EARTH THERMAL FIELD VARIATIONS IN DEPENDENCE FROM LUNISOLAR TIDES (BY VOROTILOVO DEEP WELL OBSERVATIONS) O. A. Esipko[1] and A. E. Rosaevr[1], [(1)] FGUP NPC "NEDRA" Svobody 8/38, Yaroslavl 150000, Russia, E-mail:log@nedra.ru

A number of deep and superdeep wells have been drilled in Russia. The wells where all drilling activities have been finished, but the research activities still continue, are of a great scientific and practical interest for studying the present-day geological processes taking place in the Earth's interior. Vorotilovo deep well (VDW), drilled in a central part of Russian platform, is one of those wells-geolaboratories. The depth of the well is 5374 m, the temperature at the bottom is 95ºC, open borehole in range 689-5374 m.

As a result of geophysical fields monitoring, the complex nature of spatial-temporal variations that depend on the influence of various natural factors was determined in the VDW [1].

Lunar tides are one of the important factors that define the geophysical fields' variations in the VDW. The relation between temperature variations in the VDW and the tide (monthly) phase is detected. The dependence of such influence on the depth of measurement agrees with the model of "layered" Earth where every layer has a particular response on tidal force (in dependence from it's physical properties).

The shift between phases of monthly tides and temperature variations is observed. This shift is different at different depth and by our estimations [2], it has a maximal value at depth interval 1800-2000 m, which complies with crack area. In according with our results, most important to study temperature – tide dependence at depth range 600 - 2500 м. At the top of the well, the surface effects (and processes) significant, at the bottom of well the temperature variations are too small.

In addition to temperature, variations of another geophysical parameters (seismic-acoustic for example) show the dependence from tidal gravity variations. It may be significant at earthquake prediction problem. In the result of phase-amplitude modulation of a seismoacoustic wave under the effect on a lunisolar tide studying [3], is shown that curves of seismoacoustic signal amplitude and tide are similar. However, the lagging about one hour is observed.

The origin of this shift has two sources. First, it is the obvious inertia of the heat phenomena. Second, it is the lagging due to dissipation of the tidal energy inside, more correctly, in different Earth's shells. It means, that the main dissipation in Earth's upper core takes place in the depth interval 1800-2000 meters [2].

The continuation of the measurements, improvement of data analyses methods and extension of collaboration of specialists from different brunches of science, are required in order to obtain more exact results and improve their interpretation.

A joint experiment with registration temperature variation with seismic-acoustic emission recording, is planned at VDW at 2004.

References

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