

Pulkovo IVS Analysis Center (PUL) 2008 Report

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Abstract

This report briefly presents the PUL IVS Analysis Center activities during 2008 and plans for the coming year. The main topics of investigations in that period were comparison and combination of catalogs of radio source positions, analysis of VLBI EOP series, analysis of radio source position and zenith troposphere delay time series.

1. General Information

The PUL IVS Analysis Center was organized in September 2006 and is located at the Central Astronomical Observatory at Pulkovo of Russian Academy of Sciences (Pulkovo Observatory). The main topics of our activity are:

- Improvement of the International Celestial Reference Frame (ICRF), including investigations of stochastic and systematic errors of radio source catalogs, constructing combined catalogs, investigation of the ICRF stability, and investigation of radio source position time series.
- Computation and analysis of EOP, station position, baseline length, and zenith troposphere delay time series.
- Investigation of the Free Core Nutation (FCN).
- Comparison of VLBI results with other space geodesy techniques.

The PUL AC's Web page http://www.gao.spb.ru/english/as/ac_vlbi/ is supported.

2. Scientific Staff

The PUL team consists of three scientists:

1. Zinovy Malkin (70%) — team coordinator, EOP, TRF, and CRF computation and analysis;
2. Natalia Miller (10%) — EOP and zenith troposphere delay analysis;
3. Julia Sokolova (100%), until September, now on leave of absence at the Curtin University of Technology, Australia — CRF computation and analysis;
4. Elena Popova (50%), since August — radio source velocities analysis.

3. Activities

The main activities of the PUL IVS Analysis Center during 2008 included:

- Investigations in the framework of the IERS/IVS Working Group on the Second Realization of the ICRF were continued. The main directions of this activity were comparison and combination of radio source catalogs as well as computation and investigation of source position time series. The main results obtained in 2008 are the following:

- A new combined radio source catalog was constructed and investigated [1].
 - A new method of assessment of the time series scatter based on an extension of the Allan deviation technique, which allows the treatment of unequally weighted and multi-dimensional data [2], was applied to the analysis of the source position time series. This method allows us to get a new estimate of the radio source stability independent of systematic and low-frequency source position variations.
 - The impact of the radio source selection strategy and source position instability on CRF and celestial pole offset estimates was further investigated. Analysis showed that variations of radio source coordinates affect celestial pole offset estimates [3].
 - Various other issues related to the construction of ICRF-2 were investigated [4].
 - The first version of a new list of the optical characteristics of geodetic radio sources is compiled. Further development is being performed in cooperation with the AUS Analysis Center and Pulkovo optical astronomers [5].
- Influence of low-elevation observation weighting on estimates of EOP and baseline length was investigated for a case of CONT05 campaign [6].
 - A comparison of EOP results obtained from various VLBI networks and observing programs based on the VLBI network volume as a new network geometry index was performed. Accounting for a network volume allows investigation of finer dependencies such as dependence of the EOP errors on recording data rate [7].
 - Several longest and densest zenith troposphere delay time series provided by the IGG IVS Special Analysis Center as an IVS troposphere product were analyzed by means of the method of Singular Spectrum Analysis (SSA) in both one-dimensional and multi-dimensional modes. The structure of the time series including regular, quasi-regular (periodical), and irregular (trend) components was obtained and investigated. Using SSA allowed us to derive nonlinear trends in zenith troposphere delay, and also research the variation of amplitude and phase of season components with time [8].
 - An analysis of the systematic effects in the observed radio source velocities was started [9].
 - A list of the forthcoming close approaches of Jupiter and Saturn to geodetic radio sources through the year 2050 was computed [10].
 - A regular computation of two refined Free Core Nutation (FCN) time series started in 2006 was continued. These series are available at the PUL Web page.
 - Development of algorithms and software for data processing and analysis was continued.
 - PUL archive of VLBI data and products was originated at the end of 2006. At present, all available databases and NGS cards have been stored along with main IVS and IERS products.
 - PUL staff members participated in activities of several IVS projects, Working Groups, and Committees.

4. Outlook

Plans for the coming year include:

- Continuation of the IVS related studies.
- Development of the algorithms and software used for data processing.
- Support of the PUL archive of data and products.

References

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