Geoscience Australia Analysis Center

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Abstract

This report gives an overview about the activities of the Geoscience Australia IVS Analysis Center during 2010.

1. General Information

The Geoscience Australia (GA) IVS Analysis Center is located in Canberra. The Geodesy Group operates as a part of the Geospatial and Earth Monitoring Division (GEMD).

2. Component Description

Currently the GA IVS Analysis Center contributes nutation offsets, EOP, and EOP rates on a regular basis for IVS-R1 and IVS-R4 networks and their predecessors (IRIS-A and NEOS-A). The EOP time series are available for 1983 to 2010. The CRF catalogs using a global set of VLBI data since 1979 are regularly submitted.

3. Staff

- Dr. Oleg Titov - project manager

4. Current Status and Activities

Several CRF solutions have been prepared using the OCCAM 6.2 software. The last solution has been uploaded in January 2011. VLBI data comprising 4,005 daily sessions from 25-Nov-1979 to 02-Oct-2010 have been used to compute several global solutions with different sets of reference radio sources. This includes 5,017,615 observational delays from 2,848 radio sources observed by 60 VLBI stations. [1].

Station coordinates were also estimated using NNR and NNT constraints. The long-term time series of the station coordinates have been established to estimate the corresponding velocities for each station. The tectonic motion for the Gilcreek VLBI site after the Denali earthquake was modeled using an exponential function [2]. The tectonic motion of the TIGOCONC VLBI site after a strong earthquake on 27 February 2010 is under study (Figure 1).

The adjustment has been done by least squares collocation [3], which considers the clock offsets, wet troposphere delays, and troposphere gradients as stochastic parameters with a priori covariance functions. The gradient covariance functions were estimated from GPS hourly values [4].

5. Geodetic Activity of the Australian Radio Telescopes

During 2010 three Australian radio telescopes – Hobart26, Hobart12 operated by the University of Tasmania (UTAS), and Parkes operated by the Australia Telescope National Facility (ATNF), – were involved in geodetic VLBI observations. GA's Geodesy Group supported the observations

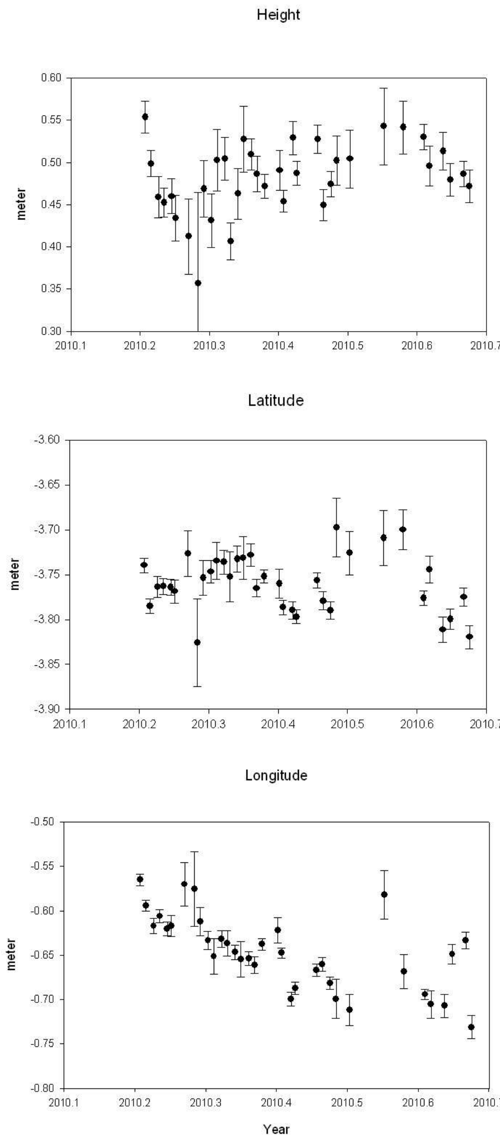

Figure 1. Height, latitude, and longitude variations of the TIGOCONC geodetic positions in 2010 following the 27 February 2010 earthquake.

in different ways including assistance with campaign scheduling.

The Parkes 64-meter telescope participated in two geodetic VLBI sessions in 2009 (R1416 and CRF-61) for improvement of the ITRF and the ICRF in the Southern Hemisphere. This program is undertaken in cooperation with ATNF and UTAS.

