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Fluid-magmatic systems and volcanic centers in Northern Caucasus

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The central segment of Alpine mobile folded system and the Greater Caucasus is considered with respect to fluid-magmatic activity within modern and Holocene volcanic centers.
A volcanic center is a combination of volcanoes, intrusions, and hydrothermal features supported by endogenous flow of matter and energy localised in space and steady in time; responsible for magma generation and characterized by structural representation in the form of circular dome and caldera associations.
Results of complimentary geological and geophysical studies carried out in the Elbrus volcanic area and the Pyatogorsk volcanic center are presented.
The deep magmatic source and the peripheral magmatic chamber of the Elbrus volcano are outlined via comparative analysis of geological and experimental geophysical data (microgravity studies, magneto-telluric profiling, temperature of carbonaceous mineral waters). It has been determined that the peripheral magmatic chamber and the deep magmatic source of the volcano are located at depths of 0–7 and 20–30 km below sea level, respectively, and the geothermal gradient beneath the volcano is 100°C/km. In this study, analysis of processes of modern heat outflux produced by carbonaceous springs in the Elbrus volcanic center is carried out with respect to updated information about spatial configuration of deep fluid-magmatic structures of the Elbrus volcano.
It has been shown, that degradation of the Elbrus glaciers throughout the historical time is related both to climatic variations and endogenic heat. The stable fast rate of melting for the glaciers on the volcano's eastern slope is of theoretical and practical interest as factors of eruption prognosis. The system approach to studying volcanism implies that events that seem to be outside the studied process should not be ignored. This concerns glaciers located in the vicinity of volcanoes. The crustal rocks contacting with the volcanism products exchange matter and energy between each other. Hence, the ice that has overlain a volcano must be considered as a part of the environment for volcanism.
In the area of Caucasus Mineral Waters (Pyatogorsk volcanic center) an interrelated annular zonality of structural, petro-geochemical, geothermal, and hydrochemical features is found. The probability of peripheral magmatic source existence at 9–15 km depth is shown.
The relation between hydro-chemical properties of Caucasus Mineral Waters and structural as well as petrologic and geochemical features of the fluid-magmatic system of the Pyatogorsk volcanic center is determined and thus the Caucasus Mineral Waters region may be identified as a hydrothermal element of the system.