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New geophysical electromagnetic method of archeological object research in Egypt

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The demand to the enhanced geophysical technique and device, in addition to the precise interpretation of the geophysical data, is the resolution of the geophysical complex research, especially by the absence of priory information about the researched place. Therefore, an approach to use the planshet method of electromagnetic induction in the frequency geometry was developed by Hachay. et al., 1997a, 1997b, 1999, 2000, 2002, and 2005. The method was adapted to map and monitor the high complicated geological mediums, to determine the structural factors and criteria of the rock massif in the mine subsurface. The field observation and the way of interpretation make the new technology differ from other known earlier methods of field raying or tomography (Hachay et al., 1997c, 1999, and 2000).The 3D geoelectrical medium research is based on the concept of three staged interpreting of the alternating electromagnetic field in a frame of the block-layered isotropic medium with inclusion (Hachay 1997a, and 2002); in the first stage, the geoelectrical parameters of the horizontal block-layered medium, which includes the heterogeneities, are defined. In the second stage a geometrical model of the different local heterogeneities or groups inside the block-layered medium is constructed based on the local geoelectrical heterogeneities produced from the first stage after filtering the anomalous fields plunged in the medium. While in the third stage, the surfaces of the searched heterogeneities could be calculated in account of the physical parameters of the anomalous objects.For practical realization of that conception the system of observation for alternating electromagnetic field with use of vertical magnetic dipole was elaborated. Such local source of excitation and regular net of observations allows realizing overlapping by different angles of observation directions. As incoming data for interpretation, three components of modules of three components of magnetic field are used. For the case on surface observations the data are measured on the Earth's surface at the set of distances between the source and receiver as a function of frequencies. The measurements of the module of three components of the magnetic field vertical and two horizontal: one directed to the source and second perpendicular to that direction are provided in the frame of planshet for the fixed net with fixed step and fixed length of the planshet's side. In the frame of profile observations the planshet become to a band or a line and the length of the band or the line is a base of observations or an array. For the variant of the wide profile (band) the source of excitation is located at the beginning of the array on the profile, which is parallel to the measuring profile. We shall call that a wide array. It moves systematically with a fixed step of meters. For the variant of an usual profile the source is located on the measuring profile and the moving of the oscillator is similar. For the variant of a planshet survey the source is located into the center of the planshet using the fixed net of observation. Then the planshet array moves systematically with overlapping usually on the half of the planshet.The interpretation is made in a frame of n-layered model for each array and planshet location. After that each point of the planshet is associated with one and only column of layers thicknesses and corresponding fixed column with resistance of the medium in that layers. Gathering information of all planshets together we obtain a many-valued function of each point – distribution of thicknesses and resistances of the medium layers. Then we calculate the average value for these distributions for each point of the observation set. Thus we obtain the unique distribution of thicknesses of horizontal layers and resistances, which corresponds to the medium model as a cylinder with vertical generatrixes and with a rectangle at the bottom and with a point of observation located in its center. Thus we change over layered model to a block-layered model. Then, gathering the values of thicknesses and resistances for all points of observation, located on one and the same profile we obtain the file of an average cross-section along the profile.The next step is combining the neighboring blocks with close-range values of resistance to one block. That operation is made according to the fixed scale of resistance. The second stage of interpretation

is used to define the geometrical characteristics of conductive inclusions and their equivalent moments, which are proportional to the ratio of the conductivity difference in the host rock and in the inclusion to the conductivity in the host rock. Here the approximation principle is used for alternating electromagnetic fields. The initial model of the inclusion is a current line of fixed length. That approximation construction is used for fitting of the average parameter of geoelectrical heterogeneity, which is calculated and located to each point of the profile (Hachay O.A. et all. 2002).The first problem: to found the tomb of Ptolemey in Alexandria. That work is provided by NRIAG together with the Aphine University. The historical and archeological work was provided during a long time. In that moment when we had been asked to do our research on that object it must be needed to show more precisely the place of that tomb on the territory of the ancient royal garden in Alexandria. NRIAG had developed electro prospecting works using radar and vertical electric soundings. With use of our results on the archeological object it had been choose a more precise place for the borehole and for next excavation. The results of drilling showed, as it was forecasted, that from the depth 7m on the showed picket of the observed profile it had been revealed stone objects which differ from the limestones sandstones. The drilling was achieved on 20-th of april 2008.