



## **Logic-information methods in analysis of petrophysical diagrams of rock samples from Precambrian tectonic structures of Baltic Shield**

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Petrophysical diagrams of velocity of longitudinal ultrasonic waves ( $V_p$ ) bear the genetic information on geological processes, mirroring a geologic situation existing in plaited frame in a place of a taking of a sample, specially degree of tectonic processing of rocks synchronic with a metamorphism. Therefore a problem of their classification is very actual for detection of milestone tectonic and metamorphic transformations of rocks. Three-dimensional anisotropy of  $V_p$  was studied with an ultrasonic radiator combined with a theodolite device in the perpendicular oriented plates saturated with water. The  $V_p$  values were calculated from 74 individual measurements at interval of 0-3-6-10-15 mm of centre, on circle 30° in a given plane-parallel plate with the precision of 3-5 %. Database of rock samples from Precambrian tectonic structures of Baltic Shield include petrophysical diagrams  $V_p$  of 1600 core from depth horizons of Kola Superdeep Borehole and 2400 samples on surface in Pechenga ore district from the coast of the Barents Sea to the Allarechka ore field. The classification of the diagrams is carried out on materials of Kola Superdeep Borehole section and reference profile, where these diagrams are figured in a projection to horizontal plane. Special computer-based programs were used for diagram construction. Kola Superdeep Borehole introduced in a projection to a vertical transverse section. For classification the basic elements - belt of heightened speeds, isomeric maxima, minima were selected on each diagram. The sizes of maxima both minima and their arrangement on the diagram were taken into account too. The composition of rocks at the analysis of the diagrams was leaved out. All transferred units of the diagrams were encoded by 16 tags. The

analysis of the petrophysical diagrams by taxonomy method based on principle of the nearest neighbor has allowed to outline among them homogeneous groups describing main stages of tectonic transformations of rocks under operating of geological processes and to construct the ranked consequence pursuant to intensity of these processes for samples of rocks selected in depth horizons of Kola Superdeep Borehole section and their oriented analogues on surface. Logic-information data processing has allowed to appreciate variability of values of the attributes (intervals - indicators) describing analyzed groups of diagrams; and quantitatively estimate its dividing abilities. Such approach to the analysis of diagrams has allowed to create the model of the allocated groups of diagrams with estimation of the contribution of each attribute into identification of samples. The greatest contributions belong to attributes describing type of a belt, intermediate minima and size  $\Delta V_p$ . The present research was executed under financial support of the Russian Foundation for Fundamental Research (project 06-05-64659).