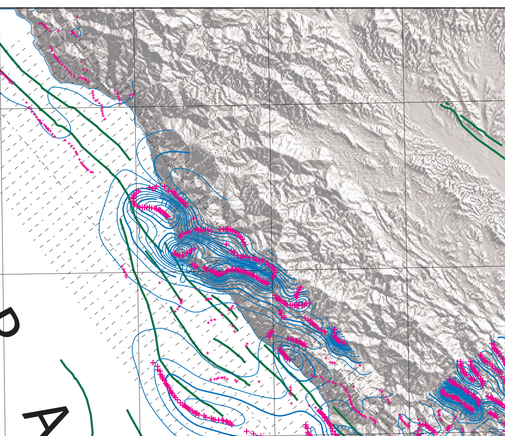
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Open-File Report 2009-1044



This aeromagnetic survey was flown as part of a Cooperative Research and Development Agreement (CRADA) with the Pacific Gas and Electric Company and is intended to promote further understanding of the geology and structure in the central California Coast Ranges by serving as a basis for geophysical interpretations and by supporting geological mapping, mineral and water resource investigations, and other topical studies. Local spatial variations in the Earth's magnetic field (evident as anomalies on aeromagnetic maps) reflect the distribution of magnetic minerals, primarily magnetite, in the underlying rocks. In many cases the volume content of magnetic minerals can be related to rock type, and abrupt spatial changes in the amount of magnetic minerals can commonly mark lithologic or structural boundaries. Bodies of serpentinite and other mafic and ultramafic rocks tend to produce the most intense magnetic anomalies, but such generalizations must be applied with caution because rocks with more felsic compositions, such as the porphyritic granodiorite-granite of the La Panza Range (Ross, 1984), and even some sedimentary units, also can cause measurable magnetic anomalies.

Total-field aeromagnetic data were collected by Eon Geosciences, Inc. from July to September 2008 along flight lines spaced 800 m apart and at a nominal terrain clearance of 305 m. Tie lines were flown 8,000 m apart. Two areas within the survey area were not flown because of proximity to condor nesting sites. Data were adjusted for tail sensor lag and diurnal field variations. Further processing included microleveling using the tielines and subtraction of the reference field defined by IGRF2005 extrapolated to August 1, 2008.

Data were transformed to a Universal Transverse Mercator Projection (Base Latitude 0°, Central Meridian -123° W.) and interpolated to a square grid with a grid interval of 200 m using the principle of minimum curvature (Briggs, 1974).

The small "plus" symbols indicate possible locations of abrupt lateral changes in magnetization and may represent lithologic or structural boundaries. Locations of these magnetization boundaries were determined as follows:

(1) The total-field magnetic anomaly data were mathematically transformed into pseudogravity anomalies(Baranov, 1957); this procedure effectively converts the magnetic field to the "gravity" field that would be produced if all the magnetic material were replaced by proportionately dense material.

(2) The pseudogravity field was continued upward a distance of 500 m and subtracted from the original pseudogravity field. This procedure emphasizes those components of the pseudogravity field that are caused by the shallow parts of the magnetic bodies, which are most closely related to the mapped geology.

(3) The horizontal gradient of the pseudogravity field difference was calculated everywhere by numerical differentiation.

(4) Locations of locally steepest horizontal gradient ("plus" symbols) were determined by numerically searching for maxima in the horizontal gradient grid (Blakely and Simpson, 1986).

Boundaries between bodies having different densities are characterized by steep gradients in the gravity field they produce and, if the boundaries have moderate-to-steep dips (greater than 45°), locally the maximum horizontal gradients will be located over the surface traces of the boundaries (Blakely and Simpson, 1986). Similarly, boundaries between bodies having different magnetizations are characterized by steep gradients in the pseudogravity field and, therefore, the procedure described above can be used to locate these boundaries. For example, the "plus" symbols coincide closely with strands of the Rinconada and San Andreas faults.

REFERENCES CITED

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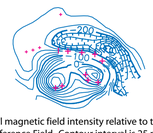
Topography from 30-meter digital elevation model (DEM).
North American Datum of 1927 (NAD27).

SCALE 1:250 000

1 0 1 2 3 4 5 6 7 8 MILES

1 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

GN
MN
0°17'
5 MILS
14°
249 MILS



Contours of total magnetic field intensity relative to the International Geomagnetic Reference Field. Contour interval is 25 nanoteslas. Hachures indicate closed magnetic lows. "Plus" signs indicate possible locations of boundaries between regions of different magnetizations (see accompanying text for explanation). Larger "plus" signs denote gradient amplitudes greater than the mean for the study area; smaller "plus" signs denote amplitudes less than the mean.

Flight line

Fault from Jennings (1994)

Aeromagnetic Survey Map of the central California Coast Ranges

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