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Thermal regime of the lithosphere and upper mantle of the East European platform

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Temperature (T) logs from 1300 deep wells of 420 areas have been used for imaging the lithosphere temperature and heat flow from the Earth's interior. The resulting temperature maps of the Volga-Ural, Precaucasus, Caspian and other regions of the East European platform are the first high-resolution maps of these regions ever drawn. Unlike the available ones, these maps are based upon high-precision measurements conducted in the wells that were shut-in over a long period of time and thus had a restored thermal regime. Therefore, the maps most adequately reflect the natural, undisturbed, thermal field of the lithosphere. In some areas, the thermal field is highly inhomogeneous. The isotherms have been correlated with the tectonic structures and faults as well as with the gravity data and other physical fields. It is noteworthy that a minor increase in temperature has been recorded in some active faults. At the same time, no passive faults have ever been reflected in the temperature field. Observed heat flow from the Earth's interior is significantly variable, ranging from 25 to 92 mW/m^2. Research results convince us that there is a spatial periodical pattern of terrestrial heat flow. Thermal models predict the existence of a small-scale cellular convection in the mantle. Calculations of temperature in the lithosphere have been made by modeling of different dynamic processes in the mantle with the most appropriate models. The best agreement between theoretical and measured temperatures and heat flows is observed when the lower boundary condition is given in a form of the T distribution corresponding to a hexagonal convection cell in the mantle.