U.S. DEPARTMENT OF THE INTERIOR
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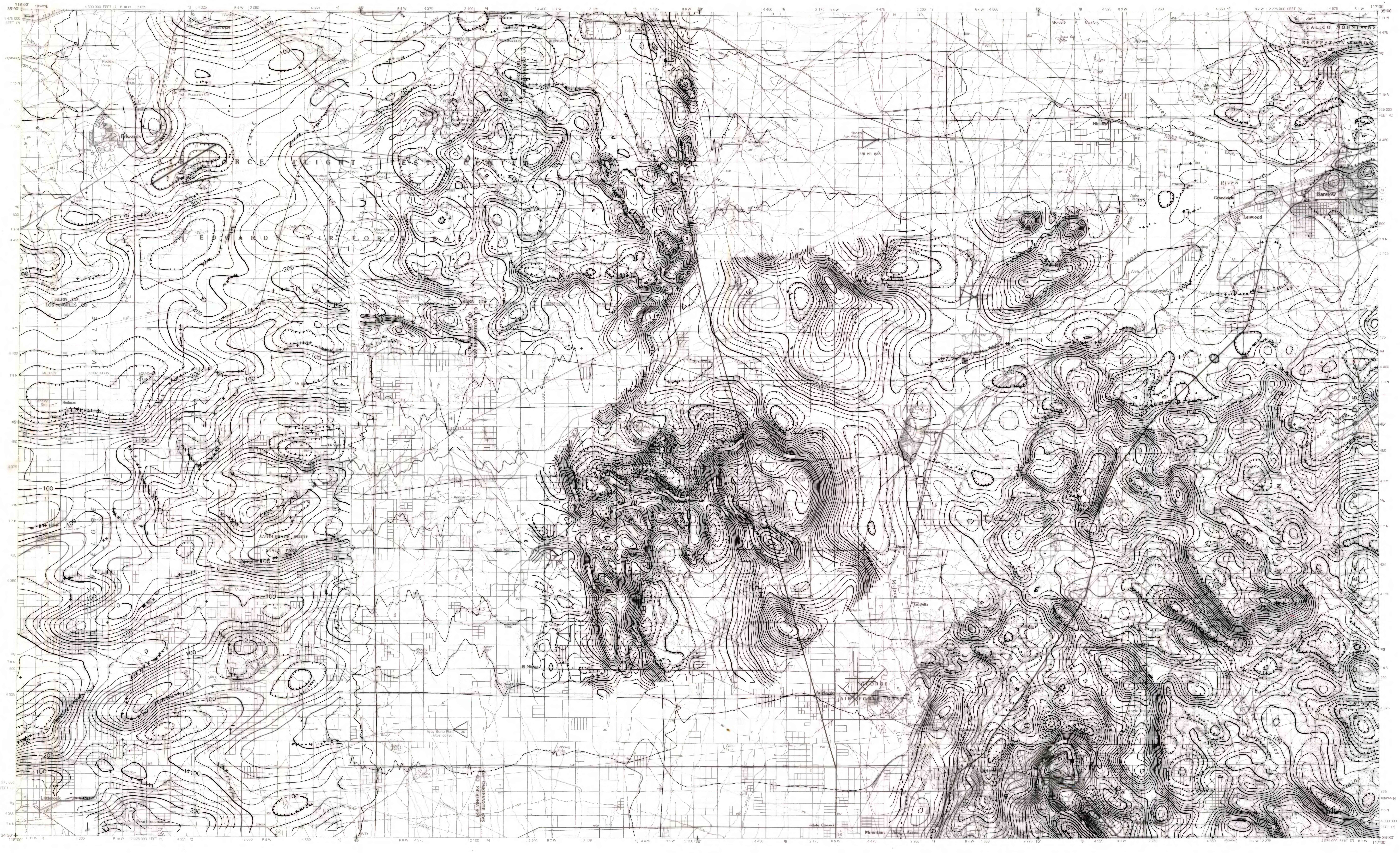
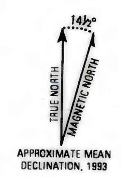


Base from U.S. Geological Survey, 1982

Universal Transverse Mercator projection



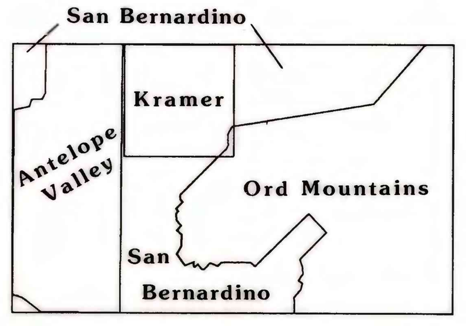
SCALE 1:100 000

KILOMETERS

MILES

FEET

CONTOUR INTERVAL 50 METERS



AEROMAGNETIC MAP OF THE VICTORVILLE 1:100,000 SCALE QUADRANGLE, CALIFORNIA

By

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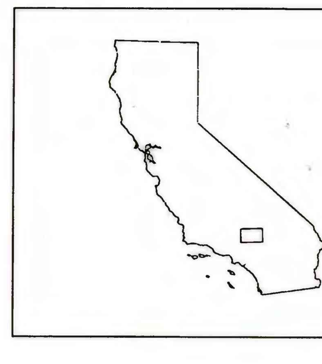
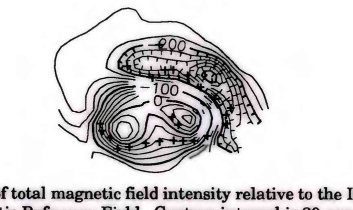
1993





Contours of total magnetic field intensity relative to the International Geomagnetic Reference Field. Contour interval is 20 nanoteslas. Hachures indicate closed magnetic lows. Small "plus" signs indicate possible locations of boundaries between regions of different magnetizations (see accompanying text for explanation).

