GPS MEASUREMENTS OF THE GEOTECTONIC RECENT MOVEMENTS IN EAST SLOVAKIA

Prof. Vladimir SEDLAK, Slovak Republic

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ABSTRACT

The paper deals with transformation procedures observed *GPS* (*Global Positioning System*) data from the World Geodetic System *WGS-84* into the national geodetic grid datum *S-UTCN* (*System of United Trigonometric Cadaster Network*) and *Baa*.(*The Baltic Sea after adjustment*). *GPS* measurements are situated into the geodetic network in the Košice-Valley for a purpose of deformation surveying geotectonic recent movements in the East-Slovak regions. Adjustment with constraints and free adjustment are applied at determining coordinates of the geodetic network points.

Transformation from *WGS-84* into *S-UTCN* is the most frequently by means of using the 7-element Helmert transformation with using three identical points. Geodetic network was adjusted by two ways. In a case when datum parameters are absolutely accuracy then an adjustment with constraints is considered; in a case when datum parameters are determined with a concrete accuracy, what has also an influence on an accuracy of adjusted parameters except on measured accuracy, then a free adjustment is considered.

The *GPS* measurements are realised on points of the geodetic network (*GN*) localised in the Kosice-Valley (Slovakia). The aim of these measurements is determining recent geotectonic movements in the urban agglomeration of Kosice-city. 3D coordinates of the network points determined from satellite navigation present a realisation result of the solved scientific project at the Department of Geodesy and Geophysics of the Technical University of Kosice since 1997.

GPS measurements are periodically realised twice a year (spring and autumn). Altogether, 17 points of *GN* are measured by means of using the *GPS* static method. A priority of the chosen static method for our measurements is above all a high accuracy in determining point positions which is conditioned by longer period of measurement on a determined point (cca 45 minutes). The determined *GN* points are solved by double *GPS* vector technology always regarding two reference points, i.e. three *GPS* receivers are used for measurements. These points are placed so that the territories in which some geotectonic movements are presupposed according to geologists. The main tectonic fault in the Kosice-Valley, according to which two expressive geological faults of the Earth ground blocks should move, is assumed in the north-south direction along the river Hornad. The secondary tectonic faults of smaller extent are in the direction perpendicular to the Hornad fault, i.e. in the east-west direction. These secondary tectonic faults are mutually parallel.

Three double-frequency *GPS* receivers Sokkia GRS 2100 were used to measurement. Adjustment of observed data was realised by the firm software Prism ver 2.1 Sokkia. Coordinates of all points in *GN* were transformed from *WGS-84* into a plane coordinate system *S-UTCN,* which is obligatory coordinate system for realisation of geodetic works in Slovakia. The non-linear rotary matrix method was applied to the adjustment. After transformation, the coordinates were consecutively adjusted by an adjustment with constraints.

For a purpose of deformation consideration in the monitoring network the coordinate differences are subjected to the teststatistic hypotheses. A size of deformations is presented by the deformation vectors on the individual network points. Modelling deformations in the Kosice-Valley is based on GIS data by means of using the MicroSoft and Kokes software.

CONTACT

Assoc. Prof. Vladimir Sedlak, MSc., PhD.
Technical University
Department of Geodesy and Geophysics
Park Komenskeho 19
SK-043 84 Kosice
SLOVAKIA
Tel. + 421 95 6022 916
Fax + 421 95 6336 618
E-mail: sedlak@tuke.sk

BIOGRAPHICAL NOTE

Vladimir Sedlak is associate professor on geodesy and engineering surveying at the Technical University of Kosice, Department of Geodesy and Geophysics, Slovakia. He graduated on mine surveying and geodesy at TU Kosice in 1980. In 1987 he obtained PhD. on mine surveying. He is member of FIG (Commission 4), Presidium ISM and General Assembly CLGE.