DEVELOPMENT OF HARDWARE-SOFTWARE COMPLEX FOR REGISTRATION THE ATMOSPHERIC ELECTRIC POTENTIAL GRADIENT

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The Kamchatka Peninsula is a unique testing ground for studying in various geophysical fields effects caused by such phenomena as earthquakes and volcanic eruptions. There are 30 active volcanoes on the Kamchatka Peninsula, and four most active volcanoes form the Northern Group: Shiveluch (the northernmost of the active and one of the most active volcanoes of Kamchatka), Klyuchevskaya Sopka (the highest one. 4750 m above sea level and the most productive of the active volcanoes in Eurasia), Bezymianny and Plosky Tolbachik. The volcanoes of these groups are the most active on the peninsula Kamchatka. Ash plumes of explosive eruptions are the aero-electric structures that have a powerful electric charge. The atmospheric electric field reacts sensitively on these structures. Near this group of volcanoes, electrostatic fluxmeter (Efimov V.A et al., 2014) for registration the atmospheric electric potential gradient (PG) were installed in Klyuchi (KLY), Kozyrevsk (KZY) and Krutoberegovo (KBG). It allowed us to study along with traditional problems of atmospheric electricity (study of unitary variation, the mechanisms of the global electric circuit (GEC), etc.) the atmospheric-electrical effects arising during the formation and propagation of gas-ash clouds from explosive volcanic eruptions (Firstov P.P. et al., 2016).

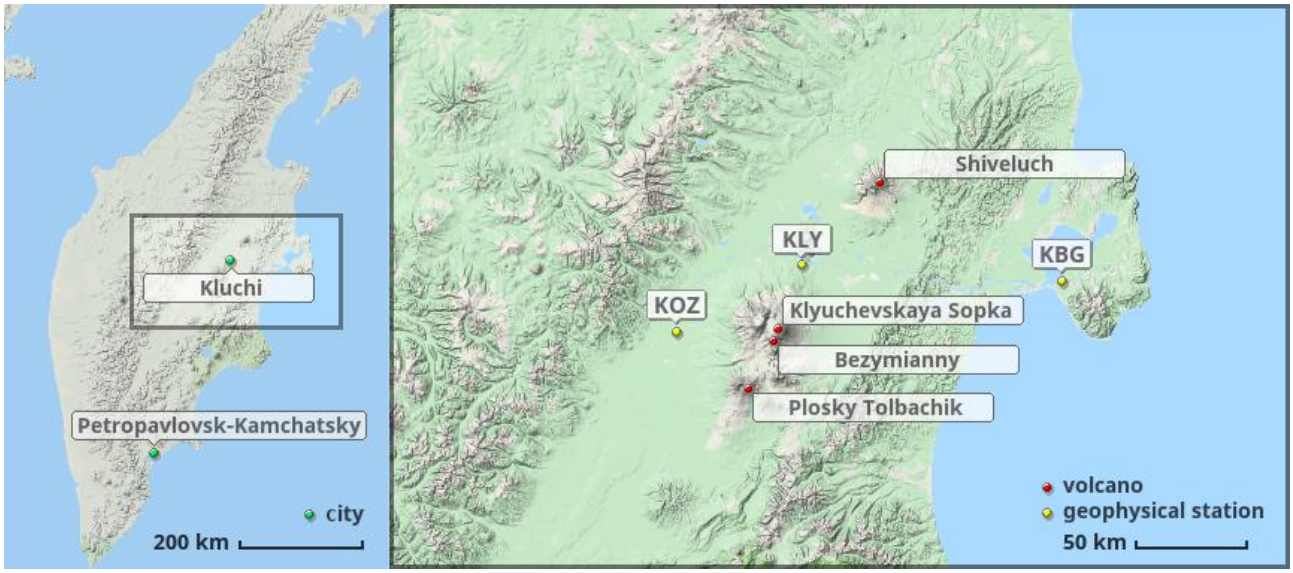

Fig. 1. Location of geophysical stations.

Propagation of ash clouds for hundreds and thousands of kilometers at altitudes of 8-15 km during volcanic eruptions represents a special danger to aviation. In this regard, the eruption of the Icelandic volcano Eyjafjallajökull in June 2010, when air communication was paralyzed for several days in many European countries, is illustrative. Near the eastern coast of the Kamchatka Peninsula and directly above the peninsula, there are also a large number of air routes connecting the North American continent with Japan and countries of Southeast Asia. During the strong eruptions of Kamchatka volcanoes, their ash plumes often crosses international air routes, creating a danger for airliners. Therefore, monitoring of eruptions of active volcanoes by remote methods is of great importance for aviation safety (Makhmudov E.R. et al., 2016).

Investigation of the form of the signal and its connection with the genesis of explosions, the determination of the charge of volcanic clouds from powerful explosive eruptions are urgent problems for both volcanology and the atmospheric electric field studies within the GEC concept, which can be solved on the basis of registration of PG near erupting volcanoes, and it can also improve the effectiveness of ash hazard assessments (Firstov P.P. et al., 2016).

In order to automatize the process of collecting and primary processing of data obtained during the monitoring of the atmospheric electric field, a hardware-software complex based on electrostatic fluxometers (EF-4) (Efimov V.A et al., 2014), L-Card E-24 ADC and Asus Thiner Board microcomputers is developed by the FIC ECS RAS. The development of the complex with the use of microcomputers allows us to have remote access to the software part of the complex located at remote stations and to configure the equipment without the need for physical access, that increases the rapidness of work. Software part of the complex is implemented using Python - a modern high-level general-purpose programming language.

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