

IVS Analysis Center at Main Astronomical Observatory of National Academy of Sciences of Ukraine

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Abstract

This report summarizes the activities of the VLBI Analysis Center at the Main Astronomical Observatory of the National Academy of Sciences of Ukraine in 2009.

1. Introduction

The VLBI Analysis Center was established in 1994 by the Main Astronomical Observatory (MAO) of the National Academy of Sciences of Ukraine (NASU) as a working group of the Department of Space Geodynamics of the MAO. In 1998 the group started its IVS membership as an IVS Analysis Center. The MAO AC is located at the office building of the observatory in Kiev.

2. Technical Description

VLBI data analysis at the center is performed on two computers: an Intel Core 2 Duo 3.1 GHz box with 4 Gb RAM and a 1 TB HDD, and a Pentium-4 3.4 GHz box with 1 GB RAM and two 200 GB HDDs. Both computers are running under the Linux/GNU Operating System.

The Main Astronomical Observatory improved its Internet connection in 2009. Now we have a 100 Mbps fiber channel with a 256 Kbps backup on a leased line.

For data analysis we use the STEELBREEZE software which was developed at the MAO NASU. The STEELBREEZE software is written in the C++ programming language and uses the Qt 2.x widget library. STEELBREEZE makes Least Squares estimation of different geodynamical parameters with the Square Root Information Filter (SRIF) algorithm (see [1]).

The software analyzes VLBI data (time delays) of a single session or a set of multiple sessions. The time delay is modeled according to the IERS Conventions (2003) [2], as well as by using additional models (tectonic plate motion, nutation models, wet and hydrostatic zenith delays, mapping functions, etc.). The following parameters are estimated: Earth orientation parameters, coordinates and velocities of a selected set of stations, coordinates of a selected set of radio sources, clock function, and wet zenith delay.

3. Staff

The VLBI Analysis Center at Main Astronomical Observatory consists of three members:

Yaroslav Yatskiv: Head of the Department of Space Geodynamics; general coordination and support of activity of the Center.

Svitlana Lytvyn: Junior research scientist of the Department of Space Geodynamics; investigates the stability of VLBI-derived celestial and terrestrial systems.

Sergei Bolotin: Senior research scientist of the Department of Space Geodynamics; responsible for the software development and data processing. Sergei took an active part in the work of

the MAO AC in January—May. Since June he has advised us about the technical aspects of VLBI data analysis.

4. Current Status and Activities in 2009

In 2009 we performed regular VLBI data analysis to determine Earth orientation parameters. “Operational” solutions were produced and submitted to the IVS on a weekly basis. The IERS Conventions (2003) [2] models were applied in the analysis. In the solutions, station coordinates and Earth orientation parameters were estimated.

Also, this year we continued to participate in the IVS Tropospheric Parameters project. Estimated wet and total zenith delays for each station were submitted to IVS. The analysis procedure was similar to the one used for the operational solutions.

The MAO AC participated in the IVS activities concerning ICRF2 preparation. In the frame of the IVS working group (WG) for ICRF2 we produced time series of radio source positions. Also, two global solutions, mao008a and mao006a (with and without VCS sessions), were obtained and provided to the ICRF2 WG.

The combined catalog maoC08a was created using all solutions submitted by various IVS analysis centers (individual solutions: aus007a, bkg001a, gsf007b, iaa008c, mao008a, opa008b and usn010b).

Some activities were directed to porting the STEELBREEZE software to the Qt3 library. The first, preliminary STEELBREEZE release, which can be compiled using the Qt-3.8.8 library, was issued.

5. Plans for 2010

The MAO Analysis Center will continue to participate in operational EOP determination, as well as in updating the TRF and CRF solutions from VLBI analysis of the full data set of observations. We also plan to create a stable STEELBREEZE release based on Qt3 and to start to port this software to Qt4.

Acknowledgments

The work of our Analysis Center would be impossible without the activities of other components of IVS. We are grateful to all contributors from the Service.

References

- [1] Biermann, G.J., 1977, Factorization Methods for Discrete Sequential Estimation, V128, Mathematics in Science and Engineering Series, Academic Press.
- [2] IERS Conventions (2003), IERS Technical Note 32, eds. D.D. McCarthy and G. Petit, Bundesamt für Kartographie und Geodäsie, Frankfurt am Main.