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Magnetic interpretation by the Monte Carlo method with application to the intrusion of the Crimea

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The study involves the application of geophysical methods for geological mapping. Magnetic and radiometric measurements were used to delineate the intrusive bodies in Bakhchysarai region of the Crimea. Proton magnetometers used to measure the total magnetic field in the area and variation station. Scintillation radiometer used to determine the radiation dose. Due to susceptimeter measured the magnetic susceptibility of rocks. It deal with the fact that in this area of research the rock mass appears on the surface. Anomalous values of the magnetic intensity were obtained as the difference between the observed measurements and values on variation station. Through geophysical data were given maps of the anomalous magnetic field, radiation dose, and magnetic susceptibility. Geology of area consisted from magmatic rocks and overlying sedimentary rocks.

The main task of research was to study the geometry and the magnetization vector of igneous rocks. Intrusive body composed of diabase and had an average magnetic susceptibility, weak dose rate and negative magnetic field. Sedimentary rocks were represented by clays. They had a low value of the magnetic susceptibility and the average dose rate. Map of magnetic susceptibility gave information about the values and distribution of magnetized bodies close to the surface. These data were used to control and elaboration the data of the magnetic properties for magnetic modelling. Magnetic anomaly map shows the distribution of magnetization in depth.

Interpretation profile was located perpendicular to the strike of the intrusive body. Modelling was performed for profile of the magnetic field. Used the approach for filling by rectangular blocks of geological media. The fitting implemented for value magnetization and its vector for ever block. Fitting was carried out using the Monte Carlo method in layers from the bottom to top. After passing through all the blocks were fixed magnetic parameters of the block with the best approximation between the theoretical and observed fields i.e. object function. It was first iteration. The next iteration begins with this block. If after next access through blocks was not reduce the objective function is carried out with the passage of the last block as in the first iteration. This technique worked well for separate synthetic models. As result was obtained the geometric boundaries of geological objects. Igneous rocks are nearly vertical magnetization with respect to the current field. Perhaps, this is because the Jurassic diabase at its formation frozen in time when the magnetic poles have opposite signs in comparison to the modern magnetic field. Due to the magnetic modelling obtained geological section that consistent with geological concept.