

Precision Analysis of GPS for Datum Modernisation in Australia

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SUMMARY

An increasingly important requirement for Australia's geodetic reference system is that the relationships between the International Terrestrial Reference Frame (ITRF) and the national horizontal and vertical datums are well understood. To support the development of improved geodetic infrastructure in Australia, we have analysed GPS data observed at 2310 survey marks. These data, observed between 1995 and 2009, across continental Australia were processed with consistent standards to generate a combined solution with an estimated uncertainty of better than 5 and 20 mm (1 sigma) in the horizontal and vertical components, respectively. Our combined solution, which was mapped to ITRF2005 at the reference epoch of 2000, is the first unified single-epoch solution with sufficient resolution to support datum modernisation in Australia. We review the considerable work undertaken to determine the optimum analysis procedure, including comparisons of solutions using different antenna phase centre variations (PCV) calibration models, and find that the heights determined using relative PCV models differ from those determined using absolute PCV models by a maximum of 27 mm and an average of 6 mm. Also, we assess the impact of both observation session lengths and crustal velocity modelling. There will be two important applications for this new GPS solution. First, will be the development of an improved model for the estimation of Australian Height Datum (AHD) values from GNSS observations, and the solution will be an important input into the Australian Height Modernisation Project. Second, will be its use as constraining dataset for the readjustment of the terrestrial geodetic observations used in GDA94 as part of the creation of the Geodetic Model of Australia, and will potentially lead to a new national datum.

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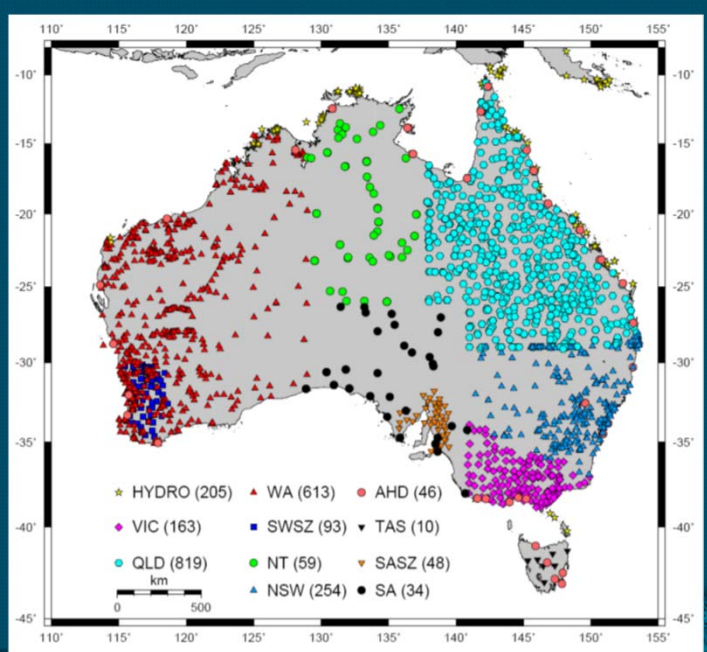
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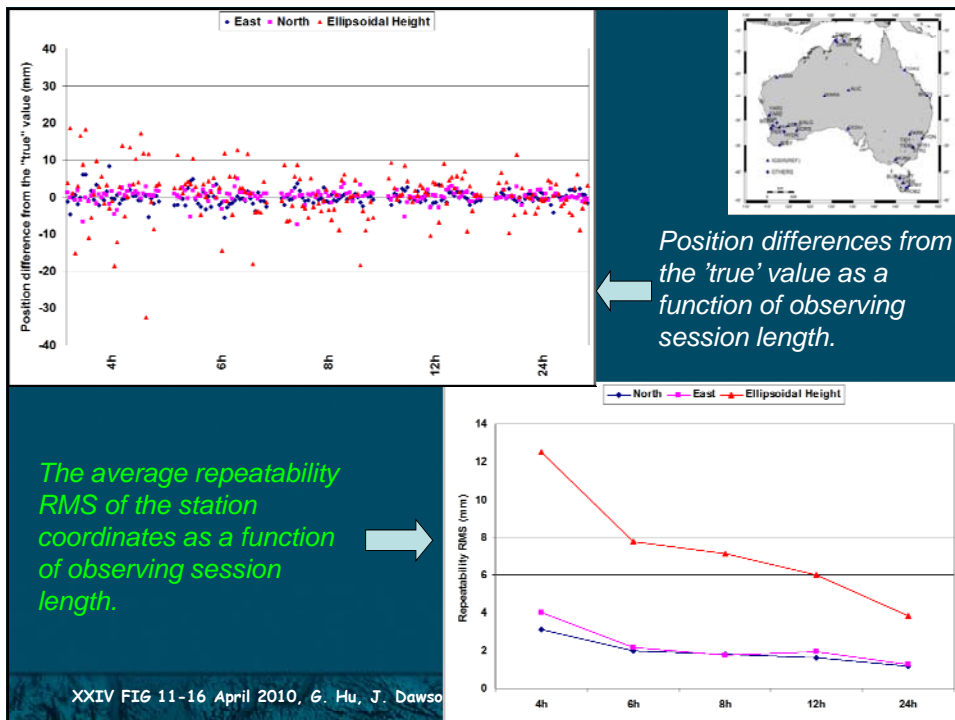
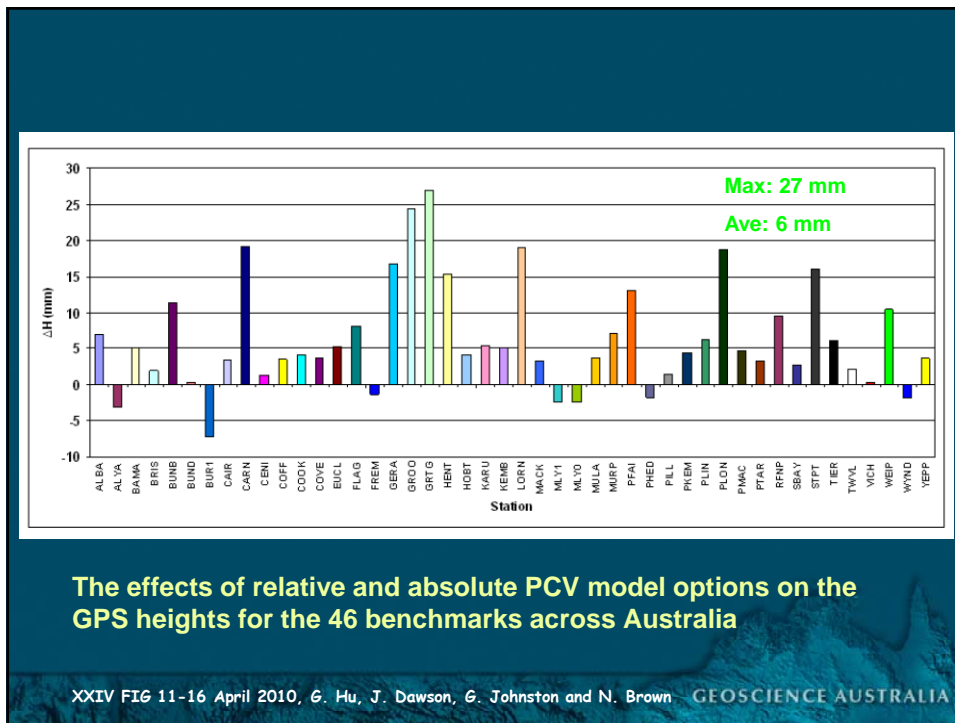
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Objectives

