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## **Geoscience Australia Continuous Global Positioning System (CGPS) Station Field Campaign Report**

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March 2016



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## **Executive Summary**

This station formed part of the Australian Regional GPS Network (ARGN) and South Pacific Regional GPS Network (SPRGN), which is a network of continuous GPS stations operating within Australia and its Territories (including Antarctica) and the Pacific. These networks support a number of different science applications including maintenance of the Geospatial Reference Frame, both national and international, continental and tectonic plate motions, sea level rise, and global warming.

## **Acronyms and Abbreviations**

|       |   |
|-------|---|
| APREF | Asia-Pacific Reference Frame                                |
| ARGN  | Australian Regional GPS Network                             |
| ARM   | Atmospheric Radiation Measurement Climate Research Facility |
| CGPS  | Continuous Global Positioning System                        |
| DARM  | Darwin, Australia, ARM site                                 |
| GA    | Geoscience Australia  |
| GNSS  | Global Navigation Satellite System                          |
| GPS   | Global Positioning System                                   |
| RINEX | Receiver Independent Exchange Format                        |
| SPRGN | South Pacific Regional GPS Network                          |

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## 1.0 Background

The objective of this field campaign was to establish a Continuous Global Positioning System (CGPS) station at the U.S. Department of Energy's Atmospheric Radiation Measurement (ARM) Climate Research Facility site in Darwin. The CGPS station was constructed by Geoscience Australia (GA) and operated for a period of 7 years (between January 2007 and November 2014). This station, referred to as DARM, formed part of a larger array of 150 stations located across Australia, Antarctica, and the Pacific. The data from this station contributed to a myriad of different scientific applications including the maintenance of the National Geospatial Reference Systems, tectonic plate motions, and climate and sea level studies.

## 2.0 Notable Events or Highlights

The CGPS station was constructed in late 2006. The station consisted of an ASH701945C\_M GPS antenna connected to a LEICA GRX1200PRO GPS receiver. The antenna was mounted on a concrete pillar that was firmly anchored to the ground (Figure 1). Dual frequency (L1 + L2) GPS observations were recorded at the station every 30 seconds for a period of 7 years. The data were transferred to the GA regional GPS data center in Canberra daily via the internet. In total 2719 days of data were observed at the station. These data are freely available in the Receiver Independent Exchange (RINEX) format from the GA public data archive (<ftp.ga.gov.au/geodesy-outgoing/gnss/data>).

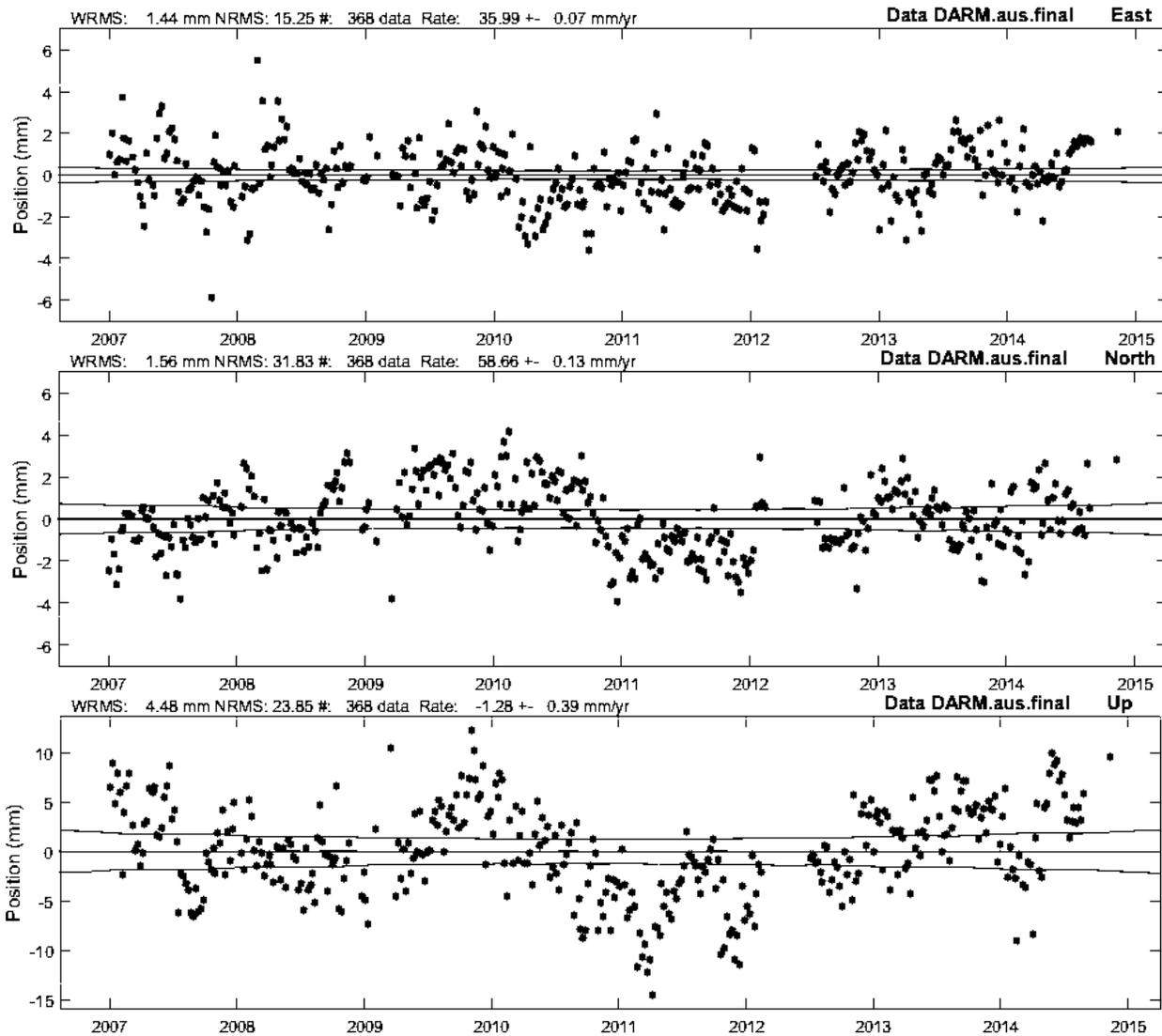
During the station's operation there were no significant equipment failures.



**Figure 1** The antenna at the CGPS station was installed on a concrete pillar firmly anchored to the ground.

### 3.0 Results

The data collected at the station were routinely processed as part of GA's routine analysis. The resulting coordinate time-series (Figure 2) was used to help maintain the National Geospatial Reference Frame and contributed to the Asia-Pacific Reference Frame (APREF) project.



**Figure 2.** Time-series of the coordinate residuals for the east-west (top), north-south (middle) and up-down (bottom) components at the DARM CGPS station. From the analysis, the station was estimated to have a velocity of  $58.66 \pm 0.13$  mm/yr (north),  $35.99 \pm 0.03$  mm/yr (east) and  $-1.28 \pm 0.39$  mm/yr (up).

## 4.0 Publications

Choy, S, E Fu, J Dawson, M Jia, Y Kuleshov, F Chane-Ming, C Wang, and T Yeh. 2015. “Application of GNSS atmospheric sounding for climate studies in the Australian region.” *Proceedings of FIG 2015*, Denmark, 17-21 May 2015.



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