Australian Government
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The Asia Pacific Regional Geodetic Project (APRGP) GPS Solution (1997–2008)

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Geoscience Australia

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OUTLINE

- **PCGIAP-APRGP Background**
- APRGP Measurements 1997-2008
- Velocity Field Estimation
- Internal Accuracy of the Estimated Velocity
- External Accuracy of the Estimated Velocity
- Discussions
- Conclusions

PCGIAP-APRGP Background

- The annual APRGP GPS campaign is an important activity of the regional geodesy working group of the Permanent Committee on GIS Infrastructure for Asia and the Pacific Region (PCGIAP) under the auspices of the United Nations Regional Cartographic Conference (UNRCC).
- Annual 7-day RINEX files and occupation reports of APRGP GPS campaigns are organised and data collected in Geoscience Australia since 1997.
- All PCGIAP APRGP 1997-2008 GPS campaigns data can be downloaded for the member countries of PCGIAP at: ftp://ftp.ga.gov.au

PERMANENT COMMITTEE ON GIS INFRASTRUCTURE FOR ASIA & THE PACIFIC

United Nations

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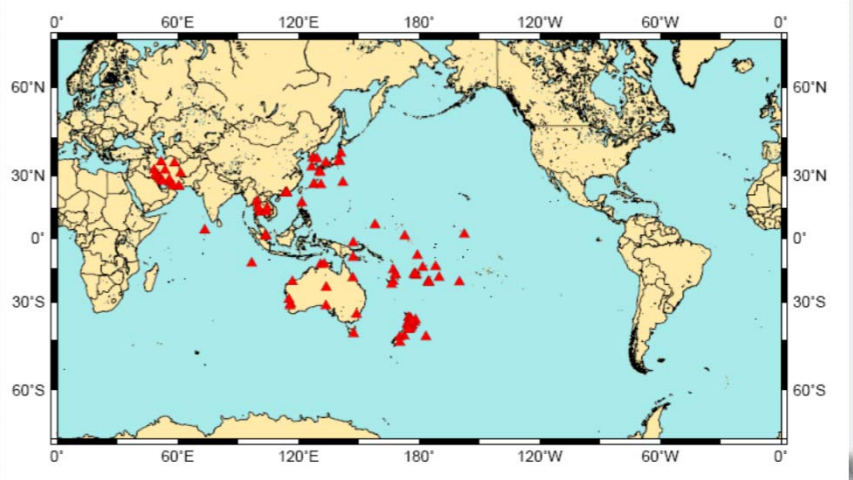
2

APRGP 2003 campaign regional stations



XXIV FIG 11-16 April 2010, Guorong Hu and John Dawson

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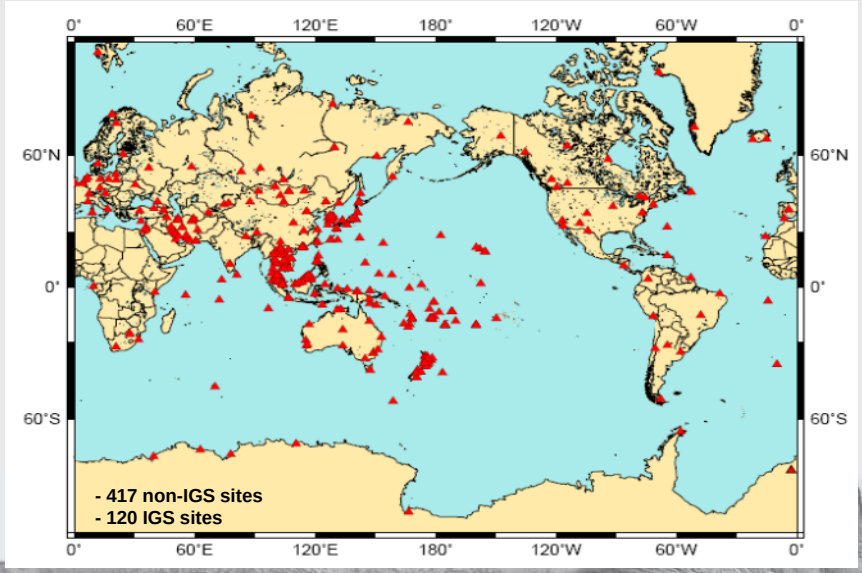
3

