ABSTRACT

Although nearly half a century back Schlumberger realised that deep-seated basement structures could be mapped by the electro-telluric method of prospecting, it was actually Porstendorfer (1959) who indicated the possibility of its use in prospecting buried ore deposits. Telluric fields over cylindrical basement structures were studied by various authors, but unfortunately the data available are not sufficient to attempt interpretation. Accordingly, in the present work, the author has considered a few basement structures (anticline, horst, graben) and solved them analytically by the method of Schwarz Christofel transformation assuming (i) cylindrical structures and (ii) sedimentary layers of finite resistivity overlying the infinitely resistive basement.

From computed anomaly curves it is concluded that complete information about the geometrical parameters of the anticlines/horsts can be obtained only if the basement relief is at least thirty per cent of the total thickness of the overburden. On the other hand, partial information about these parameters is obtainable by the electro-telluric methods even if these structures are found at greater depths. Apparent resistivity method (studied in the case of anticline only) is found to be less sensitive for detecting basement structures. Analytical continuation method has been found to furnish much accurate information about the limiting depth of the structure. The application of this method in telluric current studies has been emphasised to find out the shape of the basement structure, especially when it is deep seated.

From the investigation of the behaviour of the telluric anomalies over (i) graben and syncline, (ii) step fault and inclined normal fault, studied on conducting paper models, it is concluded that the electro telluric method does not differentiate (i) vertical and steeply dipping walls (70°), and (ii) step fault and inclined normal fault beyond the depth of resolution.

Simulating the rotating field in an electrolytic model tank, the behaviour of the absolute ellipses, for various types of cylindrical and non-cylindrical bodies, is studied. Such a study indicates that (i) area and linear eccentricity of the absolute ellipses are the most useful parameters for interpretation of underground structures and that (ii) the direction of mineralization for vein type buried ore deposits can be predicted from the surface.

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