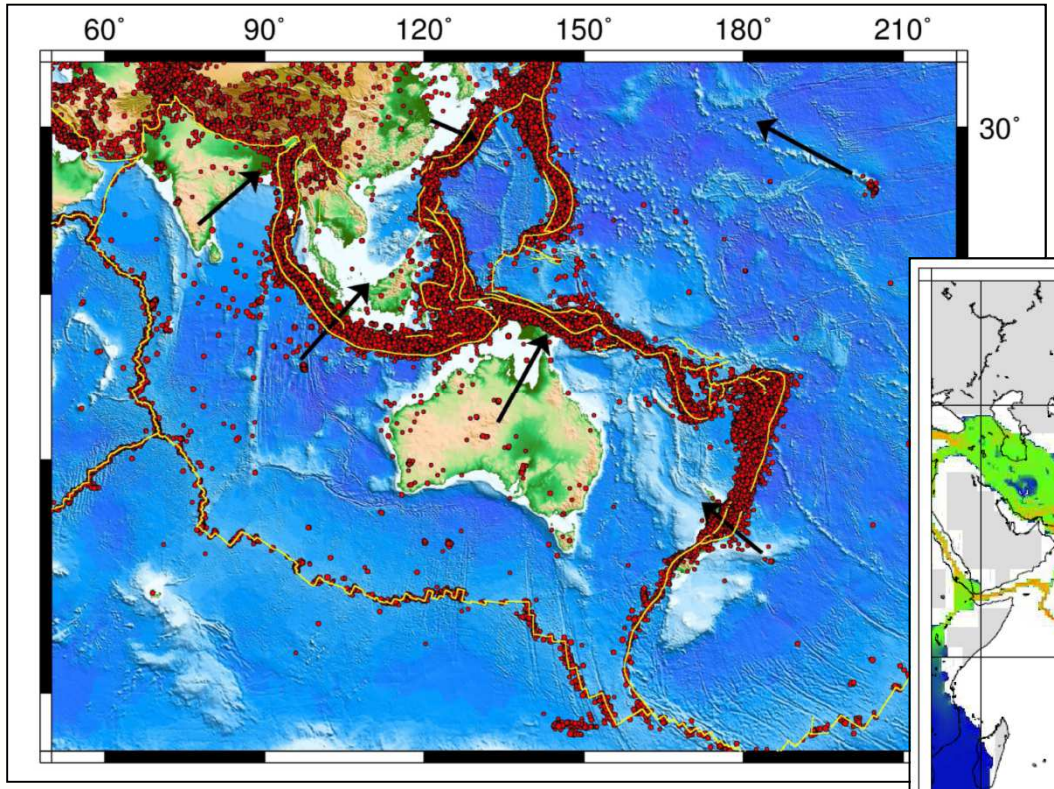


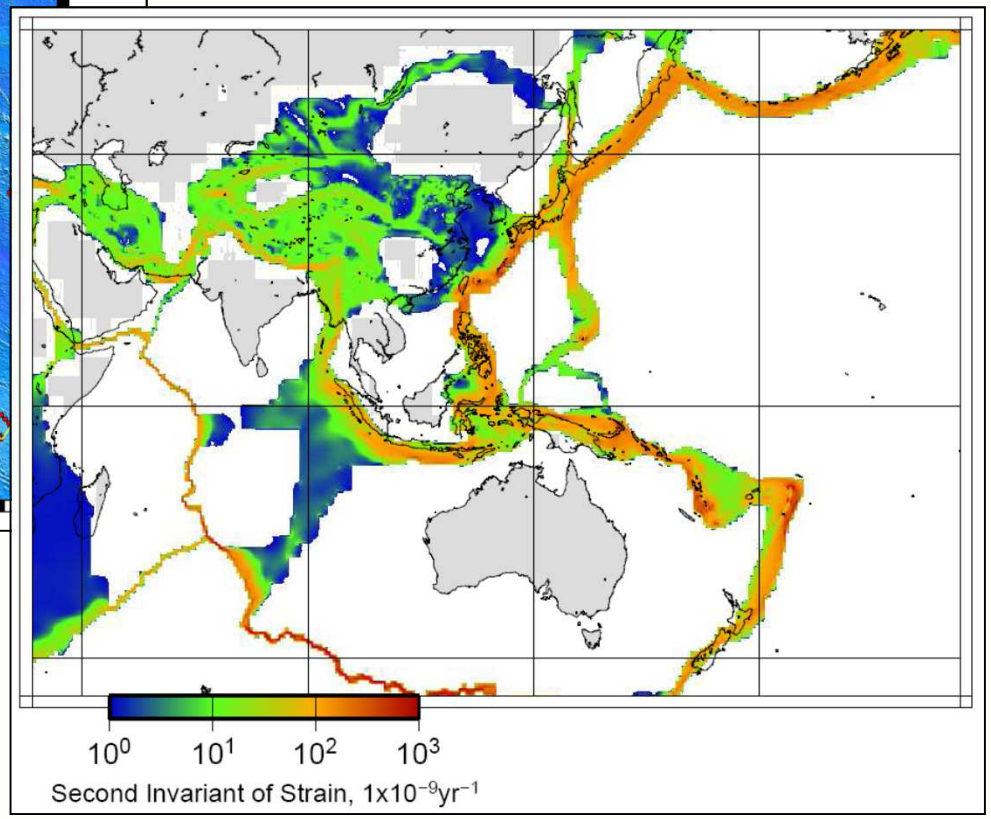
Understanding the Earth System





Crustal Strain and Earthquakes: Asia Pacific

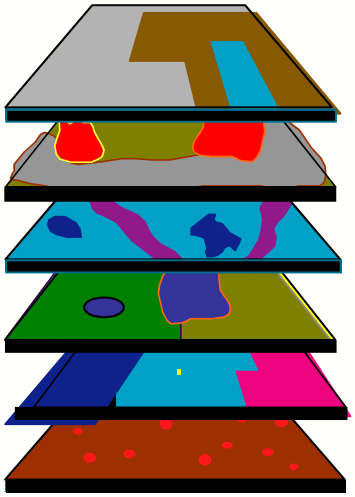




United Nations – Sustainable Development Goals

High quality, timely and reliable data

Geodetic
Elevation
Water/Ocean
Land use/cover
Transport
Cadastre
Population
Infrastructure
Settlements
Admin. Bdys.
Imagery
Geology/soils
Observations
etc.



Asia Pacific Reference Frame

- **A**sia **P**acific **RE**ference **F**rame – **APREF**