PCGIAP APRGP Stations used in GPS Analysis



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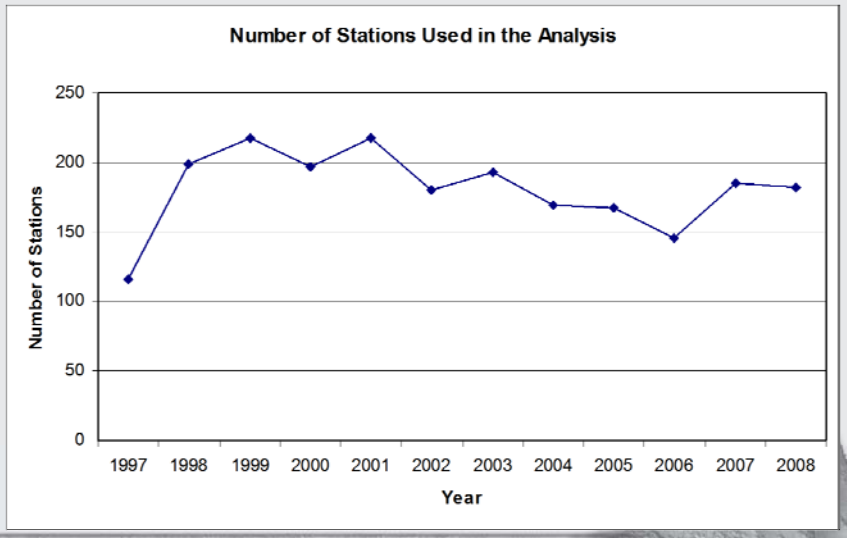
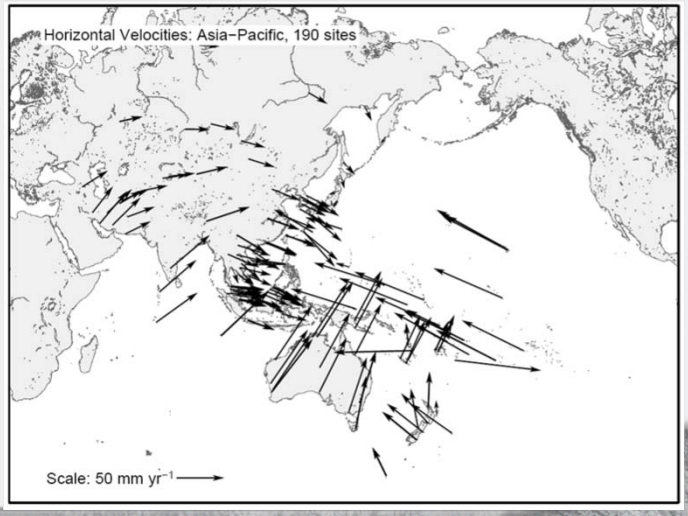


The average repeatability RMS for the campaigns of the years from 1997 to 2008 inclusive, unit: mm.

EPOCH	STATIONS	NORTH	EAST	UP
1997	116	4.7	6.5	10.7
1998	199	4.6	6.0	11.1
1999	218	3.4	4.0	9.1
2000	197	3.6	4.0	9.1
2001	218	3.4	4.6	9.0
2002	180	3.3	4.5	9.3
2003	193	3.1	4.2	8.6
2004	169	3.8	4.2	8.9
2005	167	4.4	3.2	8.0
2006	146	3.8	3.5	9.3
2007	185	3.3	4.3	10.3
2008	182	1.9	2.2	7.0

The Estimated Horizontal Velocity Field for the Asia-Pacific Region



190 sites linked to ITRF2005 via 120 IGS sites

Internal Accuracy (Precision) of the Estimated Velocity

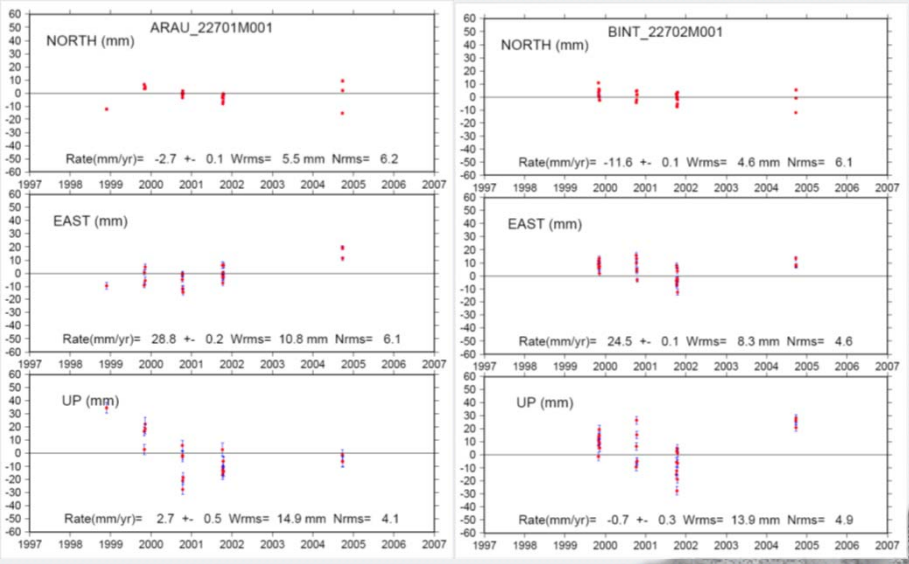
- The velocity uncertainty can be estimated by using the following equation, defined by Mao et al. [1999, JGR] with scaling factors from Mazzotti et al. [2003, JGR] for white, flicker, and random walk noise, respectively

