# Geoelectrical models of fault zones in Gorny Altai region

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Complex-built areas with the presence of fault zones in the territory of large depressions of the Altai Mountains were selected for the study. The faults can generate seismicity, and their detailed characteristics are important for a number of geological disciplines, geodynamic and forecast problems. Determination of the structure, as well as the location of the fault zone covered by loose sediments, causes certain difficulties. In this case, it is necessary to involve several electromagnetic methods. The measurement technique for the construction of geoelectric fault models supposes the use of two methods of different depths: TEM, electrical resistivity tomography (ERT) or VES-ERT depends on the sedimentary layer thickness. Firstly, the fault is separated according to VES and TEM, but the ERT method is used to confirm the continuation of the fault identified in the first stage into the upper part of the section.

Field electrical exploration work was performed at three sites with the presence of faults in the Chui and Kurai depressions. The complexity of using a set of methods is to obtain models with different scales. Therefore, in the course of interpretation the models are considered sequentially: the depth model at first and then the surface one; and the method for interpreting the field data of each method is somewhat different. However, the approach is general, at first simpler 1-2D software tools for modeling and inversion are used and then three-dimensional programs are used to verify and refine the models. Detailed models of the near-surface part of fault structures according to ERT data are verified using the module of numerical three-dimensional modeling on graphic processors. The program algorithm is reduced to modeling the distribution of the electric potential of a point source in an arbitrary three-dimensional environment. Three-dimensional modeling makes it possible to take into account the influence of the structural features of the non-uniform upper part of the section on the measured signal, such as contrasting resistivity blocks, as well as to clarify the position of the existing subvertical and inclined boundaries. According to the results of interpretation, the geoelectrical characteristics of a number of fracture structures were determined. In general, fault zones are distinguished by lowering the electrical resistivity relative to the host sediments, which is affected by a number of factors, such as the lithological composition of rocks, the presence of permafrost, the seismic regime of the territory and so on. It can be noted that for each specific section there are characteristic ranges of resistivity, the size of the fault violation, displacer inclinations, which can vary significantly. According to the monitoring data, the lowest resistivity values were obtained for active structures, and in areas with the presence of cryogenic rocks resistance is almost an order of magnitude higher. At present, a number of faults of various ranks have been identified on the territory of the depressions, their deep and subsurface models have been built, and changes in the geoelectrical characteristics over time directly dependent on the seismic activity of the region have been revealed.