- Analogous to other ITRF based regional reference frames EUREF, SIRGAS, NAREF, AFREF, etc.

- Joint initiative of the UN-GGIM Asia Pacific and the International Association of Geodesy (IAG) supported by **FIG**

Asia Pacific Reference Frame: Objectives

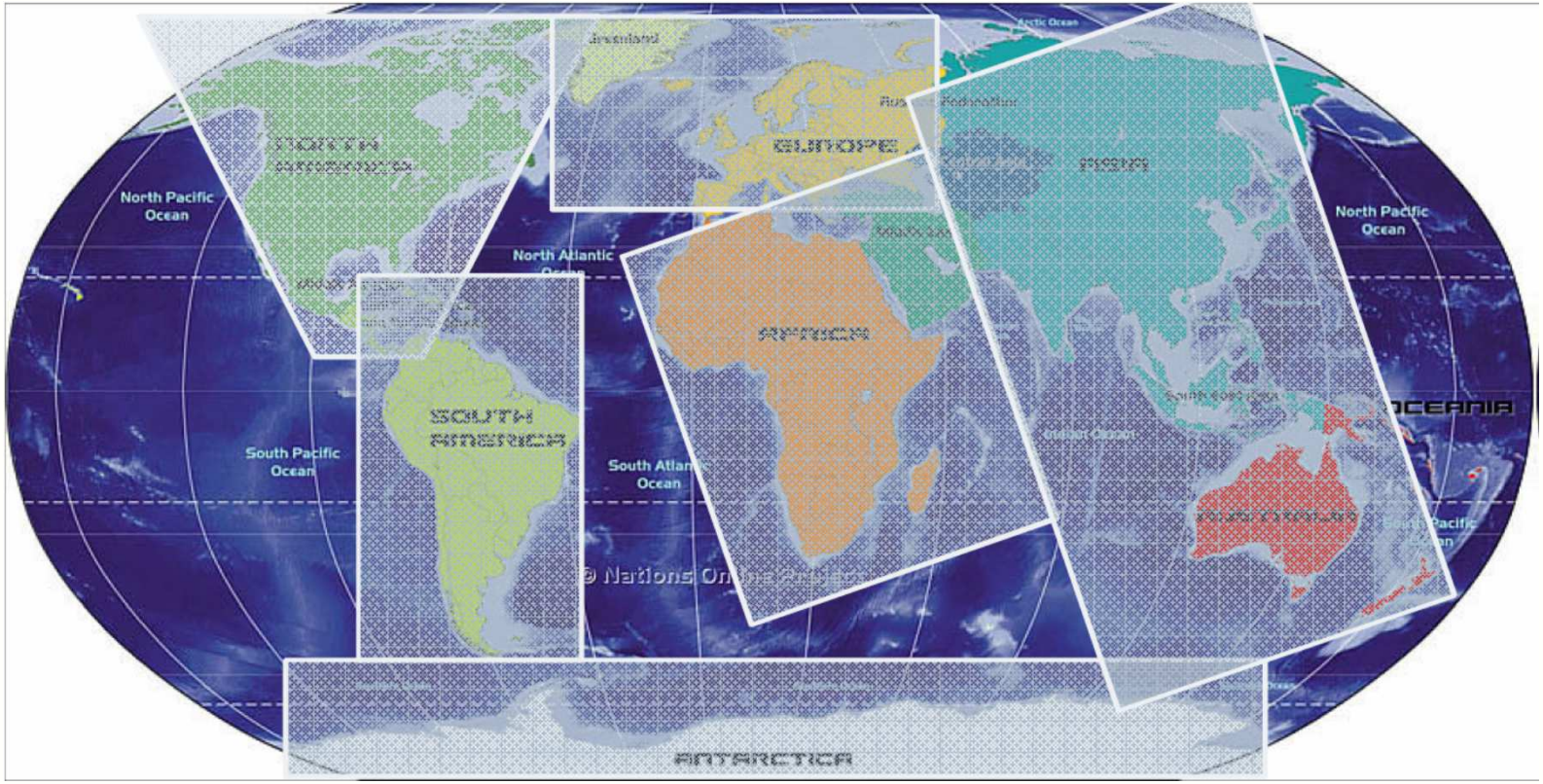
- Create and maintain an accurate and densely realised geodetic framework, based on continuous observation and analysis of GNSS data
- Densification of the ITRF in the Asia-Pacific
- Encourage regional data sharing of GNSS CORS data and its analysis

