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CREATION OF PERMANENTLY OPERATING SATELLITE REFERENCE STATIONS NETWORK.STATUS AND POSSIBILITIES OF THE STATE GEODESICAL NETWORK OF THE REPUBLIC OF UZBEKISTAN

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Abstract: The creation of permanently operating reference stations network arose as a result of significant shortcomings identification of traditional measurement methods. This article discusses the process and goals of creating satellite stations. It was revealed the main advantages and disadvantages of using a permanent satellite reference stations network and carried out the analysis of the current state and possibilities of the state geodetic network of the Republic of Uzbekistan.
Keywords: reference stations, GNSS, GPS / GLONAS / GALILEO, CORS, Vector.

Introduction

Reference stations are stations that have geodetic coordinates determined and connected to the state geodetic base network, which continuously perform GPS measurements. They are an integral part of the state's geodetic framework.

Permanent reference stations include a satellite geodetic receiver and antenna, which are installed in reliable locations and operate from a regular power supply. The receiver constantly receives satellite signals and transmits these signals to other devices operating in real time.

It includes a permanent reference station, complex satellite receivers, antennas, general control (computing) center, special software, communication systems, means of communication and economic infrastructure. Most reference stations are selected based on their coverage area, communication lines availability, terrain, and consumers. Many stations recommended in the Republic of Uzbekistan to ensure the regular guaranteed network operation are four.

A new satellite geodetic network creation will provide defense and the country's economy with fast and accurate coordinates of any objects location on the ground at an efficient and low cost. Similar stations have been built in the Republic of Uzbekistan, connected to the state geodetic base network and their permanent operation is provided

PRACTICAL USE OF PERMANENT WORKING REFERENCE STATIONS

In the XXI century, the satellite geodetic systems use has become an objective reality. First of all, the geodetic organizations specialists studied and applied modern tools and satellite measurement methods, software that provides the points coordinates as the final information. Coordinate measurement in the satellite method is widely used in various geodetic production processes:

- construction of geodetic foundation networks;
- in engineering research;
- various purposes and scales in topographic surveys;
- in cartographic production;
- in providing information to the geoinformation system;
- in creating the state geodetic basis;
- in observing the earth's crust movement;
- in geodetic works during construction;
- in the deformations observation that may occur during the structure operation;
- in cadastral works in different directions, etc..

It is also used in shipping, in determining their location and navigation, airports, aircraft, vehicles, in the management of technological mechanisms in the construction process, in automotive equipment in the process of

prospecting for minerals, on agricultural machinery doing field work and in the construction of skyscrapers.

Measurements in all high-precision satellite systems are made relative to the base stations, regardless the execution method. Vector measurements are performed at separate points' pairs. When doing large-scale work, you have to stand at these points for a long time, even in the dark. When creating geodetic bases on objects over large areas, the points range is at great distances from each other, having to cover several kilometers and stay at points for a long time in static mode, which also leads to long measurements.

The main condition for a long stay to determine the coordinates at the geodetic base points is the constant radio signals reception and reliable autonomous power supply provision. During the measurements, it is necessary to make a " descent" of at least one specialist to work at the geodetic point or to guard the instruments. It is advisable to build and include at least three or four permanent reference stations in the geodetic foundation system to carry out the work quickly, efficiently and with quality. Of course, it depends on many aspects, firstly on the financial capabilities, secondly on the construction period, technical and geometric factors. Most importantly, the implementation of permanent reference stations project increases the economic efficiency in the first place and is convenient and useful compared to the traditional method.

EQUIPMENT COMPOSITION OF PERMANENT WORKING REFERENCE STATION

At present, reference stations have been built in four regions of the Republic of Uzbekistan and are equipped with basic and additional service equipment. This ensures that they have a permanent working system.

To build and equip a single reference station, approximately the following will be required:

- construction of a reinforced concrete structure for the receivers installation;
- modem receiver in satellite geodetic system (GNSS-Global Navigation Satellite System);
- shelf for equipment and communication;
- permanent power block;
- the high-resolution antenna of the receiver;
- lightning protection;
- conditioners;
- set wall;
- internet network;
- GSM connection with IP address.

You will need Topcon Tools to process and equalize data, TopNET + to manage the database station, and TopNET RTK software to work in RTK (Real Time Kinematic - Kinematic real time) mode.

