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Deep geo-observatories as a tool for monitoring nonequilibrium geological and geophysical processes

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The application of new methods of studying the deep portions of the Earth's crust has permitted the detection of extensive endogenic processes in zones that were previously thought to be geodynamically stable. Such zones include ancient platforms and crystalline basements of shields.

The appearance forms of endogenic processes occurring on ancient platforms and shields and methods of their detection are substantially different from those related to endogenic processes occurring in geodynamically active zones. The intensity and character of endogenic processes taking place on ancient platforms can be analysed through the creation of deep geo-observatories based on deep and ultra-deep wells that were drilled in these regions. In the eastern portion of the Russian Plate, a sufficiently large amount of such wells have already been drilled to obtain reliable data on endogenic processes in this region.

Previously, information on the deep structure of the Earth's interior was mainly obtained through geophysical studies that provided data for the construction of various structural depth models. However, their results did not reflect the composition and properties of rocks at great depth and did not allow the correct interpretation of geophysical data. In view of this fact, explicit data obtained through the study of core material from deep and ultra-deep wells can be of great importance when combined with geophysical data.

The authors conducted monitoring studies using core and geophysical data on a number of deep wells that penetrated the crystalline basement in the eastern portion of the Russian Plate. Their results permit the conclusion that the crystalline basement under-

goes extensive geodynamic and hydrothermal changes mainly within specific mobile zones of the Earth's deep crust, or the *destruction zones*. These zones are composed of metastable mineral and lithologic complexes, which remain in a nonequilibrium state under thermodynamic conditions of the Earth's crust. This phenomenon explains their continuous compositional evolution and, accordingly, the evolution of geophysical fields generated by these zones.