$$\sigma \cong \sqrt{\frac{12(0.7\mathrm{WRMS})^2}{gT^3} + \frac{1.78(\mathrm{WRMS})^2}{g^{0.22}T^2} + \frac{(0.5\mathrm{WRMS})^2}{T}}$$

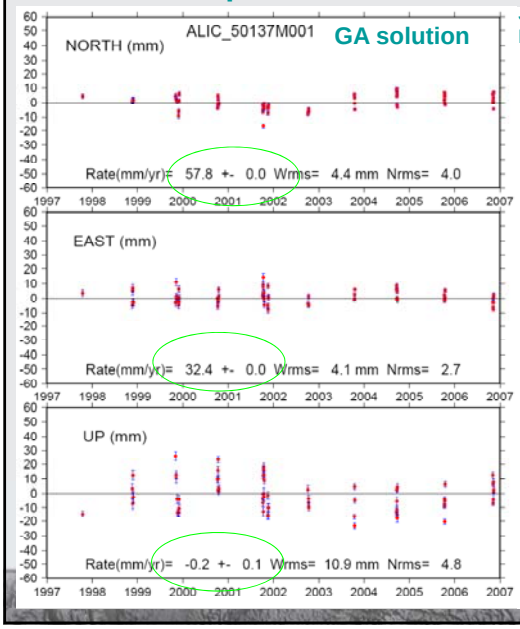
WRMS - the weighted root-mean-square residual position scatter;
g - the number of measurements per year; and
T - the time series length in years.

- Advantages: the velocity uncertainties are scaled not only by the data quality (as indicated by the scatter WRMS) but also by the length of the time series T and the number of measurements per year.

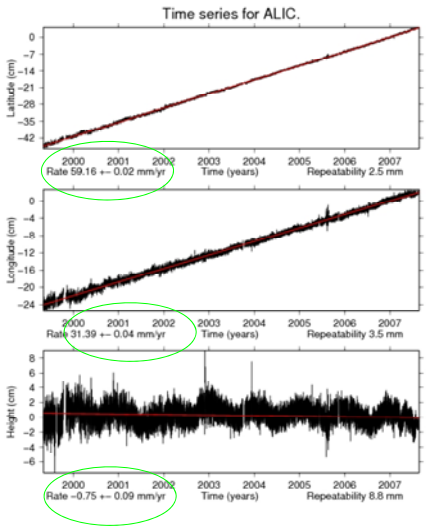
Examples of Time Series for Two Stations in Malaysia



External Accuracy of the Estimated Velocity - Comparison of Solutions between GA and JPL



JPL Solution public available in http://sideshow.jpl.nasa.gov/mbh/all/ALIC.html



10

Statistics of the external accuracy of the estimated velocity fields (based on the common 96 IGS sites available, unit: mm/yr)

