

IMPROVEMENT OF THE SOFTWARE BERNESE FOR CALCULATION OF THE EARTH ROTATION PARAMETERS ACCORDING TO THE DATA OF SATELLITE LASER RANGING (LAGEOS 1, LAGEOS 2) IN THE MAIN METROLOGICAL CENTRE OF THE STATE TIME AND FREQUENCY SERVICE

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ABSTRACT

Preparatory works for resuming operational calculations of the Earth rotation parameters based on the results of satellite laser ranging data processing (LAGEOS 1, LAGEOS 2) are to be completed in the Main Metrology Centre Of The State Time And Frequency Service (VNIIFTRI) in 2014. For this purpose BERNESE 5.2 software (Switzerland) was chosen as a base software which has been used for many years in the Main Metrological Centre of the State Time and Frequency Service to process phase observations of GLONASS and GPS satellites. Although in the BERNESE 5.2 software announced presentation of the possibility of the SLR data processing is declared, it has not been fully implemented. In particular there is no such an essential element as corrective action (as input or resulting parameters) in the local time scale («time bias»), etc. Therefore, additional program blocks have been developed and integrated into the BERNESE5.2 software environment. The program blocks are written in Perl and Matlab program languages and can be used both for Windows and Linux, 32-bit and 64-bit platforms.

INTRODUCTION

In 2010 at VNIIFTRI a program development for SLR measurements processing was started under the supervision of leading researcher M. B. Kaufman to calculate Earth rotation parameters. The program had been developed on the base of BERNESE software.

The authors of the work have developed and implemented algorithm (see figure. 1) and calculation technique of ERP according to SLR supervisions, and also individual software elements enable to calculate and then to include Range-bias (Rb) and Time-bias (Tb) corrections in measurements files. Also a software module was developed to provide preliminary analysis and screening of rough measurements.

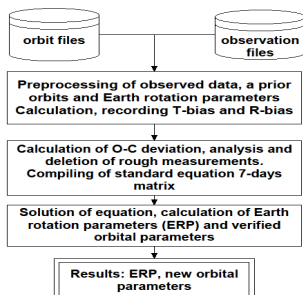


fig.1 Algorithm of calculation

RESULTS

At this time ILRS Network (figure2) includes around 40 stations. The measurements of 33 are used for ERP calculation. In table 1 there is a list of stations which measurements are used for ERP calculation

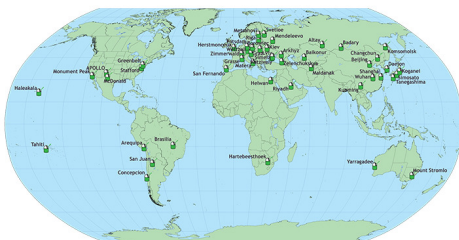


fig.2 ILRS Network

RESULTS

Table 1 ILRS station list

1824	KIEV	7358	TANEGASHIM
1868	KOBSHOLSK	7403	AREQUIPA
1873	SIMEIZ	7405	CONCEPCION
1879	ALTAY	7406	SAN JUAN
1884	RIGA	7501	HARTEBEST
8834	WETZELL	7810	ZIMMERWALD
1893	KATZIVELY	7821	SHANGHAI
7080	MCDONALD	7824	SAN FERNAN
7090	YARRAGADEE	7825	MOINT STRO
7105	GREENBELT	7838	SIMOSATO
7110	MONUMENT P	7839	GRAZ
7119	HALEAKALA	7840	HERSTMONCE
7124	TAHITI	7841	POTSDAM
7237	CHANGCHUN	7845	GRASSE
7249	BEIJING	7941	MATERA
7308	KOGANEI (CRLAS)	1874	SAJEN-TM
7328	KOGANEI (KOGLAS)		

Nowadays the program is operation in experimental conditions and the first results have been obtained: in figures 3 and 4 the influence of Rb and Tb on laser satellite measurement carried out on station MDVL is shown; figures 5-6 show the declination between calculated pole coordinate values (xp,yp) and values of IERS service for 2013 year.

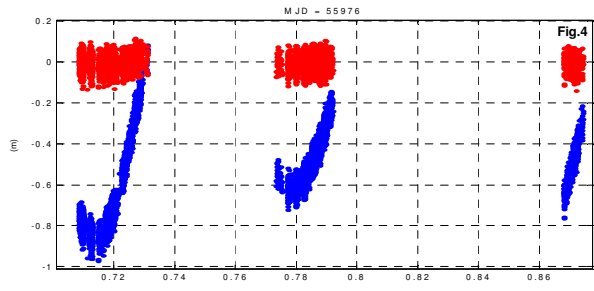
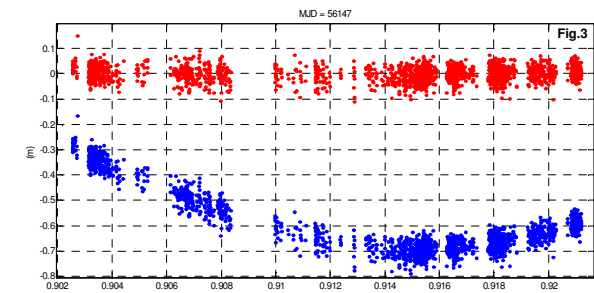


fig. 3-4 Influence of Rb and Tb on laser satellite measurement (station MDVL)

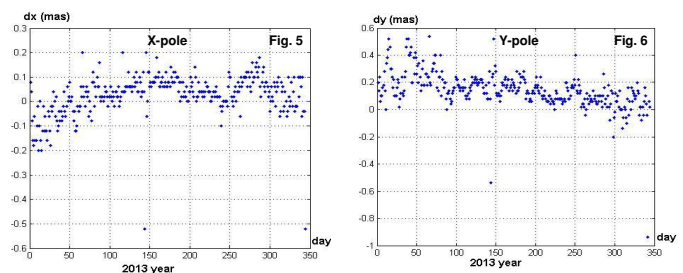


fig. 4-5 Declination between calculated pole coordinate values (xp, yp) and values of IERS service

CONCLUSIONS

- The programme for Earth Rotation Parameters (ERP) calculation has been developed;
- The accuracy of the obtained results is close to the one of the International Service IERS;

In order to integrate the programme into the service activity the only thing left to do is to overcome a series of technical issues.