In August 2010 a group of scientists from Australia and Germany undertook a run of spectroscopic observations of the reference radio sources. They used the New Technology Telescope (NTT) optical facility (3.58-meter telescope in La Silla, Chile) operated by the European Southern Observatory (ESO). The goal of this work is to identify the radio sources regularly observed for the geodetic and astrometric VLBI programs. New red shifts of 31 radio sources in the southern hemisphere have been found. Five radio sources (1659-621, 1758-651, 1815-553, 2236-572, and 2344-514) belong to the list of the ICRF2 defining sources. Two observers (Oleg Titov and David Jauncey (ATNF)) were supported by a travel grant of the Access to Major Research Facilities Program (AMRFP) to travel to La Silla. A paper reporting the results is under preparation. Figure 2 shows a sky field around the 1758-651 source made at NTT. Two stellar objects are close to each other; therefore the slit of the spectrograph was directed to cover both objects. Figure 3 shows the dirty spectrum of the two objects. While the brighter object does not show any features, the fainter companion has two strong emission lines. The clean spectrum after processing shown in Figure 4 reveals two strong emission lines identified as CIII] and MgII. A set of less prominent lines was also found.

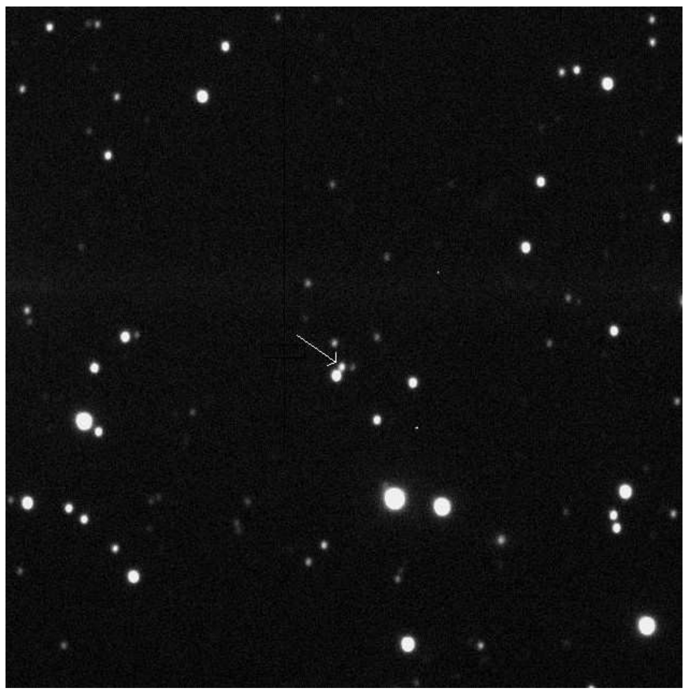

Figure 2. The NTT image of the sky field around the quasar 1758-651 (shown by arrow). Closeness of the quasar to the bright star probably caused an identification failure in the past.

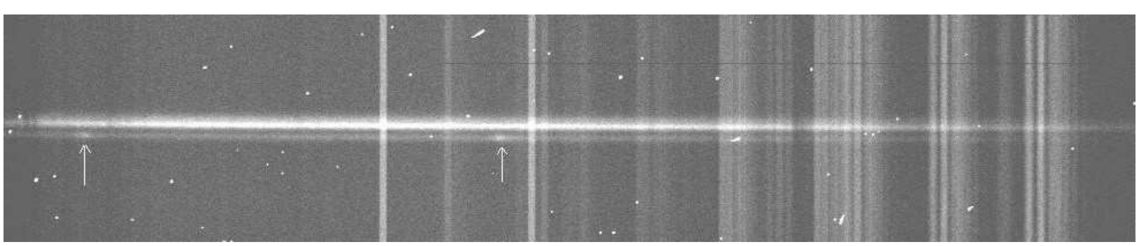

Figure 3. The spectra of the two optical objects of Figure 2. The spectrum of the star has no features while the less powerful spectrum of 1758-651 highlights two emission lines shown by arrows.

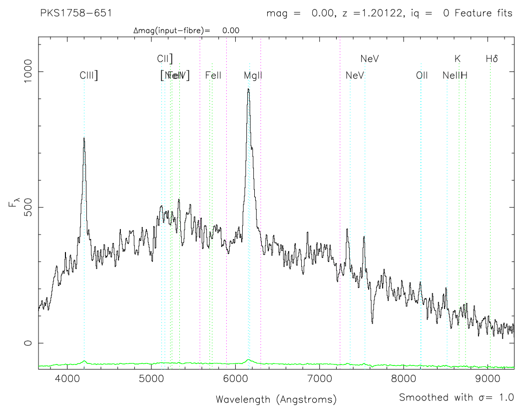

Figure 4. The clean spectrum of 1758-651 after processing. Two main lines CIII] and Mg II are followed by a set of less prominent lines. The red shift was estimated as equal to 1.2.

6. New Geodetic VLBI Network

Geoscience Australia supported the installation work of the new Australian geodetic VLBI network during 2010. Antenna Hobart12 started operations in October 2010. Two other antennas, Katherine and Yarragadee, will start operations in 2011.

Acknowledgements

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References

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