Geoscience Australia IVS Analysis Center

Oleg Titov, Ramesh Govind

Abstract

This report gives an overview about activity of the Geoscience Australia IVS Analysis Centre during the 2002 year.

1. General Information

The Geoscience Australia IVS Analysis Center is located in Canberra. The National Mapping Division (formerly, AUSLIG) includes the Space Geodesy Analysis Center which undertakes VLBI, GPS, SLR and DORIS data for processing. The GA IVS Analysis Center contributes astrometrical and geodetic results to the IVS and IERS.

2. Component Description

Currently the GA IVS Analysis Center contirbutes five EOPs for IRIS-A/NEOS-A networks. The EOP time series from 1983 to 2002 is available. During 2002 the OCCAM software was enhanced to estimate source positions, station coordinates and EOPs in a single homogeneous solution.

The IERS 2000 computation standards are implemented. The Niell mapping function has been used for modeling of troposphere and its gradients. All observations with elevation less than 5 degrees were downweighted. The MBH nutation model has been applied for calculations except the free core nutation effect that is contained at the final nutation offset times series.

The adjustment has been done having least squares collocation method which considers the clock offsets and wet troposphere delays as stochastic parameters with a priori covariance functions. Following the approach the matrix of a priori covariances becomes non-diagonal. It allows taking into account the mutual correlations between delays within a 24-hour session as well as estimating the stochastic parameters for every observational epoch.

The parameterisation includes three groups of parameters:

- global (radiosource coordinates)
- local (daily estimates for the EOPs, nutation offsets, station coordinates, daily clock offsets and rates, daily wet troposphere delays and gradients)
- stochastic (intraday variations of the clock offsets and wet troposphere delays).

3. Staff

- Dr. Ramesh Govind - Director of the Space Geodesy Analysis Center
- Dr. Oleg Titov - project officer

4. Current Status and Activities

Global homogeneous solution has been done using the new facilities of OCCAM. VLBI data comprising 2764 daily sessions from 12-Apr-1980 till 05-Sep-2002 have been used to compute the global solution GA2002. This includes 2,280,506 observational delays from 645 radiosources observed by 53 VLBI stations. Weighted root-mean-square of the solution is about 0.65 cm (21 picosec).

Using the NNR approach all radiosource coordinates were estimated as global parameters without separation into stable and unstable ones. 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. Due to a limited amount of observations the velocities have been estimated for 47 stations only. The solution details are available on website http://www.auslig.gov.au/geodesy/sgc/vlbi/.

Some interesting results have been obtained; for example, effect of troposphere gradients on source declination for IRIS-A/NEOS-A network subsolution (fig. 1) looks assymetrical due to uneven geographical distribution of the involved VLBI stations. The same effect for all networks is symmetrical and shown in fig. 2. Only quasars having 20 or more observations are drawn on the plots.

Additional research has been done to estimate long-term variations of the radiosource positions. The daily coordinates have been calculated for selected quasars. Fig. 3 demonstrates the variations of the quasar 2145+067 right ascension daily values.

Also the GA Analysis Center continues the regular submission of EOPs to the IVS/IERS and works on the development of long-term time series for the EOP, station coordinates and comparison of techniques (VLBI, SLR, GPS) for EOP and ITRF adjustment.

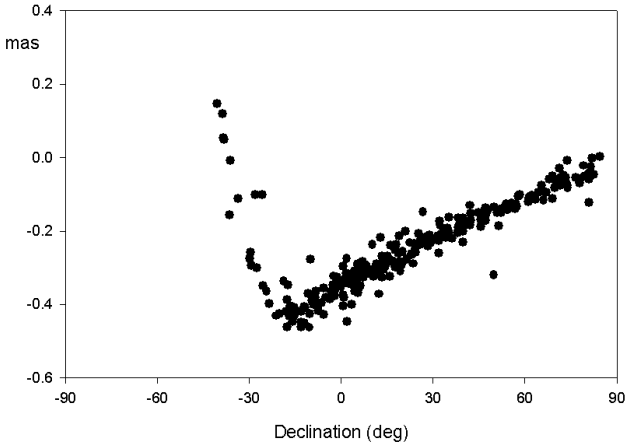

Fig.1. Differences between source declinations from analyses with and without correction for estimated gradients. Network IRIS-A/NEOS-A (1983-2001) only.

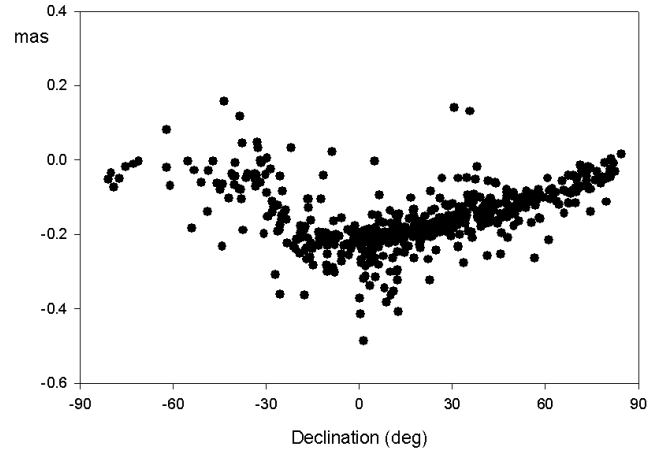

Fig. 2. Differences between source declinations from analyses with and without correction for troposphere gradients

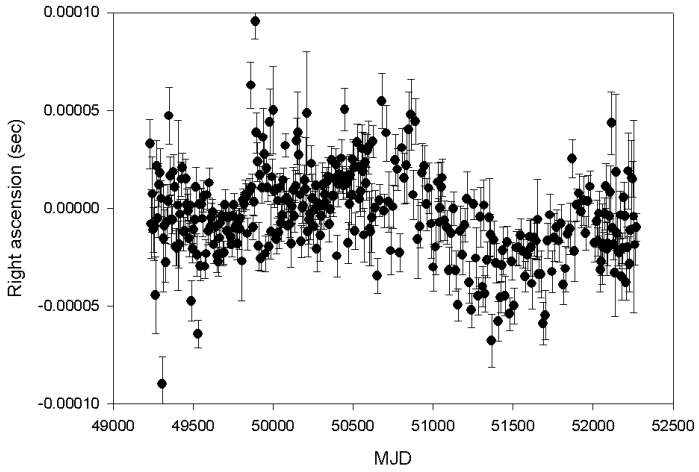

Fig. 3. Variations of the quasar 2145+067 right ascension from the NEOS-A network after 01-Sep-1993

5. Future plans

- Comparison of the individual ICRF solutions available through the IVS website.
- Combined estimation of the EOPs using VLBI, SLR and GPS data.
- Further development of OCCAM software; new version for Hewlett-Packard workstation.
- Cooperation with the Australian National University (ANU), Australian National Telescope Facility (ANTF) and University of Tasmania on development of VLBI for the southern hemisphere.