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3D mathematical modeling for substantiation of the new approach of DC tomography in archaeological prospecting and its integration with EMI soundings

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The aim of contribution is to present the results of the 3D mathematical modeling that was done due to feasibility study of the special DC tomography technique with its integration with shallow-depth EMI soundings.

This approach was offered and tested in archaeological prospecting for determination of permafrost presence in burial mounds. Only frozen mounds could be opened, that's why it is very important for archaeologists to know which mound contains the frozen object.

The main purpose of present work is to study the feasibility of special arrangement of DC electrodes without the contact onto the target. The 3D mathematical modeling in common models shows that the principal possibility for distinguishing permafrost objects exists. The maps of relative values of DC signal give the good results.

The field works in Altai mountings were produced using approaches mentioned above. To interpret these data it is needed first of all to get the mathematical model of the mound and its accommodating media. 3D modeling allows to get the structure of accommodating media. It was the stratified medium with the sloping boundaries.

Based on the DC interpretation and the common points there was done the calibration of EMI soundings data. Using calibrated EMI data the pseudo-3D model of the mounds were constructed. Some of them show the anomalies seemed to permafrost grave cameras.

For reliable determination of the permafrost presence it is necessary to get the same results of the experimental DC data and the mathematical modeling. There were pro-

duced a number of numerical experiments to fit the theoretical parameters of the mounds. The results were quite good and correlate with the EMI data interpretation.

The efficiency of the offered approach for particular archaeological and other near-surface prospecting is proved by mathematical modeling and field experiments.

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