Assuming an appropriate plane in the 3-D space and applying the reduction to the pole technique to the reconstructed magnetic field data on the plane, we can estimate more accurately the shape of the magnetic bodies.

The Fourier spectrum of the magnetic field data produced by one magnetic body in logarithmic scale is presented as

$$\log | F[\mathbf{B}_{Z_0}] | = - | \mathbf{k} | (z' - z_0) + Constant,$$

where z' is a depth of the magnetic body, z_0 is a vertical coordinate of the observation plane. Thus, we can estimate the depth of the magnetic body from the inclination of the logarithmic spectrum of the magnetic field data. However, if there are many magnetic bodies, it indicates only the depth of the shallowest body. In this study, the authors will propose the method to determine the depth of these magnetic bodies even if more than one magnetic bodies are buried in different depth. In a simple case that two magnetic bodies are buried in different depth, as the observation plane is inclined with angle θ, each distance between the observation plane and the magnetic bodies changes. At a particular angle θ', these distances are equal to each other. So, the depth of both magnetic bodies can easily calculate from the angle θ' geometrically.

For example, two magnetic dipoles are buried shown in Figure 1. The Fourier spectrum of the magnetic field data on $z = 0$ plane is shown in Figure 2. Figure 3 shows that the inclination of the logarithmic spectrum of the magnetic field data on the virtual observation plane varies as the inclination angle of the plane is changed every 1° between 40° and 50°. We can easily find a bending point at θ' = 45° in figure 3; then, we can estimate the depth of each body.

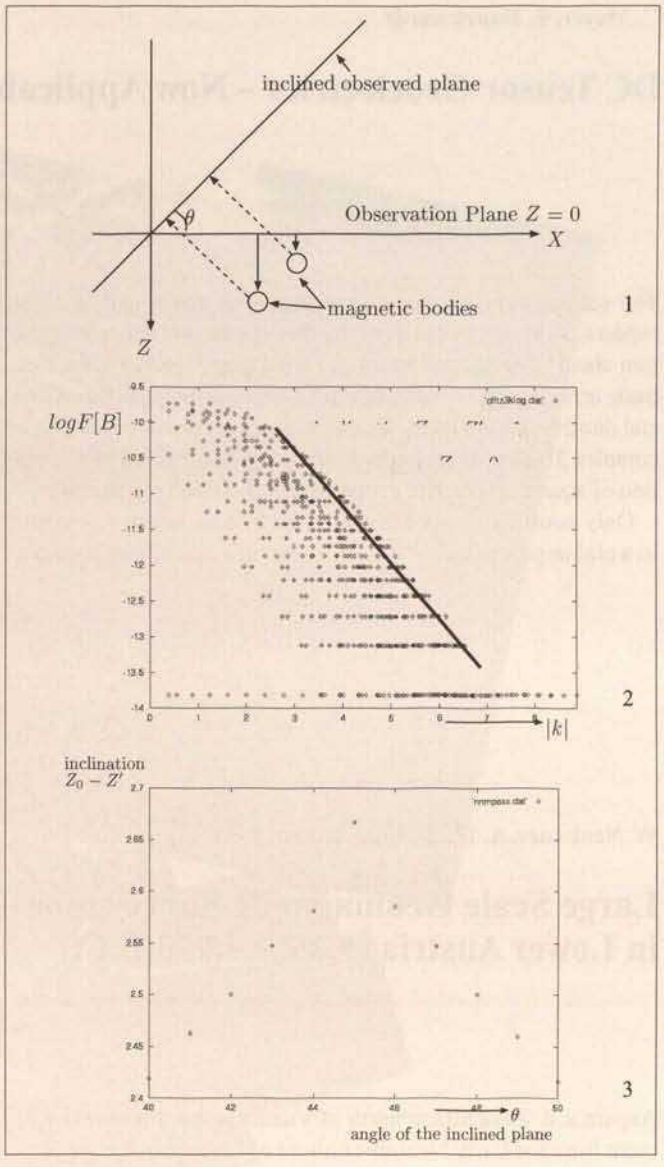

Fig. 1. Simulated model for buried magnetic bodies

Fig. 2. Fourier spectrum of magnetic field data observed on z = 0 plane.

Fig. 3. Inclination of logarithmic Fourier spectrum of magnetic field data vs. angle θ of the observation plane

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Development of a System of Geoelectrical Data Acquisition and Elaboration

The aim of the paper is to illustrate a system of acquisition, elaboration and interpretation of data obtained by geoelectrical prospecting in the upper level of the ground for archaeological research. The energising equipment furnishes an A.C. sinusoidal current with frequencies between 40–380 Hz. The generator has been set with two tension outputs to utilise two different energising dipoles during the survey. In this way it is possible to elaborate data in a tensorial form to obtain apparent resistivity maps in conformity with the actual anomalies distributions. Measurements are taken over rectangular areas using two dipoles of different sizes which are fixed perpendicularly on a mobile frame. In this way, for each measurement point, it is possible to evaluate two different components of the induced field. (The current probes are kept in the same place while all the voltage measurements are taken in the chosen area). The method proposed allows the measurement to be taken quickly. No induction effects are shown in the cables at the above mentioned frequencies interval. The acquisition system is based on a PC with a 16 bits card, a filter-amplifier provides elimination of natural and artificial disturbances. Without filtering it is possible to acquire four temporal series obtaining SP and geoelectrical measurements. For each measured area a software was developed under the PC environment to perform the invariants map of the apparent resistivity tensor, directly in the field.