	Max	Min	Mean	STD
VE	2.4	-2.9	0.1	1.4
VN	2.5	-3.7	-0.7	1.7
VU	15.3	-15.2	0.9	3.9

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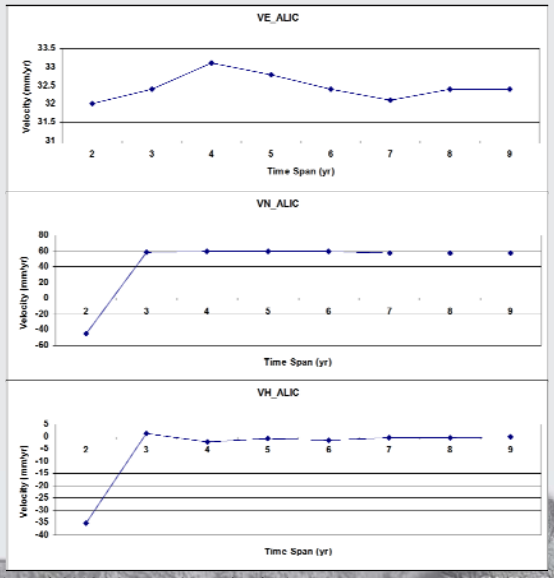
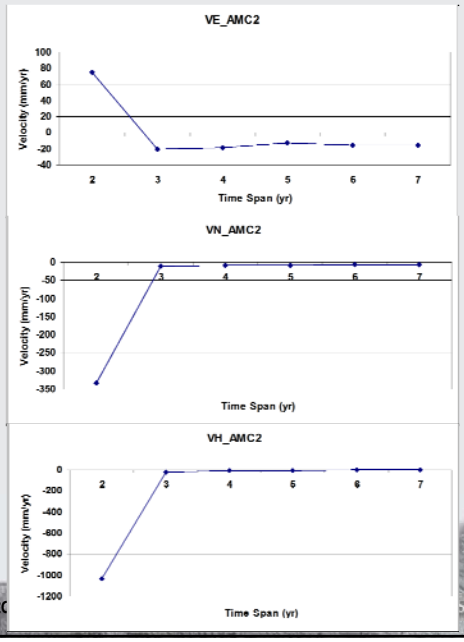
11

Discussion: **What is the minimum time span at which one should accept velocity estimates derived from the campaign-based GPS? (1/2)**



Discussion: **What is the minimum time span at which one should accept velocity estimates derived from the campaign-based GPS? (2/2)**



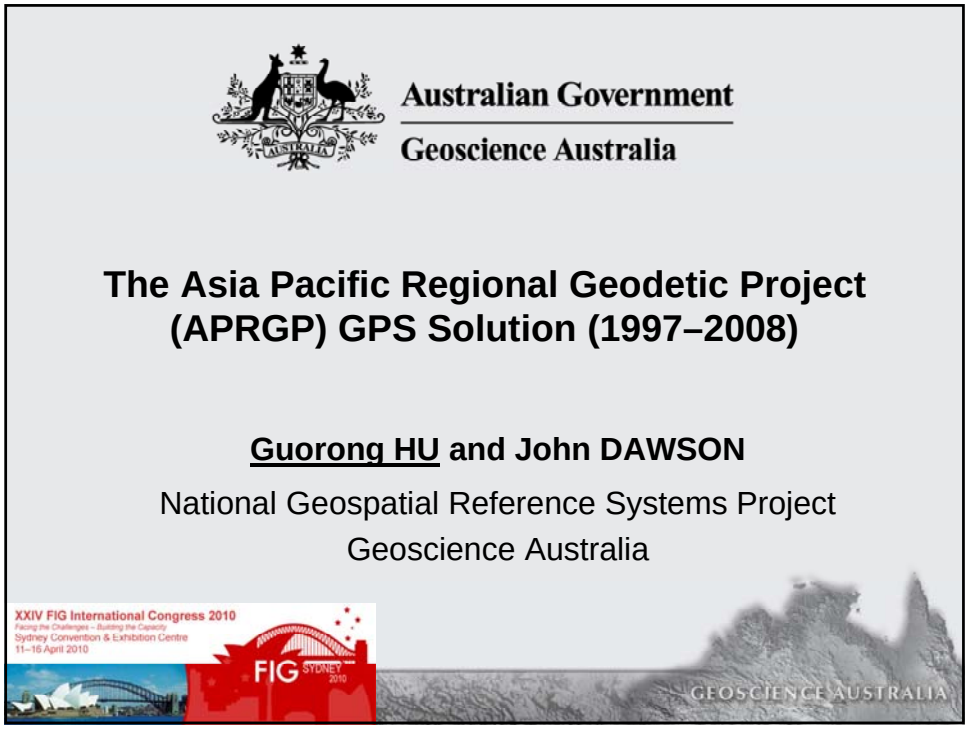
Conclusions

- The major objective of APRGP campaigns is the densification of the International Terrestrial Reference Frame (ITRF) in the Asia-Pacific region.
- Geoscience Australia has produced combined solutions for 1997-2008 campaigns, including
  - 417 non-IGS sites with updated coordinates in ITRF2005
  - 120 IGS sites
- External accuracy of the estimated velocity is at 1.4, 1.7 and 3.9 mm/yr level in the east, north and vertical components, respectively; This could be taken as thresholds for velocity uncertainties.
- A minimum of 3 years campaign data is required before reliable velocity estimates can be derived from the campaign-based GPS.

Thank you

To all station operators, Data Centres and their agencies

For your support to the PCGIAP-APRGP activities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