



Thermal regime and geodynamics of the Precaucasus region

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High-precision temperature logging conducted in deep and superdeep wells after restoring their thermal regime have been used for drawing temperature and heat flow maps of the Precaucasus region. The temperature survey has determined major thermal features of the region and correlation between heat flow from the Earth's interior and geodynamics. Heterogeneity of the temperature field, observed within both the whole region and its structural elements, increases with depth. The heterogeneous thermal field of the Precaucasus region's lithosphere was formed due to the action of the following agents: 1) Varying deep heat flow: 29 to 90 mW/m^2 , averaging at 58.5 mW/m^2 ; 2) Varying lithofacies characteristics of the geological section, i.e. thermophysical properties and thermal capacity of rocks; 3) Mass transfer in the interior defined by the variations of the convection heat-flow reaching 10 mW/m^2 to 15 mW/m^2 within the upper sedimentary strata; 4) The latitude effect of solar radiation producing the neutral-layer temperature variations of 10 to 13 C; 5) Structural agents, such as terrain relief, etc. The structure of the thermal field in the region, i.e. the change in temperature and thermogradients, is clearly seen to be associated with its tectonic structure. The variation of terrestrial heat flow is closely related to recent vertical crustal movements. An adequate simplified mathematical model is suggested to describe this dependence, and the calculated heat flows are remarkably consistent with the experimental ones. The observed heat flow and temperature anomalies can be explained by the existence of hexagonal convection cells in the upper mantle. The most realistic numerical experiments to date have been conducted. A three-dimensional problem of steady heat conduction in the lithosphere was solved to verify the presence of a convection cell in the mantle. Experimental temperature map and calculated temperature map in the presence of a hexagonal convection cell in the upper mantle are similar.