

3.6.2.9 Institute of Applied Astronomy (IAA)

Research groups and staff

Two research groups of the Institute of Applied Astronomy of the Russian Academy of Sciences (IAA) are involved in the IERS CRC related activity:

1. Laboratory of Space Geodesy and Earth Rotation (LSGER)

Dr. Zinovy Malkin (Head), Natalia Panafidina, Elena Skurikhina
Contact: malkin@quasar.ipa.nw.ru

2. Laboratory of Ephemeris Astronomy (LEA)

Prof. George Krasinsky (Head), Nadejda Shuygina
Contact: kra@quasar.ipa.nw.ru

Activities

LSGER group

Comparison and combination of EOP series

During the last year we continued to develop software for comparison and combination of EOP series. This software is routinely used in the framework of every-day IAA EOP Service activity for control of data and result quality and study of systematic errors of various EOP series.

Several special studies were performed: investigation of accuracy of VLBI EOP rate estimations, comparison of results obtained with the IVS R1 and R4 observational programs, analysis of the VLBI nutation series and comparison with model, and others.

Most of these investigations will be continued.

One of the nearest goals of this investigations is the computation of combined EOP series from VLBI, SLR and GPS solutions routinely computed at the IAA. We expect the quality of such a combination to be close to the quality of the JPL SPACE series based on combination of similar data. We are going to compute also an operational solution with an expected delay 1.5-2 days. Prediction will be also provided. Beginning of the experimental computation is planned for 2003 if we could find needed resources for this activity.

Comparison and combination of TRF realizations

During the last year we continued to develop software for comparison of station coordinates time series and combination of TRF realizations. At the moment this software is primarily used for analysis of the VLBI TRF and EPN (European Permanent GPS Network) GPS results.

The VLBI TRF solution which is used for comparison and combination with GPS data is computed from all available VLBI sessions (both 24h and intensives can be used). Final coordinates and velocities are obtained from analysis of session solutions. Software for computation of EOP+TRF session solution is in progress.

GPS coordinate time series is computed from analysis of available EPN weekly solutions. The basis of this project is using a

non-fiducial (free network) strategy for computation of station coordinates. This strategy has some evident advantages:

- Such a solution does not cause a distortion of the network.
- More stations can be used for orientation of a network which makes final orientation of the solution more reliable and dependant to a lesser degree on unmodelled errors in coordinates of fiducial stations.
- Such a solution can be easily transformed to any reference system and re-transformed to another one using a much simpler procedure than that needed for removing constraints.

Two approaches to obtain an homogeneous coordinate time series have been tested. The first one is based on re-processing of available combined weekly EPN solutions produced at CODE and BKG. This processing is made in three steps:

- Removing constraints from the official EPN solutions.
- Re-scaling of covariance matrix to obtain homogeneous solution in sense of errors.
- Transformation of obtained quasi-free-network solution to ITRF.

The first solution obtained using this strategy was computed in two steps only (1 and 3). The results showed that this method allows us to obtain independent homogeneous coordinate time series close to computed at the ROB. However, analysis of errors of our solution showed several significant jumps in errors of several mm in coordinates which most probable are caused by episodic changes in processing options during computation of the official EPN combined solution. Introducing of step 2 gave us a possibility to solve this problem.

The second solution (which is now under development) is based on independent combination of individual EPN Analysis Centres' solutions using a three step approach:

- Removing the Analysis Centre specific constraints when necessary.
- Computation of a weekly free network solution.
- Final orientation of the weekly free network solution w.r.t. ITRF2000.

We are going to submit our EPN solutions to the EPN Central Bureau on a regular basis when available.

VLBI+GPS analysis of European baselines

This project is directed toward investigation of crust deformations in the European region on the basis of comparison and combination of results obtained with VLBI and GPS observations at European stations. The first results showed a good agreement between baseline length rates (except Ny Alesund), however analysis of seasonal variations in baseline length revealed some problems. This investigation will be continued with new GPS and VLBI results obtained with updated versions of software.

Results of researches are available on the Lab web site at
<<http://www.ipa.nw.ru/PAGE/DEPFUND/GEO/>>.

LEA group The main topic of investigations of the LEA group is combining of space geodesy and other astronomical observations at the observational level in single processing using ERA software. Combined processing of VLBI and SLR observations with the goal to obtain dense UT1 and nutation series is under development. DORIS observation processing is also underway.

During the last year this group concentrated on the improvement of the processing software.

*Zinovy Malkin, Natalia Panafidina, George Krasinsky,
Nadejda Shuygina*