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Experience in applying acoustopolarization method for rock samples from the Kola (SG-3), German (KTB) and Finnish (OKU) investigation boreholes

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The Kola Superdeep Borehole (SG-3) was drilled in the NW-part of the Kola Peninsula [1]. The borehole intersected the lower Proterozoic complex (0-6848 m) of the Pechenga Formation and an Archaean granite and metamorphic complex (6848-12261 m). Our investigations show that rocks of the Archaean complex (paragneiss, metabasite, amphibolites) have high elastic anisotropy. It correlates with breakouts from the walls of the borehole and its inclination (deviation) from the vertical during drilling. Because of this when drilling SG-3 at a depth of 7.7 km to 10.1 km accidents occurred with the loss of the drill string part. Sinking the German drill hole - (9101 m) was also accompanied by complications during its drilling [2]. The drill hole was drilled in the crystalline basement of the Bohemian massif in the south of Germany. The main rocks composing the massif are paragneiss, metabasite, granite and metasedimentary rocks. Our investigations of the - samples from the 4.1-7.1 km interval also showed a high level of elastic anisotropy.
The investigation drill hole Outokumpu (OKU) located in SE Finland, reached a final depth of 2516 m. The drill hole has passed through mica schists, biotite gneiss, serpentinite and pegmatite granite. Excluding pegmatite granite, all rocks have a high level of elastic anisotropy. Joint analyses of rock samples from SG-3, - and OKU showed that the use of the acoustopolariscopy method can reveal intervals with breakouts and inclinations of the drill hole from the vertical. Elastic anisotropy monitoring of rocks performed by the acoustopolariscopy method will prevent accidents during sinking wells.

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