Geophysical Research Abstracts
Vol. 15, EGU2013-10317, 2013
EGU General Assembly 2013

Ultrasonic polarization measurements of elastic-anisotropic properties of metamorphized rocks on the slit of the German KTB superdeep well in the 4100-7100 m depth range

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The KTB German Superdeep Well (Germany, Windischeschenbach) has limiting depth of 9101 m. It is one of the world deepest well among the continental boreholes. A study of physical parameters including elastic ones of the massif intersected by the well allowed to represent a real pattern of changing properties and the state of crystalline rocks in upper and middle part of the Earth crust. Such a deep section enables performing analyses of large spectrum of geological and geophysical objects, such as minerals, crystalline rocks, geological strata, formation complexes et al. Recently obtained results permit to get a general idea of elastic-anisotropic properties of crystalline rocks extracted from great depths. A study of properties and state of rocks along the KTB section will make it possible to most precisely determine regular changes of the Earth's rock properties within a large range of depths.

Below are the results of investigation of elastic-anisotropic properties for 13 core samples of the KTB rocks in the range of 4.1 to 7.1 km. In this interval the well has penetrated metamorphosed rocks [1]. The measurements have been done by an acoustopolarization method with recent improvements and with devices for determination of sample elastic properties [2 3]. The data obtained are the result of extended study into the KTB rock samples by the method [4].

Study of rock samples from the KTB Superdeep Well in the 4100-7100 m depth range showed that they all are elastic anisotropic and pertain to a orthorhombic symmetry type. Virtually the degree of linear acoustic anisotropic absorption (LAAA) effect has been detected in all samples. Its appearance is likely related to directional orientation of mineral grains as well as to the generation of microcracks during drilling and lithostatic stress release. The several samples showed an angular unconformity between the LAAA orientation and elastic symmetry elements. The shear waves depolarization (DSW) effect was detected in garnet amphibolites samples. There was observed a tendency to persistence in propagation rate of compression and shear wave velocities. The pattern of change in anisotropy factors for compression and shear waves in depth shows itself in a similar way. There is an inverse correlation between density and anisotropy.

R E F E R E N C E S

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