



Results of comparative study of elastic-anisotropic properties of rocks from the Kola and German superdeep wells in the 4-5 km depth range

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Scientific deep well drilling is a unique possibility to have a look inside the Earth crust. The Kola Superdeep Borehole SG-3 (Russia, Zapolarny, 12261m deep) is the deepest borehole in the world. The second deepest borehole is the German superdeep well KTB (Germany, Windischeschenbach, 9101m deep) [1,2]. The measurements have been done by the acoustopolarization method with recent improvements and with devices for determination of sample elastic properties [3,4].

All investigated core samples from both German and Kola Superdeep wells in the 4.1 – 5.3 km depth range have anisotropy of elastic properties. The samples from SG-3 have considerably higher parameters of elastic anisotropy, than the KTB ones. The average indices of anisotropy are: SG-3 (Ap = 0.25; Bs = 0.22); KTB (Ap = 0.13; Bs = 0.11). Elastic anisotropy can be related to the cracks that resulted from pressure release in the course of drilling. In this case a careful study of the acoustopolarograms and development of the relevant procedure can provide answers to such problems as reconstruction of palaeotectonics of the given region. Observations of the cavern formation (rock falls from the borehole walls) in the SG-3 Luchlompolo fault area showed that the areas with maximum anisotropy are most dangerous. These intervals are characterized by maximum sizes of caverns and the material extracted from them to the surface is represented just by drill cuttings. There are less anisotropic rocks between these intervals, wherefrom the core samples were taken for the study. Thus, a high degree of the rock elastic anisotropy is an indication of its strength decrease which can result in stability loss of the borehole.

At present more attention is given to the projects dealing with burial of hazardous substances (radioactive wastes etc.). Therefore, to ensure environmental safety and to prevent disastrous effects, when conducting preparatory engineering operations at the massifs intended for such burials, one of the necessary requirements should be performing geodynamic reconstructions on the basis of anisotropy and palaeostress estimation.

R E F E R E N C E S

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