Geoscience Australia Analysis Center

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Abstract

This report gives an overview of the activities of the Geoscience Australia IVS Analysis Center during 2012.

1. General Information

The Geoscience Australia (GA) IVS Analysis Center is located in Canberra. The National Geospatial Reference System Section operates as a part of the Mineral and Natural Hazard Division (MNHD).

2. Component Description

Currently, the GA IVS Analysis Center contributes estimates of nutation offsets, EOP, and EOP rates on a regular basis for the IVS-R1 and IVS-R4 networks and their predecessors (IRIS-A and NEOS-A). The EOP time series are available from 1983 to 2012. The CRF catalogs, using a global set of VLBI data since 1979, are regularly submitted to the IVS database.

3. Staff

- Dr. Oleg Titov - senior scientist
- Dr. Laura Stanford - VLBI scientist

4. Current Status and Activities

Several CRF solutions have been prepared using the OCCAM 6.2 software. The latest solution was uploaded in September 2012. VLBI data comprising 4,109 daily sessions from 25 November 1979 to 31 May 2012 have been used to compute several global solutions with different sets of reference radio sources. This includes 5,537,065 observational delays from 2,895 radio sources having four or more observations.

Station coordinates were also estimated using No-Net-Rotation and No-Net-Tranlation constraints. The long-term time series of the station coordinates have been used 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 typical of post-seismic deformation [1]. The tectonic motion of Tigoconc (2010) and Tsukub32 (2011) VLBI sites after the strong earthquakes is currently under study.

The adjustment was made by least squares collocation [2], which considers the clock offsets, wet troposphere delays, and tropospheric gradients as stochastic parameters with a priori covariance functions. The gradient covariance functions were estimated from GPS hourly values [3].

Our first CRF solution, aus2012a.crf, did not impose the NNR constraints. The second CRF solution, aus2012b.crf, imposed NNR constraints. This second solution is consistent with the CRF solutions submitted by other Analysis Centers.

A progress report on the secular aberration drift was presented at the IAU General Assembly in Beijing on August 28, 2012. This work was done in collaboration with colleagues from the IVS Analysis Center of Paris Observatory. The new estimate of the dipole systematic effect, 5.3 ± 1.5 μas/yr, was found using the individual proper motion of the 643 reference radio sources with the CALC/SOLVE software. New coordinates of the acceleration vector are $\alpha = 268 \pm 12$ degrees and $\delta = -30 \pm 13$ degrees [4].

5. Geodetic Activity of the Australian Radio Telescopes

In 2012, all three new AuScope 12-meter radio telescopes moved to full operational mode. Two other Australian radio telescopes – Hobart26, operated by the University of Tasmania (UTAS), and Parkes, operated by the Australia Telescope National Facility (ATNF) – participated in the geodetic VLBI programs occasionally.

The Parkes 64-meter telescope participated in six geodetic VLBI sessions in 2012 for improvement of the ITRF and the ICRF in the Southern Hemisphere. This program was undertaken in cooperation with ATNF and UTAS.

6. Optical Spectroscopic Observations of the Reference Radio Sources

A program for optical identification and spectroscopy of the reference radio sources is continued in collaboration with the Australian Telescope National Facility, University of Sydney and Nordic Optical Telescope. A new paper that includes redshifts of 126 reference radio sources was submitted [5].

Acknowledgements

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References

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[2] Titov, O., Estimation of subdiurnal tidal terms in UT1-UTC from VLBI data analysis, In: IERS Technical Notes 28, B. Kolaczek, H. Schuh, and D. Gambis (eds.), 11–14, 2000.

[3] Haas, R., private communication.

[4] Titov, O, S. Lambert, Dipole systematics in the reference radio source proper motion. Presentation at the IAU General Assembly, Joint Discussion 7, Beijing, 2012.

[5] Titov, O., L. Stanford, H. Johnston, R. Hunstead, D. Jauncey, K. Maslennikov, and A. Boldycheva, Optical Spectra of Candidate International Celestial Reference Frame (ICRF) Flat-Spectrum Radio Sources, submitted to AJ, 2013.