Exploration Significance of Recent Geophysical Surveys in the Mexicali-Cerro Prieto Geothermal Area

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The aeromagnetic survey of the Mexicali-Cerro Prieto geothermal area was undertaken to determine the effectiveness of aeromagnetic prospecting techniques in locating geothermal resources, to determine the magnetic character and the nature of the heat source for the Cerro Prieto geothermal area, and to seek out favorable areas for further geothermal exploration. The work was carried out in cooperation with the government of Mexico through the Comisión Federal de Electricidad de México.

The survey was flown during July 1971 with a flight line spacing of 1 km and a constant barometric altitude of 1000 ft above sea level. The residual total intensity aeromagnetic map displays a close correlation with previous geophysical data in the Salton-Mexicali Trough.

Present subsurface knowledge of the area does not allow a determination of whether the heat source for the Cerro Prieto geothermal fields is a cooling magma at depth or a combination of crustal thinning and faulting. However, the aeromagnetic survey does indicate that future exploration should be concentrated along strike-slip faults, particularly in areas where linear magnetic lows are coincident with the faults. These lows are probably produced by hydrothermal alteration in the fault zone along which there have been upwelling geothermal fluids.

Lateral Resolution in Velocity Analysis Programs—Implications of Lateral Variations in Dip and Normal Moveout Velocity

JOHN FAIRBORN

Implicit in current velocity-analysis programs, which stack data from adjoining depth points, are the assumptions that both dip and normal moveout velocity are constant with depth point. What happens when these assumptions are not valid is shown through two examples. The first involves a linear variation in normal moveout velocity with depth point, the second, a parabolic variation in the zero-offset traveltime. The effects are shown by computing directivity patterns, as a function of dip and normal moveout velocity, for a set of synthetic traces corresponding to a typical geometry of depth points and offsets used in a velocity analysis. The most interesting results are: 1) a lateral variation in the normal moveout velocity can cause error in the computed dip; 2) the general shape of the directivity pattern does not change appreciably until the lateral variations in the normal moveout velocity get quite large—up to ±10 percent; and 3) parabolic curvature of the zero-offset traveltime lowers the amplitude of the directivity pattern but does not significantly change its shape. The amplitude is down by a factor of about two when the reflector curvature deviates from the best fitting plane by about one-quarter of the dominant signal period.

Preliminary results of the ERTS/EROS experiment

WILLIAM A. FISCHER

ERTS-1 (Earth Resources Technology Satellite) was successfully launched in July 1972 and is producing pictorial data of exceptional quality. The Department of the Interior, under its EROS (Earth Resources Observation Systems) program, is using these data to: (1) produce new maps of the nation at scales of 1:250,000 and 1:500,000; (2) gain new insights into geologic structure and processes; and (3) produce national inventories of vegetation, water, snow, and massed cultural features (cities), and the changes in these resources and features with time.

Laboratory Model Studies in Seismic Holography

G. L. FITZPATRICK

A large acoustically isolated concrete cube (6 ft × 6 ft × 6 ft) in which several objects are embedded is examined using the technique of seismic holography. Holograms made at the surface faces of the model are reconstructed by a laser, and optical images of the embedded objects are thereby obtained. One object corresponds to a very weak seismic anomaly, and image-enhancement techniques are employed to bring out the image. An embedded hollow tank is also examined after being filled with various materials to determine effects of density contrast on the images obtained. The implications of this study for applications to practical field problems are then discussed.

Moving Base Rotating Gravity Gradiometer Development

ROBERT L. FORWARD

The rapid acquisition of high-resolution gravity data from a moving vehicle has been an unrealized goal of geophysics because of the contamination of the gravimeter data by vehicle acceleration. In principle, one could use a gravity gradiometer which can distinguish between vehicle accelerations and gravity signals. However, until recently, instrument technology had not produced a gradiometer rugged enough to operate in a mobile environment at high sensitivity.

We have developed a rugged gravity gradiometer that shows promise for use in moving vehicles. The basic sensor structure consists of two mass loaded arms cross-connected by a stiff torsional spring. In operation the sensor structure is rotated about its torsional axis at exactly half its torsional resonance frequency. Error signals due to external accelerations coupling through sensor fabrication errors cause alter-