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)

   Zinovy Malkin (head), Natalia Panafidina
   Contact: malkin@quasar.ipa.nw.ru

2. Laboratory of Ephemeris Astronomy (LEA)

   George Krasinsky, Nadejda Shuygina
   Contact: kra@quasar.ipa.nw.ru

Activities

The main topics of investigations in this direction in 2001 included:

1. Comparison of EOP series, TRF and CRF realizations for investigation of systematic differences between them.
2. Comparison of VLBI EOP series obtained with different software and from different observational programs.
3. Comparative analysis of the VLBI nutation series, their combination and comparison with model.

LSGER group

1. Comparison and combination of EOP series, TRF and CRF realizations in the framework of the IAA EOP Service activity

The nearest goal of this investigations is the derivation of combined EOP series from VLBI, SLR and GPS solutions routinely computed at the IAA.

2. Computations of independent GPS/EPN coordinate time series.

The basis of this project is using a non-fiducial (free network) strategy for computation of station coordinates. This strategy has some evident advantages:

1. Such a solution does not cause a distortion of the network.
2. More stations can be used for orientation of a network which makes the final orientation of the solution more reliable and dependant to a lesser degree on unmodelled errors in the coordinates of the fiducial stations.
3. 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.

At the first stage of the project we re-processed original GPS observations for selected EPN subnetwork. That processing was made in three steps:

1. Computation of a daily free network solution.
2. Computation of a weekly free network solution.
3. Transformation of weekly free network solution to ITRF.

This approach can provide a fully independent solution free of network distortion. Unfortunately, this way of computation requires too much resources and it is practically impossible to re-process all EPN observations in such a way.

The second stage of our work is re-processing of available combined weekly EPN solutions produced at CODE and BKG. This processing is made in two steps:

1. Removing constraints from the official EPN solutions.
2. Transformation of obtained quasi-free-network solution to ITRF.

We plan to begin regular operative computation of this series in 2002 after solution of some remaining problems.

The third stage of the project is now under development. We plan to compute a new EPN combined solution based on independent combination of existing EPN Analysis Centers' solutions using a three step approach:

1. Removing the Analysis Center's specific constraints when necessary.
2. Computation of a weekly free network solution.
3. Final orientation of the weekly free network solution w.r.t. ITRF2000.

3. Participation in the IERS Analysis Campaign to align EOPs to ITRF2000

Five EOP solutions obtained from processing of VLBI, SLR and GPS observations were submitted to the IERS Analysis Coordinator: IAA01L83020, IAA02L93020, IAA03R84020, IAA04R80020, IAA05P00020. Besides, VLBI session TRF solutions for 1999 were provided.

LEA group

The main topic of investigations is the combination of space geodesy and other astronomical observations (optical, radar, Doppler) at the observational level in single processing using ERA software.

Experimental computation of combined SLR+VLBI series was begun in 1998 and advanced algorithms and software are under development. SLR observations of Lageos-1, Lageos-2, Etalon-1, Etalon-2 have been processed in the frame of the ILRS AWG Pilot Project "positioning + Earth orientation" and submitted to the AWG. The approach proposed by the AWG was expanded by experiments with a combined processing of the SLR observations with VLBI observations of the NEOS-A program for the same time interval.

In this way the contribution of SLR data not only to determination of the pole coordinates and LOD but also to evaluation of time variations of Celestial Pole could be provided. Kalman filtering was used both for modelling of the fast changing parameters of VLBI techniques (clock errors and atmosphere effects) and the time variations of the all five Earth Orientation Parameters. It appeared that in this way some fine effects in the variations of EOPs might be studied.

Zinovy Malkin, Natalia Panafidina,
George Krasinsky, Nadejda Shuygina