For field work you will need at least one satellite geodetic system (GNSS) receiver modem

ADVANTAGES AND DISADVANTAGES OF PERMANENT ACTIVITY REFERENCE STATION

Although the construction, equipping and commissioning of permanent reference stations costs a certain amount, its continuous long-term and uninterrupted use provides advantages and cost-effectiveness over the use of temporary base stations:

- reduces additional work on the geodetic foundations development and the points installation;
- the cost of temporary bases construction and the lack of transportation costs to and from them;
- there is no need to search for points and install receivers in the geodetic base networks construction, and the ability to work in RTK (real time) mode using a set of receivers;
- absence of errors in the permanent replacement of geodetic receivers at temporary geodetic bases;
- reliability of data use of permanently operating reference stations;
- ensuring the required accuracy of geodetic works using modern geodetic

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instruments of advanced manufacturers, satellite measurement methods;
- installation of accounting and control of automobiles and technological transport at construction sites, etc.

While it has some advantages, it also has some disadvantages:
- relatively high one-time costs in the construction and equipment of reference stations;
- periodic allocation of financial resources to ensure the station continuous operation;
- maintenance of a specialist with a fixed salary for technical tools and equipment inspection.

CURRENT STATUS AND OPPORTUNITIES OF THE SATELLITE STATE GEODESY SECTOR OF THE REPUBLIC OF UZBEKISTAN

Taking into account the above advantages in a timely manner, on behalf of the State Committee of the Republic of Uzbekistan "Davergeodezkadastr" created a state satellite geodetic network (SSGN) by its enterprises. It consists of the following [1]:
- The reference geodetic points network (RGP) consists of four points, MAGK (Tashkent), FARG (Fergana), JARQ (Jarkurgan) and URGA (Urgench), in 2005-2006 it was built using two frequency GPS receivers and precision antennas.
- 0 class satellite geodetic system (SGN-0 [2] consists of 15 points, in 2005-2006 it was built using two frequency GPS receivers and precision antennas.
- 1 class satellite geodetic system was built in 2010-2014 and consists of 145 points;
- The differential satellite geodetic system consists of 50 (CORS Continuously Operating Reference Stations) permanent operating stations. SDGN UzPOS (Uzbekistan Positioning System - UzPOS) system was launched in 2018 and equipped with modern infrastructure geodetic multi-frequency GPS/GLONAS/GALILEO receivers and precision antennas.
- The scheme of the state satellite geodetic network (SSGN) of the Republic of Uzbekistan is shown in Figure 1.

The state satellite geodetic network of the Republic of Uzbekistan

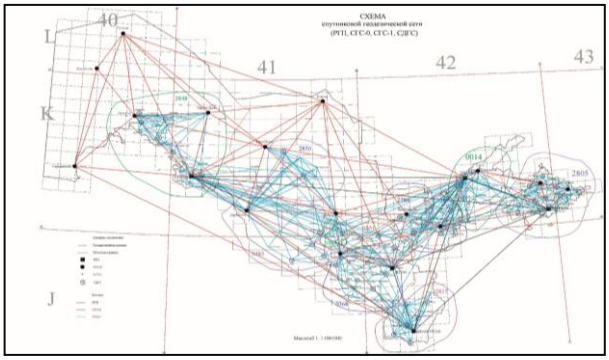

Fig. 1

Satellite geodetic measurements under the program RGP (reference geodetic points) of the Republic of Uzbekistan from 9.08.2005. to 9.11.2005 (Figure 1) and from 15.08.2006 to 28.09.2006 (Figure 2) implemented using GPS (Global Position System) receivers and precision antennas. The measurement results files in RINEX format were made using Trible Business Centre (vers. 4.1) software.

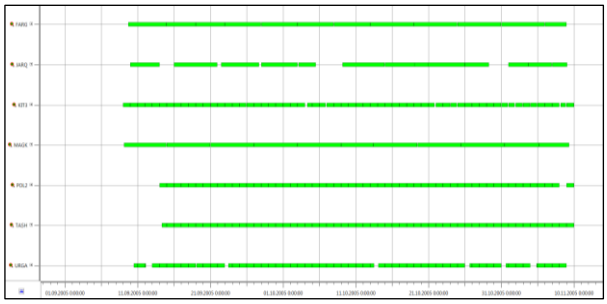

Fig. 1. RGP in 2005. Program-based measurement sessions.

