IMPLEMENTATION OF NEW MODELS FOR EARTH ROTATION IN DATA ANALYSIS AT THE UKRAINIAN CENTRE OF DETERMINATION OF THE EOP

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ABSTRACT. In our paper new realization of the Ukrainian Centre of Determination of the Earth Orientation Parameters (UCEOP) is presented. History and purpose of the creation of the UCEOP are given. Structure of Ukrainian Centre of Determination of the Earth Orientation Parameters is described. Ukrainian Space Geodynamics Networks are presented. Analytical Centre of the UCEOP is described.

1. HISTORY AND PURPOSES

Ukrainian Centre of Determination of the Earth Orientation Parameters (UCEOP) was founded in 1998 in the Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kiev, Ukraine. It was created under support of the State Program 1995-1999/2000-2003. Prof. Yaroslav Yatskiv was the founder and Senior Research Scientist Alla Korsun' was the first leader of the UCEOP (1995 - 2003). Since 2003 Senior Research Scientist Olga Bolotina is the manager of the UCEOP.

The purposes of the creation of the Ukrainian Centre of Determination of the Earth Orientation Parameters are coordination and technical support of activities of the Ukrainian Space Geodynamics Networks, creation of the geodynamics information databases, analysis of the geodynamical information for solving the problem of the basis coordinate-time provision of Ukraine.

2. STRUCTURE OF THE UCEOP

UCEOP coordinates the activities of GPS, SLR and VLBI Ukrainian Space Geodynamics Networks.

Ukrainian GPS Network is presented by nine permanent GPS stations. Five of them, Kiev/Golosiiv, Uzhgorod, Lviv, Poltava, Mykolaiv are members of International GPS Service (IGS) Network and EUREF Permanent GPS Network (EPN). Two stations, Kharkiv and Evpatoria, are candidates to the members of EPN. Permanent GPS station Simeiz is a member of Mediterranean GPS Network. Permanent GPS station Alchevsk is a new station of the Ukrainian GPS Network.

Ukrainian SLR Network includes four permanent SLR stations Golosiiv-Kiev, Lviv, Simeiz, Katzively. All of them are registered in International SLR Service (ILRS).

Ukrainian VLBI Network is presented by only one active station CRIMEA. Station is a member of the International VLBI Service (IVS).

Analyzing of geodynamical is performed in the frame of the UCEOP. The Analytical Centre of the UCEOP includs GPS, SLR and VLBI Data Analysis Centres.
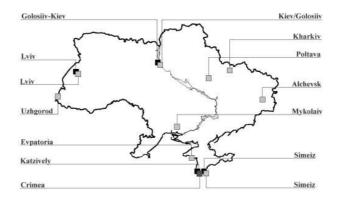
Figure 1: Ukrainian Space Geodynamics Networks

The primary interests of UCEOP Data Analysis Centres are softwares developing, data analysis of the GPS, SLR and VLBI observations, archiving the observations for local needs, controlling of the Ukrainian permanent GPS, SLR and VLBI Networks, management of local GPS campaigns in Ukraine.

The GPS Data Analysis Centre controls and supports the Ukrainian permanent GPS stations Kiev/Golosiiv, Uzhgorod, Kharkov, Evpatoria, as well as supports Operational Data Centre for providing data management for Ukrainian permanent GPS stations (expect stations Lviv and Simeiz), Local GPS Data Centre, and management and analysis of local GPS campaigns in Ukraine. Data from Ukrainian permanent GPS stations are sending automatically to the GPS Data Analysis Centre for archiving and analysis. Softwares BERNESE ver. 4.2 and GAMIT/GLOBK ver.10.1 are used for GPS data analysis in the UCEOP. Since December 16, 2003 regular weekly GPS data processing have been started.

The SLR Data Analysis Centre controls and supports of the Ukrainian SLR Network. This one controls quality of the observation data as well as provides analysis data to the Ukrainian SLR stations. Data from Ukrainian SLR stations are sent to the SLR Data Analysis Centre for archiving and analysis. Unique Kiev-Geodynamics software is used for SLR data analysis. Models and methods recommended by IERS Conventions 1996 and 2000 are realized in the Kiev-Geodynamics software.

The primary interests of the VLBI Data Analysis Centre is software developing. The unique SteelBreeze ver.2 software is used for geodetic VLBI data analysis. SteelBreeze software makes Least Square estimation of different geodynamical parameters with the Square Root Information Filter (SRIF) algorithm. The SRIF uses the Householder's transformation for matrix triangularization that makes it fast and insensitive for computer roundoff. The SRIF also makes possible to introduce the stochastic model for parameter estimation. The SteelBreeze software analyses the VLBI data of single and multiple set of sessions. The time delay is modelled according to the IERS Conventions 2003. Additional models can be used also. Various investigations on the stability of the Celestial Reference Frame have been carried out. Studies of variations of tropospheric zenith delays and comparing of GPS- and VLBI-derived zenith delays have been performed. Now, an analysis of time variations of Love and Shida numbers is conducted. Since November 2003 regular weekly EOP determinations from VLBI data processing have been started. A collection of all available VLBI observations are kept in the local archives.