

# Creation and Development of Continuously Operating Networks in the Russian Federation. Yesterday, Today, Tomorrow.

Aleksei Lapshin and Sergey Staroverov (Russia)

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## SUMMARY

The last few years have seen significant changes in the development of Global Navigation Satellite System (GNSS) infrastructure in the Russian Federation. Over the previous two years, Rosreestr created 45 points of the Fundamental Astronomical and Geodetic Network (FAGN). Their total number amounted to 99. A hardware and software complex of the Federal Geodetic Stations Network (FGSN) has been developed, which makes it possible to collect, analyze, and process satellite observations made at GNSS stations of various forms of ownership in order to control the stability of their operation and ensure that they can be used in solving the tasks of determining the location of objects in real time mode. Thus, it was possible to integrate more than 2000 of these stations. An information system has been created that allows:

to use a range of international and domestic sources of additional data;

to function in conditions of limited accessibility by providing autonomous determination of additional parameters (revised ephemeris and onboard clock corrections, ionospheric and tropospheric parameters, inter-channel delays of GLONASS (Global Navigation Satellite System in Russia) and GPS satellite signals);

to perform retrospective processing of data incoming with delay;

to perform joint equation of the results of a given set of daily solutions of the FGSN network;

to estimate the speeds of movement of FGSN points in the ITRF;

to perform delayed processing of data from individual stations or a set of several stations and then

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insert them into the general equation;

to perform joint network equation with a final common solution for the entire IGS network stations implementing ITRF;

to perform remote verification of satellite equipment.

The results of processing are daily coordinate solutions of FGSN points in the state geodetic reference system of 2011 with the accuracy of determining of FGSN stations coordinates from FAGS points – 3 cm.

Accuracy of determination of mutual position of FGSN stations – 1 cm.

In the future it is planned to expand the geographical coverage on the territory of the Russian Federation. This will improve the accuracy of determining coordinates and heights of observation points in remote and poorly explored regions.

Further development of the information system will be aimed at creating a service for automated processing of satellite observation data obtained during geodetic, cartographic, land surveying, town planning and cadastral works.

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