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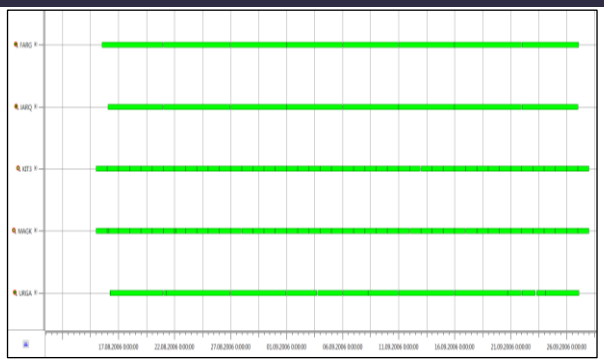

Figure 2. RGP in 2006. Program-based measurement sessions

A schematic work done by the RGP in 2005 and 2006 programs is shown in Figure 2. The KIT3 (Book) point of the IGS (International GNSS Service) network was used to link the RGP to the ITR (International Terrestrial Reference).

Location of RGP points

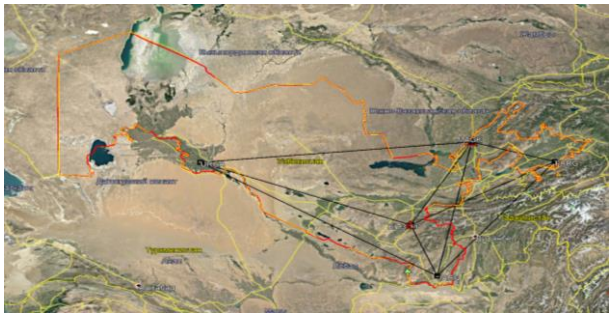

Figure 2

CONCLUSION

Preliminary processing of GPS measurement results showed that the data was of high accuracy and complied with regulatory requirements. The average square error of the points position was up to 1 cm in the plan, 3-4 cm in height.

Higher accuracy values for the 2005-2006 measurement results of reference network (RGP) points can be obtained after processing in the Bernese GNSS Software V5.2 software suite. Work on this sphere has now been completed.

Permanent reference stations built in the Republic of Uzbekistan were used as a basis for the construction of future networks CGS-0, CGS-1, CDGS.

In conclusion, the creation of a new state satellite geodetic network (SSGN - SSCS) provides fast, accurate and reliable coordinates of the location of any objects belonging to different sectors of defense and the economy. It is also widely used for scientific purposes, in the crustal movements study. Therefore, it is expedient and cost-effective to ensure the RGP points continuous operation of the reference network.

Literature:

1. The project is the introduction of a new open reference coordinate system of the Republic of Uzbekistan. Goskomzemgeodezkadastr, Tashkent. 231 p.
2. Guiding technical material on the use of satellite geodetic receivers for the creation and reconstruction of thickening networks-T.:Uzgeodezkadastr, 1999. p. 13-16.
3. The main provisions on the construction of the state geodetic network of the Republic of Uzbekistan (satellite geodetic network) .– Tashkent: Uzgeodez-cadastre, 2001.- 17 p. (Approved 12/25/2001)
4. Guiding technical material on the construction of the state-owned satellite geodetic network of the 1st class using satellite navigation systems. - Tashkent: Uzgeodezkadastr, 2000 - 55 p. (Approved January 28, 2000).
5. Rules for fixing points of the State Satellite Geodetic Network of the Republic of Uzbekistan. - Tashkent, Uzgeodezkadastr, 2003 – 51 p. (Approved 2.03.2004).
6. Guiding technical material on the construction of the state satellite geodetic network of the Republic of Uzbekistan. - Tashkent, Uzgeodezkadastr, 2003 - 43 p. (Approved March 2.04).
7. Muborakov H.M., Toshpulotov S.A., Nazarov B.R. Higher Surveying. Tashkent 2014. 459 p.
8. Genike A. A., Pobedinsky G. G. Global satellite GPS positioning system and its use in geodesy. - M .: Kartgeotsentr-Geodezizdat, 1999.p. 25.

9. Serapinas B. B. Introduction to GLONASS and GPS measurements. - Izhevsk, 1999.p. 21-23.
10. 7 Yakovlev N.V. Higher Surveying. Moscow, NEDRA, 1989, 445 pp. (in Russian)
11. 9 Yakovlev N.V., Bespalov N.A. Workshop on Higher Geodesy. Moscow. Naura, 1982, 368 pp. (in Russian)
12. 13 AvchievSh.K. Applied Surveying. Tashkent. Publishers - Voris, 2010, 153 pp. (in Uzbek)
13. 17 Klyushin E.B. The engineering geodesy. Graduate School. 2000, 446 pp. (in Russian)
14. 18 Nurmatov E.M. Geodesy. Tashkent. 2001, 224 pp. (in Uzbek)
15. 19 Basic provisions on state geodetic networks. Moscow. TsNIGAiK, 2002,128 pp. (in Russian)