State Scientific Center of the Russian Federation

National Research Institute for Physical-Technical and Radio Engineering Measurements

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ABSTRACT

Federal State Unitary Enterprise «National Research Institute for Physical-Technical and Radio Engineering Measurements» (VNIIFTRI) is one of the leading national institutes of metrology in Russia. One of the main divisions of the Institute is the Main Metrology centre of state service of time and frequency.

The Main Metrology centre of state service of time and frequency was founded based on the Head office of the unified time service and has been actively defining Earth rotation parameters based on co-processing of the entire measurement data since 1955.

Regular computing of Earth rotation parameters (ERP) according to the measurements data using satellite laser rangers (SLR) started in the Main Metrology centre of time and frequency state service in 1995. In 2010 the processing of SLR measurements had to be interrupted due to technical reasons. Nowadays the processing of laser measurements is planned to be resumed.

The present work includes the updated information on the structure and activities of Associate Analysis Center of VNIIFTRI (former Institute of Metrology for Time and Space (IMVP)) and the first results achieved in handling of SLR measurements are presented.

INTRODUCTION

AAC VNIIFTRI being division of the Russian Main Metrological Center of Time, Frequencies and Earth Rotation Service has been carrying out the rapid EOP processing based on GNSS, VLBI and SLR observations for many years.
AAC VNIIFTRI has now 3 lines of development:
1) Processing GNSS, SLR and VLBI observation data for EOP evaluation;
2) Combination of EOP series for evaluation of reference EOP values;
3) Combination of GLONASS satellites orbit/clock;

Processing GNSS, SLR and VLBI observation data for EOP evaluation

Processing of measurements by phase GPS in VNIIFTRI was started in 1999.
Today EOP from GPS are obtained by processing of measurements on Russian network which includes approximately 35 GNSS receivers of the various organizations and departments(RSA, RAS, ROSSTANDART and others) .
Since 2004 EOP evaluations from VLBI technique have been carried out with the use of software package OCCAM version 5.0, specially adapted to the rapid service mode. In 2011 we began to process the new series of VLBI data using VieVS software developed at the Institute of Geodesy and Geophysics (IGG), Vienna University of Technology.
Now VLBI observations are processed in VNIIFTRI with the use of OCCAM and VieVs package.
Use of SLR observations of the Lageos-1 and Lageos-2 was started in 1995. Processing was carried out with the help of a program package ITALAS (IAA). But the facilities and ideas which were realized in this program many years ago did not allow to evaluate EOP with accuracy required now. So use of this program for EOP evaluation in VNIIFTRI was stopped.
The preparation for renewal of regular operative calculations of EOP based on results of SLR measurements is being conducted.

Rapid combination of EOP series for evaluation of reference EOP values

Rapid combination of EOP for evaluation of reference EOP values has been started in VNIIFTRI at 1955.

Separate series which were used for combination in 2013

	Analysis centers of Russian EOP PC	Observation technics	Values
1	MMC NSTF (VNIIFTRI)	GPS	X, Y, UT1
2	MMC NSTF (VNIIFTRI)	VLBI	X, Y, UT1, dy, de
3	IAA RAS	SLR	X, Y, UT1
4	IAA RAS	GPS	X, Y, UT1
5	IAA RAS	VLBI	X, Y, UT1, dy, de
6	SVOEVP (from 1.07.13)	GPS/GLONASS	X, Y, UT1
7	MCC RSA	SLR	X, Y
8	IACRSA	GPS	X, Y

It is used method of combination which was developed and implemented by Kaufman Mark Borisovich in 2006

Combination of GLONASS satellites orbit/clock

The algorithm and the program for GLONASS satellites orbits combination were developed. The calculations by this program as well as calculations of the coordinate differences for GNSS antennas in VNIIFTRI (Mendeleevo, Moscow reg.) and the North-Eastern branch of VNIIFTRI (Irkutsk) using different orbits and clock corrections are provided. Some theoretical estimates for RMS in satellites coordinate reference values determination were derived. It is shown that under condition when RMSs in satellite coordinates estimation provided by separate Analytic Centers during a long time interval are commensurable the RMS of reference values is no greater than RMS of satellite coordinates estimated by any of the Analytic Centers.

