



The modern hydrothermal system of the crust-mantle origin related to fluid-magmatic activity of volcanic centers in Northern Caucasus

Alexei L. Sobissevitch, Yuri P. Masurenkov, Dmitriy V. Likhodeev, Irina N. Pouzich, and Ninel I. Laverova

Russian Academy of Sciences, Schmidt Institute of Physics of the Earth, Moscow, Russian Federation (alex@ifz.ru, 007 495 254 9080)

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 set of interconnected volcanoes, intrusions, and hydrothermal features united by an 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.

The 3D model of tectonic disintegration field under the Elbrus volcano has been constructed. The two anomalous domains have been outlined and they were associated with local deep magmatic source and peripheral magmatic chamber of the Elbrus volcano. Comparative analysis of experimental geophysical data obtained by means of microgravity studies over the same territory, magneto-telluric profiling and determination of subsurface thermal anomalies reflected in the temperature regime of carbonaceous mineral waters has shown appropriate correlation in terms of shape, size and position of magmatic structures in the Elbrus volcanic area.

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. The obtained data show presence of a substantial thermal effect of the volcano root system on its outer environment, which is reflected in the temperature regime of carbonaceous mineral waters. 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 new information about spatial configuration of deep fluid-magmatic structures of the Elbrus volcano.

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 interconnection 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.