INTRODUCTION

The accompanying aeromagnetic map is part of the Southern California Areal Mapping Project (SCAMP) and is intended to promote further understanding of the geology in the Victorville 1:100,000-scale quadrangle, California by serving as a basis for geophysical interpretations and by supporting geological mapping, mineral resource investigations, and 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 commonly mark lithologic or structural boundaries. Bodies of gabbroic or dioritic composition tend to produce the most intense magnetic anomalies, but such generalizations must be applied with caution because rocks with more felsic compositions also are capable of causing measurable magnetic anomalies.

Within the Victorville quadrangle, magnetic minerals are concentrated mainly in the Mesozoic plutonic rocks of the Mojave batholith (Bortugno and Spittler, 1986; Jachens and others, 1986). These plutonic rocks show a wide variation in magnetization, and include some bodies that are effectively nonmagnetic. Metavolcanic rocks of Mesozoic age also occur in the Victorville quadrangle, and some of these rocks appear to be weakly magnetic based on the coincidence of some magnetic anomalies and outcrops of these metamorphic rocks. However, plutonic rocks probably occur at relatively shallow depth beneath the metavolcanic rocks and most likely are the sources of the measured anomalies. Miocene basalts exposed adjacent to Highway 395, 8-20 km south of Kramer Junction (Bortugno and Spittler, 1986), produce small magnetic anomalies but because the bodies are very small, their anomalies generally are dominated by anomalies from the underlying plutonic rocks.

Various sedimentary deposits, ranging from Quaternary alluvium to Paleozoic limestones and metasedimentary rocks, typically are nonmagnetic, and those on the Victorville quadrangle are no exception. However, this generalization may not always hold near intrusive contacts between limestones and Mesozoic plutonic rocks. In many areas of the southern California desert lands, concentrations of magnetite in skarn deposits tend to occur near such contacts (Burchard, 1948). The Ord Mountains survey was conducted as part of an exploration program directed at locating magnetite skarns. Thus, local magnetic anomalies near intrusive contacts between limestones and plutonic rocks may reflect magnetite skarns.

At the scale of this map, most magnetic anomalies bear a direct relationship to the rocks beneath them, i.e., magnetic highs are associated with magnetic rock bodies. In detail, however, because the Earth's main magnetic field is not vertical at the latitude of the Victorville quadrangle (field inclination ~60°) and because almost all of the anomalies on this map are induced by the earth's main field, the precise relationship between a magnetic body and its associated anomaly is complex. Typically, each magnetic body will generate a magnetic anomaly composed of a high and a low, with the high lying over the southern part of the body and the low lying just north of the northern edge of the body.

DATA SOURCES AND REDUCTIONS

Total-field magnetic data from four separate surveys (table 1, index map) were used to construct the aeromagnetic map and profiles of the Victorville quadrangle. Data from the Antelope, Kramer, and Ord Mountains surveys were available only as printed maps. The total field magnetic values were obtained from these maps by digitizing values where contours crossed flight paths. Values at a few critical locations away from the flight paths were digitized in order to control subtle features of the contoured field. Data from the San Bernardino survey (displayed as profiles) were obtained directly from the digital data files provided by the contractor. The International Geomagnetic Reference Field, updated to the dates that the individual surveys were flown, was subtracted from each survey to yield a residual magnetic field.

TABLE 1

Survey	Year Flown	Flight Elevation (Above ground surface)	Flight Line Spacing	Flight Line Direction
Antelope Valley (U.S. Geological Survey, 1970)	1959	150 m	1.6 km	NS
Kramer (U.S. Geological Survey, 1970)	1954	150 m	0.4 km	NS
Ord Mountains (U.S. Geological Survey, 1987)	1957/58	150 m	0.8 km	NE/SW
San Bernardino (U.S. Department of Energy, 1980)	1979	120 m	5.0 km	EW

Data from the Antelope Valley, Kramer, and Ord Mountain surveys were projected (Universal Transverse Mercator Projection; Base Latitude 0°, Central Meridian -117°) and interpolated to a square grid (grid interval = 0.25 km) by means of a routine based on the principal of minimum curvature (Briggs, 1974). These surveys were continued upward to a height of 305 m above the ground surface (305 m drape) and the magnetic base levels of the individual surveys were adjusted to bring them onto a common datum. Where the Kramer and Ord Mountains surveys overlap, the two survey grids were merged by smooth interpolation across a one-kilometer-wide buffer zone along the common boundary. Finally, all gridded data were contoured at an interval of 20 nanotesla (nT).

The flightlines of the San Bernardino survey are too widely spaced for contouring at a scale of 1:100,00 to be a valid representation of the geomagnetic field. Therefore, these data are presented as profiled data along flightlines (shown as the segmented straight lines) at a scale of 100 nT per cm above or below the EW flightline indicators or 100 nT per cm to the left or right of the NS flightline indicators. The datum level for these profiled values is the same for all profiles but arbitrary, having been chosen to ensure that the plotted profiles do not interfere excessively with the contours of the other surveys.

The small "plus" symbols on the contoured parts of the map indicate possible locations of abrupt lateral changes in magnetization and may represent lithologic and/or structural boundaries. Their locations were determined as follows:

1) The total-field 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 horizontal gradient of the pseudogravity field was calculated everywhere by numerical differentiation.

3) Locations of locally steepest horizontal gradient ("plus" symbols) were determined by numerically searching for maxima in the horizontal gradient grid.

Boundaries between bodies having different densities are characterized by steep gradients in the gravity field and if the boundaries have moderate-to-steep dips (>45°), 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.

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