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AUDIO MAGNETOTELLURIC DATA TRANSFORMATION USING A PRIORI INFORMATION

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Abstract. Audio magnetotelluric (AMT) soundings represent updated frequency soundings studying dependence of medium impedance on frequency of natural electromagnetic fields. The main task during impedance transformation is to improve the identification of high and low values of resistance corresponding to local heterogeneities based on the cross-sections obtained.

The paper presents the method of AMT data transformation to cross-sections of effective electromagnetic parameters using a priori information on a structure of the cross-section upper part. The sequence of procedures required to transform the initial frequency AMT cross-section into the apparent resistivity and longitudinal conductivity cross-sections is described in details. The processing technique allows to conform the different methods of remote and frequency electromagnetic soundings at various depths for their qualitative and semi-quantitative interpretation. The transformation algorithm was tested using the mathematical modeling of typical geoelectric cross-sections. The calculation results were analyzed for the following models: depression of loose sediments, fault, and water-bearing horizon. The method of transformation and visualization was applied to the observational data obtained using the AMT station OMAR-2m developed earlier. Observations were conducted on three geological objects in the Urals: block of ultramafic rocks, marble open pit, and a gold deposit. The cross-sections obtained were compared with two-dimensional geoelectric sections constructed using the results of quantitative interpretation. It is shown that the method proposed allows visual recognition of the form and depth of anomalous conducting objects without solution of the inverse problem, which can considerably increase the general productivity of prospecting for water-bearing horizons, polymetallic and sulphidic ores.

Keywords: audio magnetotelluric sounding, transformation, mathematical modeling, resistivity, effective longitudinal conductivity.

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