

# Analysis Center of Saint Petersburg University

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**Abstract** This report briefly summarizes the activities of the Analysis Center of Saint Petersburg University during 2019 and 2020. The current status, as well as our future plans, is described.

## 1 General Information

The Analysis Center of Saint Petersburg University (SPU AC) was established at the Sobolev Astronomical Institute of the SPb University in 1998. The main activity of the SPU AC for the International VLBI Service before 2007 consisted of routine processing of 24-hour and one-hour observational sessions for obtaining Earth Orientation Parameters (EOP) and rapid UT1–UTC values, respectively. In 2008 we began submitting the results of 24-hour session processing.

## 2 Component Description

Currently we support two series of the Earth Orientation Parameters: spu00004.eops and spu2015a.eops.

- All parameters were adjusted using the Kalman filter technique. For all stations (except the reference station), the wet delays, clock offsets, clock rates, and troposphere gradients were estimated. Troposphere wet delays and clock offsets were modeled as a stochastic process such as a random walk. The

clock rates and the troposphere gradients were considered to be the constant parameters.

- The main details of the preparation of the EOP time series spu00004.eops and spu2015a.eops are summarized below:
  - Data span: 1989.01–2020.12
  - CRF: fixed to ICRF-Ext.2
  - TRF: VTRF2005 was used as an a priori TRF
  - Estimated parameters:
    1. EOP:  $x$ ,  $y$ , UT1–UTC,  $d\psi$ ,  $d\epsilon$ ;
    2. Troposphere: troposphere gradients were estimated as constant parameters, and wet troposphere delays were modeled as a random walk process;
    3. Station clocks were treated as follows: offset as a random walk process, rate as a constant.
  - Nutation model: IAU 1980 (spu00004.eops), IAU 2000 (spu2015a.eops)
  - Mapping function: VMF1
  - Technique: Kalman filter
  - Software: OCCAM v.6.2

## 3 Staff

The assistant professor of Saint Petersburg University, Dmitriy Trofimov, was in charge of the routine processing of the VLBI observations. General coordination and support for the activities of the SPU AC at the Astronomical Institute were performed by the head of the chair of astronomy, Sergey Petrov.

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Sobolev Astronomical Institute of Saint Petersburg University

AI SPbU Analysis Center

IVS 2019+2020 Biennial Report

## 4 Current Status and Activities

Until 2019, we processed observations only in NGS format. In 2019 we started working with the vgosDB format. In 2019, we continued the estimation of the five Earth Orientation Parameters. The OCCAM software package (version 6.2) was used for the current processing of VLBI data [1]. The time series is named spu00004.eops. It includes data obtained by the IRIS-A, NEOS-A, R1, R4, RDV, and R&D observing programs, and it covers 32 years of observations (from January 2, 1989 until December 2020). The total number of sessions processed at the SPU AC is about 2,550, of which about 200 VLBI sessions were processed in 2019–2020 and cover the interval from August 2018 to December 2020.

The new series of the Earth Orientation Parameters launched in 2015 was also continued. The total number of points in spu2015a.eops is about 2,550, of which about 200 VLBI sessions were processed in 2019–2020 and cover the interval from August 2018 to December 2020.

Our experience and the equipment of the Analysis Center was used for giving lectures and practical work on the basics of radio interferometry to university students. We use our original manual on the training in modern astrometry and in particular VLBI [2].

## 5 Future Plans

We had planned to start processing a new series based on the new catalogs of radio sources and stations, but unfortunately we have not yet begun. But these plans have remained. We also plan to improve the equipment in order to solve some technical problems. Lectures and practical exercises for students in a special course on radio astrometry will continue. This course is part of the curriculum of astronomical education at the St. Petersburg State University.

## References

1. O. Titov, V. Tesmer, J. Boehm. OCCAM v. 6. 0 Software for VLBI Data Analysis, In International VLBI Service for Geodesy and Astrometry 2004 General Meeting Proceedings, N. R. Vandenberg and K. D. Baver (eds.), NASA/CP-2004-212255, pp. 267–271, 2004.
2. V. Vityazev, I. Guseva, V. Kiyayev, M. Mishchenko, O. Titov, A. Tsvetkov. Celestial and Terrestrial Coordinates (in Russian), Manual on Astrometry, p. 301, SPb University, 2011.