Asia Pacific Reference Frame: Participants

- Data from 28 countries
- 16 national agencies participating
- Approximately 420 Asia Pacific stations
- Approximately 600 stations routinely analysed
- Four independent analysis centres
  - Geoscience Australia
  - Curtin University
  - Department of Sustainability and Environment in Victoria, Australia
  - Institute of Geodesy and Geophysics, Chinese Academy of Sciences

Regional Reference Frame Densification

ITRF = APREF, AFREF, EUREF, NAREF SIRGAS,…



Asia Pacific Reference Frame

- Open to all organisations (government, research, private) involved with CORS data collection and/or analysis
- APREF encourages those organizations who are prepared to participate on an ongoing basis (at least two years)
  - →GNSS CORS stations data;
  - →Provide access and on-line archiving of APREF data and products for users; and/or
  - →Routinely analyse some, or all, of the APREF GNSS CORS data

Benefits of APREF Participation

- Improved and continuous link between national datums and CORS networks to the ITRF
- Contribute to a open and dense ITRF network in Asia and the Pacific
- Independent quality monitoring
- Improved access to GNSS data
- Providing an opportunity and a forum towards improving the regional geodetic infrastructure

APREF website for more information

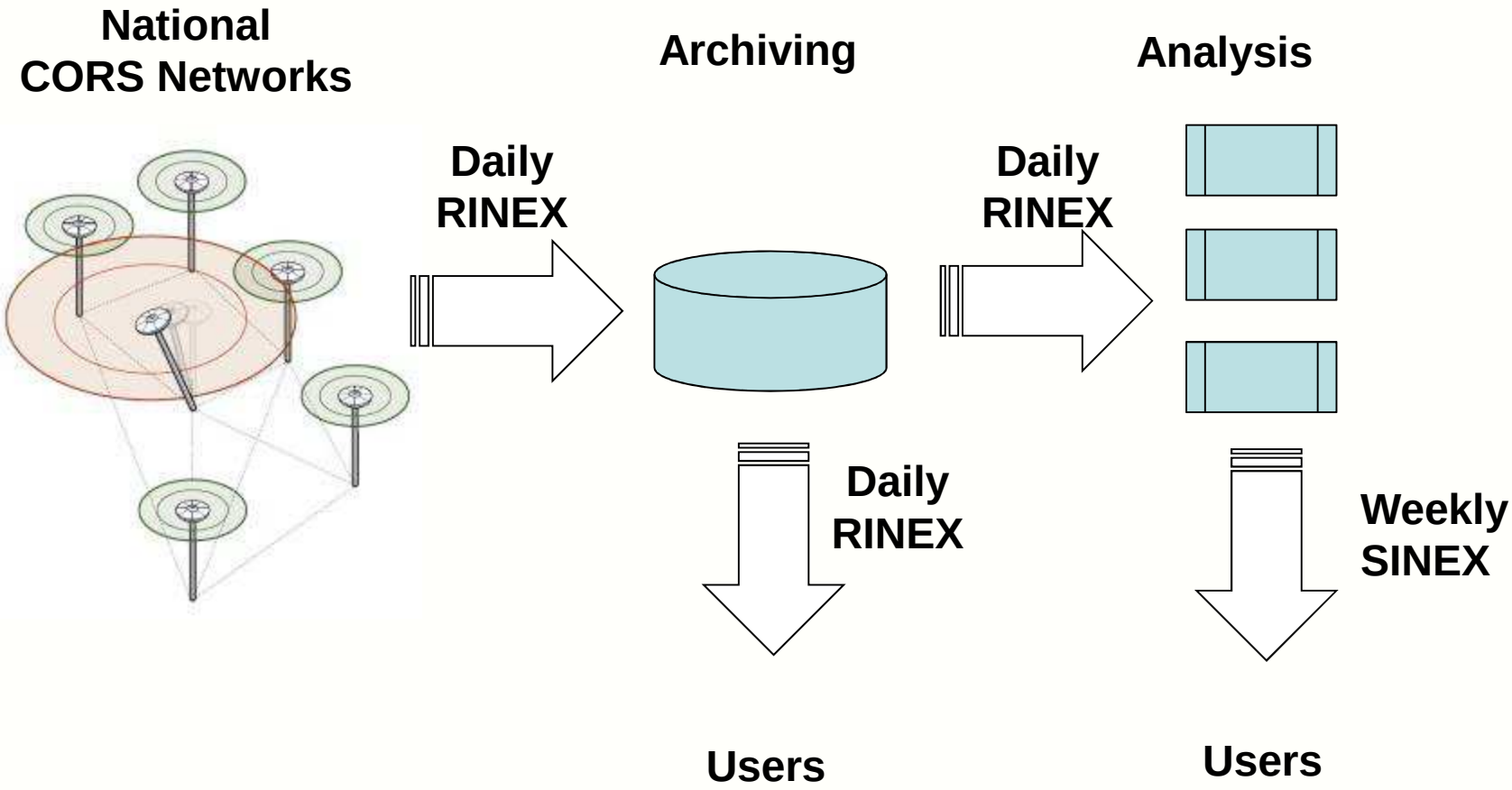
- http://www.ga.gov.au/earth-monitoring/geodesy/asia-pacific-reference-frame.html