GLONASS orbits for each Center: comparison with IGL orbit
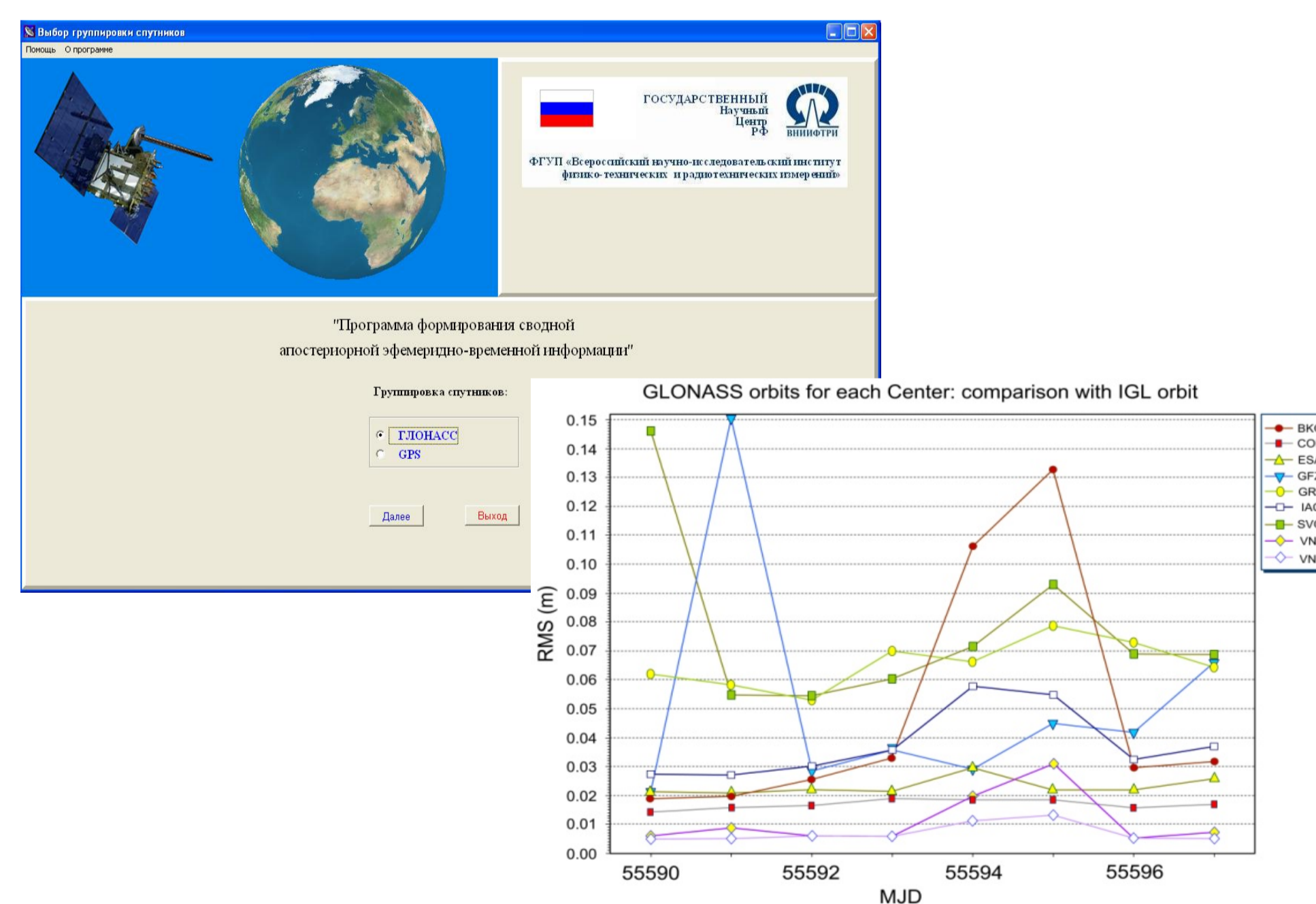
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