- To meet the requirement of understanding the relationships between the ITRF and the national horizontal and vertical datums in Australia
- To support the development of improved geodetic infrastructure in Australia

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Statistics of the estimated formal standard deviations of the 1968 sites (unit: mm).

	Max	Min	Mean	STD
Ellipsoidal Height	14.2	0.1	2.3	1.8
North	9.3	0.0	0.6	0.7
East	8.1	0.1	1.0	1.0

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Conclusions

1. In order to achieve the highest possible accuracy positions, particularly for the height component in the recent realization of ITRF2005, IGS absolute PCV models have to be used in data processing;
2. At least 6-hr duration occupations are needed to ensure to obtain reliable results especially for the GPS derived heights;
3. There will be two applications for this new GPS solution:
 - a) an important input into the Australian Height Modernisation Project.
 - b) as constraining dataset for the new national datum in the future.

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Thank you

*To all station operators and
their agencies*

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Standards and Practices for GNSS CORS
Infrastructure, Networks, Techniques and
Applications

ICSM
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Equipment Selection

➤ Equipment selection provides guidelines for potential GNSS CORS operators on issues such as:

- Antenna type,
- Signal tracking,
- Power and communication,
- Remote configuration,
- Standard data protocols,
- On board logging,
- Additional sensors.



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Site Operation

- Site Coordination
- Stability Monitoring
- Data formatting
- Data access
- Metadata



Final Remarks

- The GNSS CORS Guidelines are in draft format and are being refined by the ICSM GTSC.
- The Guidelines are planned to be a subsidiary document to a revised SP1.
- It is hoped that the guidelines will enable multiple parties to have an understanding of the quality and capability of GNSS CORS.