FOMO,
Macau, China

KUAL, Malaysia

PTAG, Philippines

Asia Pacific Reference Frame: Data Flow



Where to Find APREF Data and Products

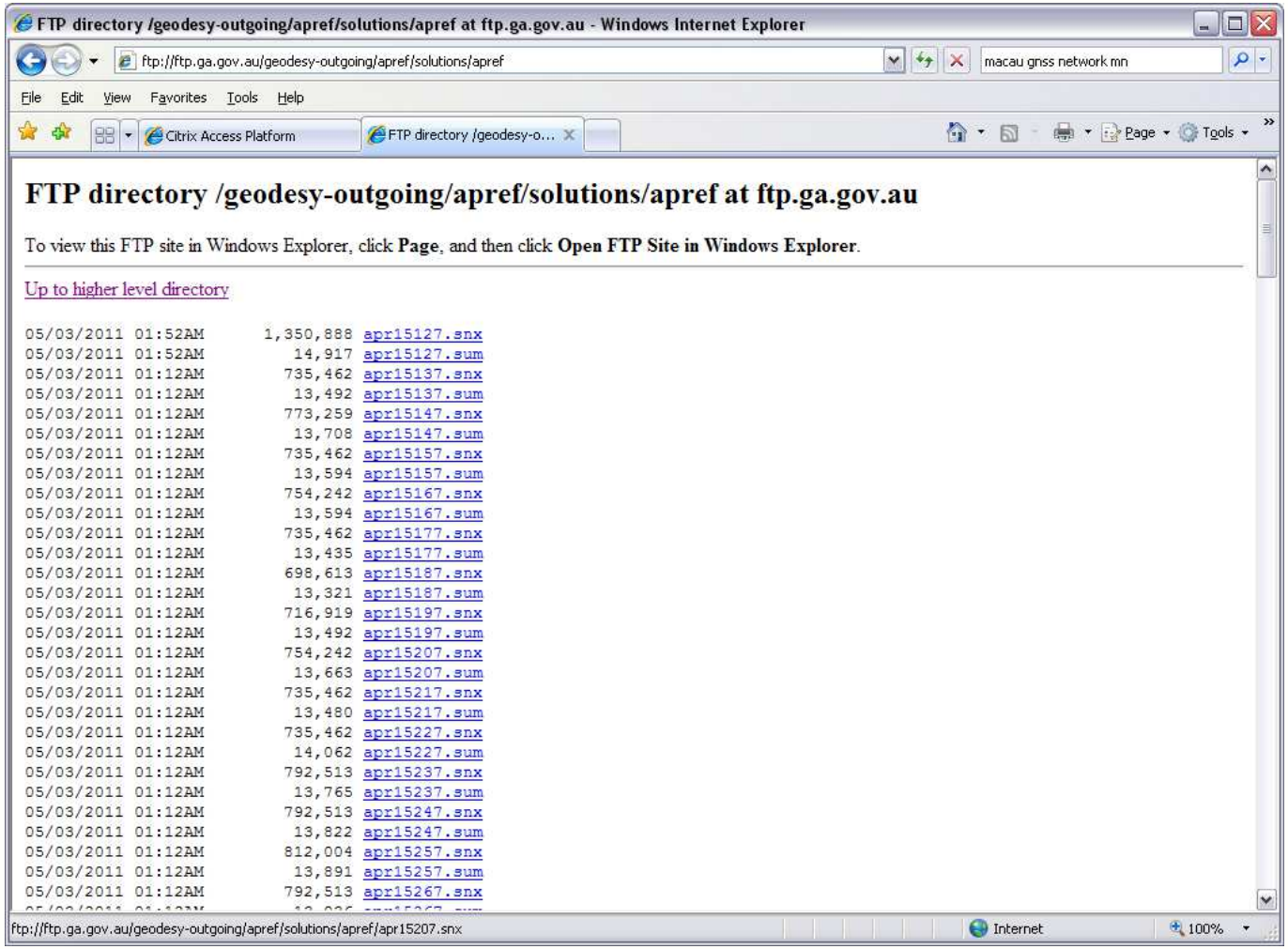
- APREF data and products are provided with an open access data policy via the internet following the practice of the IGS
- Daily GNSS RINEX data with a delay of 24 hr after observation, see:

  ftp://ftp.ga.gov.au/geodesy-outgoing/gnss/data/daily/

- Station log files, see:

  ftp://ftp.ga.gov.au/geodesy-outgoing/gnss/logs/

APREF Weekly SINEX file (i.e. coordinates)



Weekly Station Coordinate and Performance

Weekly station coordinates

ITRF2008 Cartesian Coordinates (X,Y,Z) @ 22/06/2011

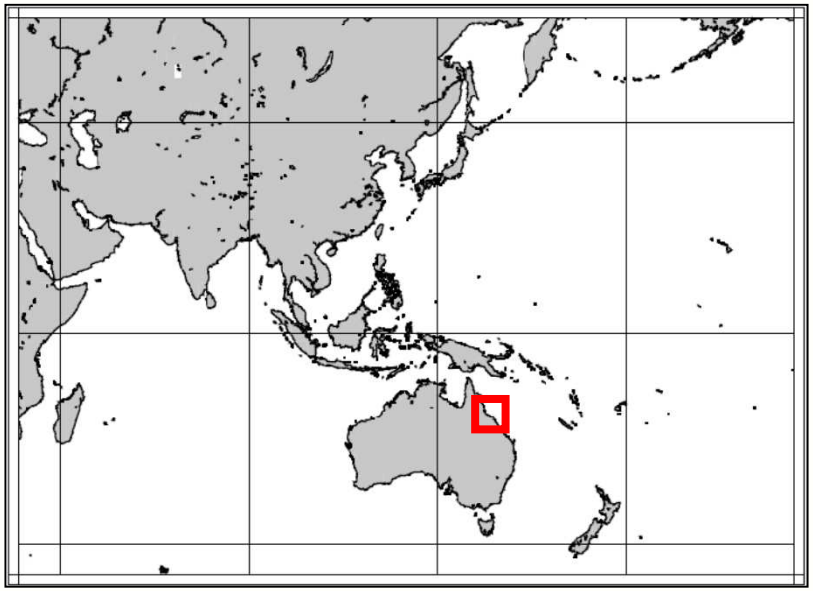
00NA 59975M001	-4073662.2922	4712064.7447	-1367874.4683
01NA 59974M001	-4084823.4609	4702026.6604	-1369125.8453
02NA 59973M001	-4078496.4549	4711380.1330	-1355915.1332
20NA 59972M001	-4050985.3396	4212133.7934	-2547954.8094
21NA AUM000184	-4048578.9364	4210151.5056	-2554917.6069
ADEL AUM000008	-3926936.9094	3461614.4215	-3631644.2263
ALBU AUM000009	-4324312.5655	2817311.0325	-3735264.7605
ALBY 50191M001	-2441714.5963	4629128.5358	-3633363.2024

