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Elastic-anisotropic properties of rocks at the lower part of the Finnish investigation drill hole cross-section

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This research pursues the study of elastic-anisotropic properties of rocks at the lower part of the Outokumpu drill hole cross-section in Finland. Earlier, the authors presented the investigation results of the drill hole down to a depth of 1 km [1]. The investigation was aimed at determining elastic and non-elastic characteristics of 29 core samples taken in the 1 – 2.5 km range. It has shown that all the rock samples studied pertain to the orthorhombic symmetry type. All the common effects arising during propagation of elastic waves in the anisotropic mediums present at the rock samples studied in a variable degree. The determinations were done on the basis of the latest improvement of the acoustopolarization method with devices for determining elastic properties [2-4]. The data obtained are a continuation of the study cycle of rocks from deep and superdeep drill holes (Kola SG-3, Ural SG-4 and German KTB) with the acoustopolarization method assisted.

The study of the rock sample properties from the Oku drill hole cross-section (Finland) showed that they are all elastic anisotropic and belong to the orthorhombic type of elastic symmetry. A strong change in the compression and shear wave velocities with depth can be observed. The effect of linear acoustic anisotropic absorption has been registered in the samples. The nature of the effect is related to the presence of microcracks of the natural character. The effect of depolarization of shear waves was registered in some samples and suggests the presence of angular unconformity between the directions of the LAAA elements and elastic symmetry elements. The variation pattern of the anisotropy factors for compression Ap and shear Bs waves with depth is manifested in a similar way and changed from 0.5% to 65%. The anisotropy appearance degrees in the studied samples are distributed in the following way: 45 percent of the samples are mediums with strong anisotropy, 31 percent of the samples are mediums with weak anisotropy, and 24 percent are isotropic mediums. The inverse relationship was established between anisotropy factors and velocities of compression and shear ultrasonic waves.

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