Geothermal Exploration with the Telluric-Magnetotelluric Method in Northern Iceland

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Hydrothermal areas in Iceland are characterized by limited zones of depressed resistivity, in contrast to an otherwise smoothly varying crustal electrical structure. Measurements made in 1973 demonstrate the usefulness of the telluric-magnetotelluric method in delineating such lateral resistivity inhomogeneities. Short period (1–100 sec) remote telluric stations were occupied on a profile in northern Iceland which extended across basalts of Tertiary to recent age and through the high-temperature thermal area at Namafjall. The subsequent data analysis was arranged in several stages. First, examination of the raw field records is sufficient to show the great decrease in resistivities within the thermal area. Hand processing of short record sections confirms this resistivity low and reveals a similar but positive anomaly adjacent to it and comparable in extent. Away from the hydrothermal area resistivities are more uniform and they exhibit a tendency to increase with increasing geologic age. The final stage in analysis is estimation of tensor impedances at each site; this is followed by modeling of the results with two-dimensional numerical techniques.