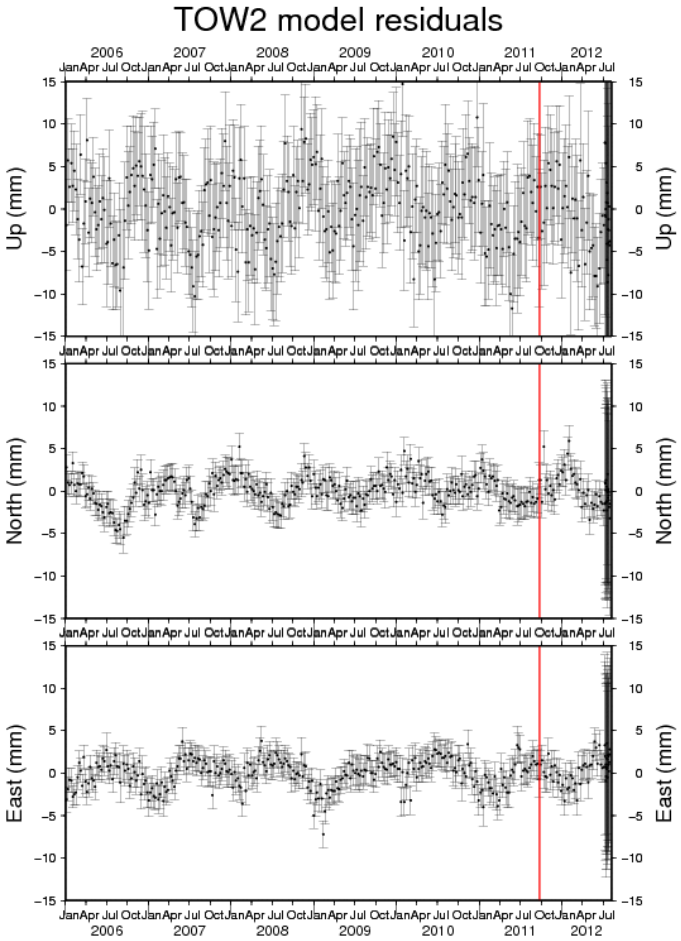
Weekly station performance

Total number of stations: 303

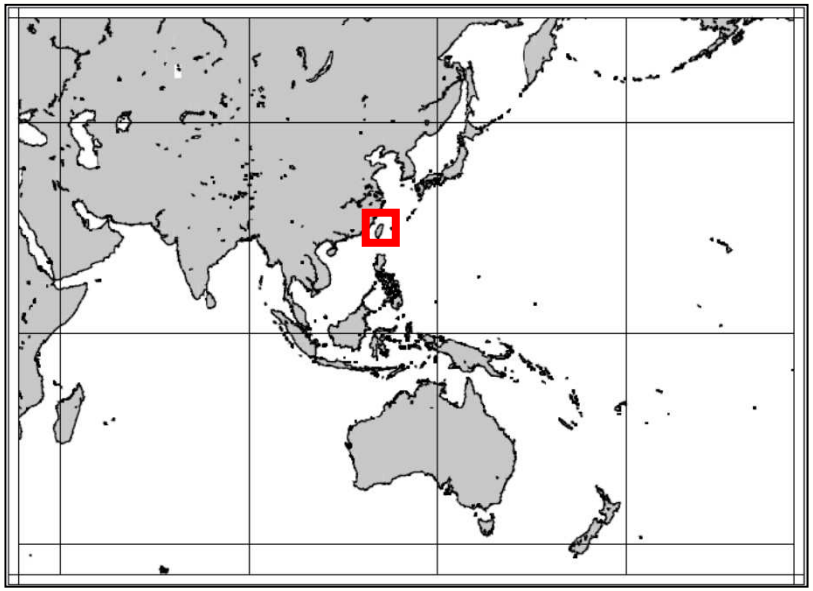
Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
00NA 59975M001	7	XXXXXXX	0.48	1.18	1.87
01NA 59974M001	7	XXXXXXX	0.54	1.61	5.80
02NA 59973M001	7	XXXXXXX	0.79	1.95	3.59
20NA 59972M001	7	XXXXXXX	0.41	1.29	2.00
21NA AUM000184	7	XXXXXXX	0.61	1.65	0.98
ADEL AUM000008	7	XXXXXXX	1.28	1.19	4.02
ALBU AUM000009	7	XXXXXXX	1.64	0.98	5.10
ALBY 50191M001	7	XXXXXXX	1.62	2.87	4.30
ALIC 50137M001	4	XXXX	0.28	1.26	1.47
ANDA 59971M001	7	XXXXXXX	0.64	0.87	1.74
ANTW AUM000010	7	XXXXXXX	1.47	0.83	3.70
APOL AUM000011	7	XXXXXXX	1.44	1.44	7.61
APSL AUM000012	7	XXXXXXX	3.27	1.23	5.96
ARMD AUM000143	7	XXXXXXX	0.60	1.42	2.74
ARTU 12362M001	5	XXXXX	3.16	2.20	3.20
ASPA 50503S006	7	XXXXXXX	2.39	2.88	12.17
AUCK 50209M001	7	XXXXXXX	1.27	1.66	4.47
AUKT 50216M001	7	XXXXXXX	1.63	1.66	4.81
BAIR AUM000015	7	XXXXXXX	1.14	1.06	5.46
BAKO 23101M002	7	XXXXXXX	2.97	3.40	10.00
BALN AUM000180	7	XXXXXXX	0.40	1.24	3.82
BAN2 22306M003	7	XXXXXXX	2.74	2.94	7.17
BBOO 59997M001	7	XXXXXXX	0.62	0.80	1.46
BDLE 50196M001	7	XXXXXXX	1.73	2.46	2.46
BDST 59981M001	7	XXXXXXX	0.80	1.43	2.86

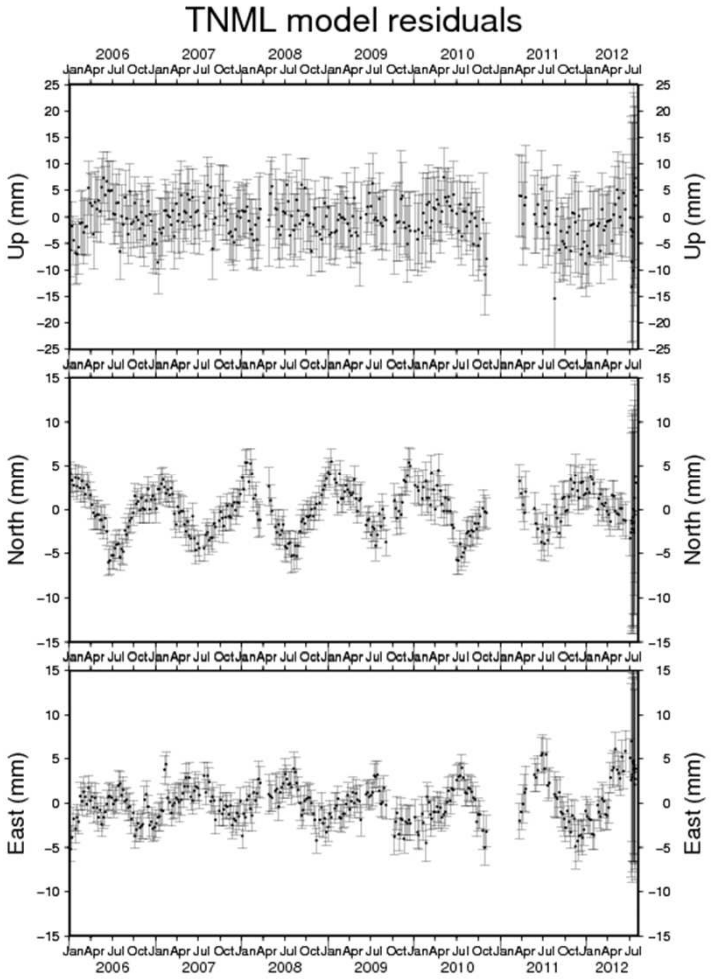
Example Coordinate Time Series: Townsville



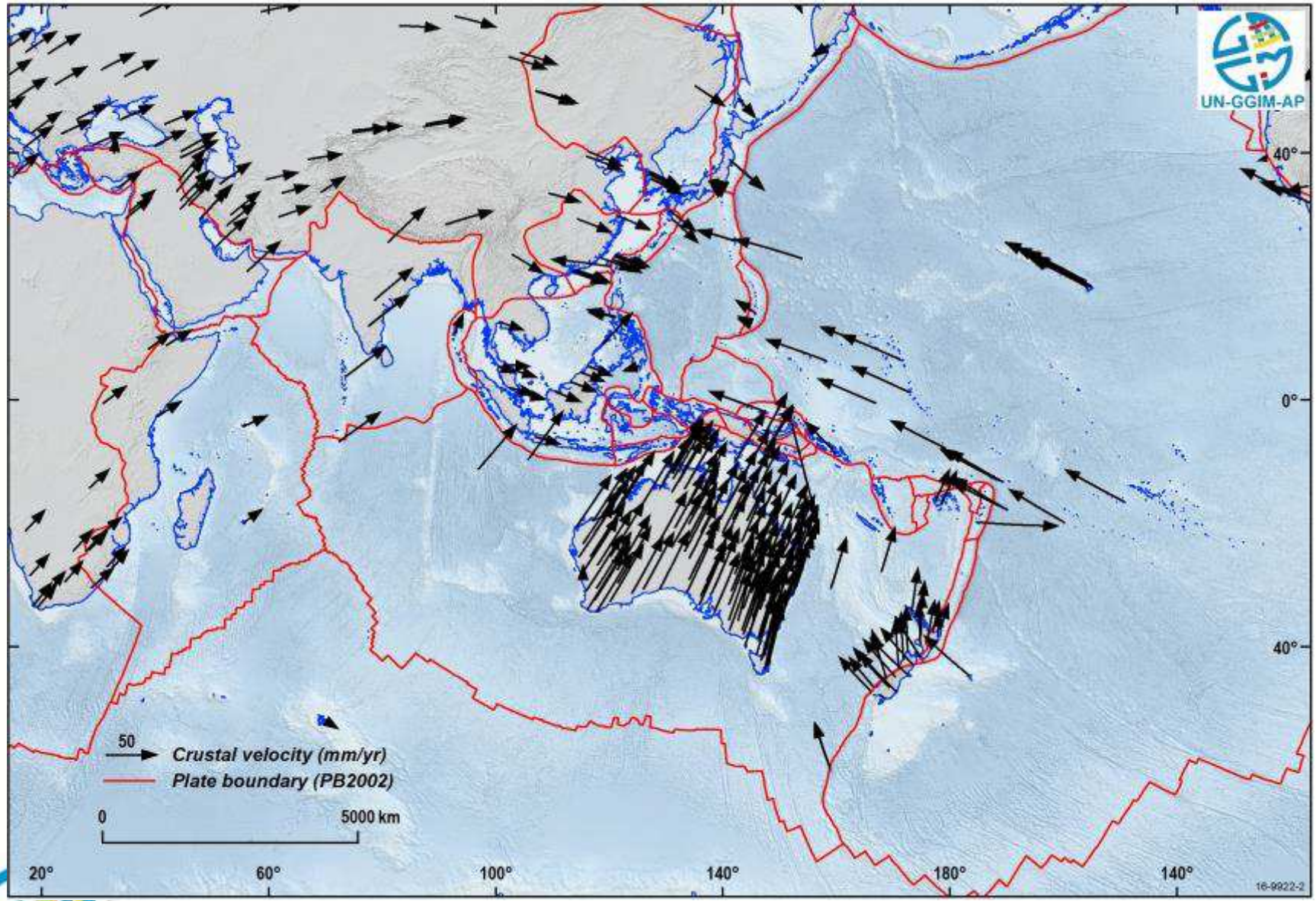


Example Coordinate Time Series: Hsinchu, Taiwan





Crustal velocities of Asia and the Pacific



How Do I Contribute CORS data into APREF?

- Do I have a permanent GNSS station?
- Is my agency willing to share its data (30 sec, daily RINEX)
- Can I do this automatically everyday?
- Does it meet the IGS or APREF standards? Check
  - → IGS: http://igscb.jpl.nasa.gov/network/guidelines/guidelines.html
  - → APREF: https://www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=72803

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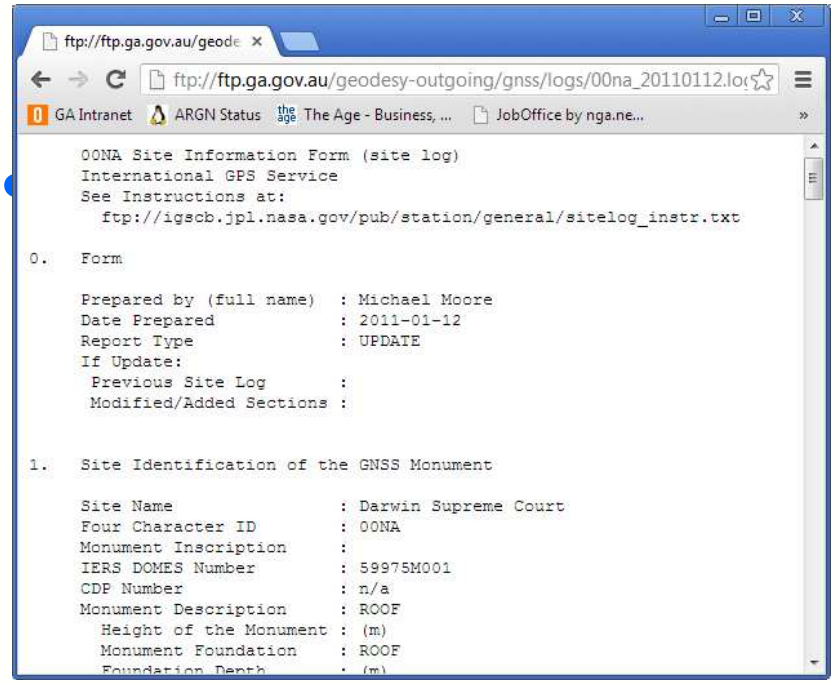

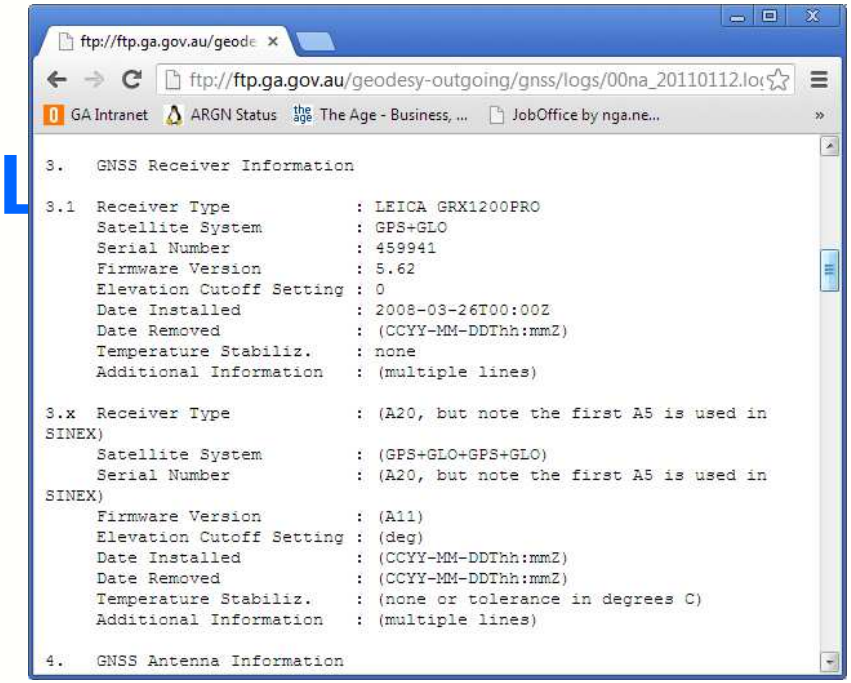

Can I commit to notifying the APREF CB every time the **Station Log File** for this GNSS station changes?

How Do I Contribute CORS data into APREF?

- Send an email to geodesy@ga.gov.au with the subject heading “Proposed APREF CORS”, in this email include:
  - → the proposed 4-character site
  - → photographs of the proposed site
  - → a completed site log-file
  - → a link to some sample data from the site

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