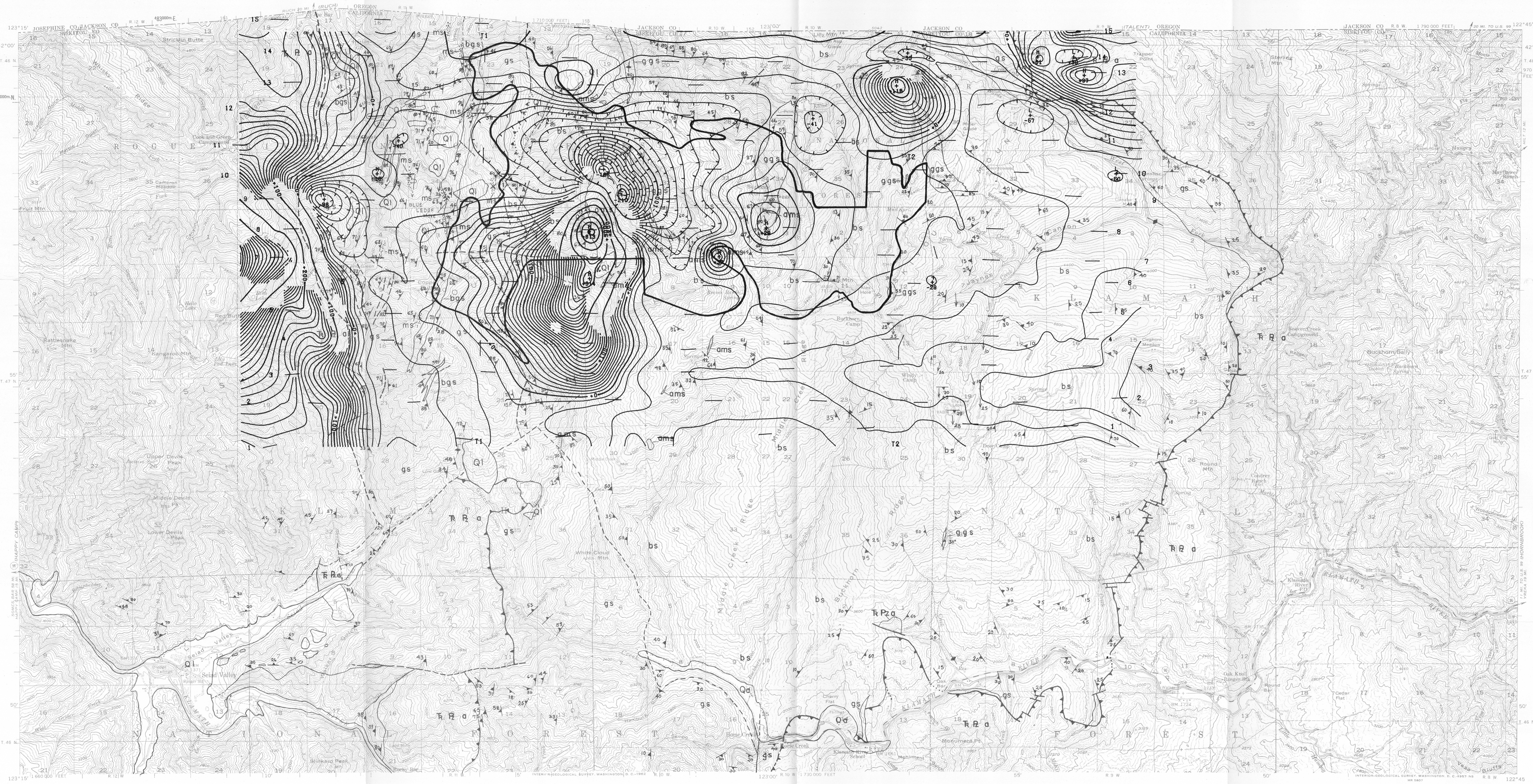
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1540-B



Base from U.S. Geological Survey, 1:62,500, Condrey Mountain, Seiad Valley, 1955

SCALE 1:50 000

CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Aeromagnetic surveys and map compilation by High Life Helicopters, Inc., Puyallup, Washington, 1981

Geology from Coleman and others (1983)

MAGNETIC CONTOURS--Showing total residual magnetic intensity. Hachures indicate direction of decreasing magnetic intensity. Contour interval 10 nanotesla (nT) with index contours at 100 nT

MAXIMUM OR MINIMUM INTENSITY--Location measured within closed high or closed low

FLIGHT PATH--Showing location and spacing of data. Numbers along west and south margins of map identify specific flight lines

CORRELATION OF MAP UNITS

Qa, Ql — QUATERNARY

bs, gs, bgs, ggs, ms; ams — JURASSIC

Thrust fault

Western Paleozoic and Triassic belt

TrPza — TRIASSIC AND PALEOZOIC

DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (QUATERNARY)--Mostly river gravels and terrace deposits

Ql LANDSLIDE DEPOSITS (QUATERNARY)

CONDREY MOUNTAIN SCHIST (Jurassic)--As mapped, divided into:

bs Blackschist

gs Greenschist

bgs Blackschist and greenschist, undifferentiated

ggs Glaucophane-greenschist

ms Mineralized schist

ams Antigorite metaserpentinite

WESTERN PALEOZOIC AND TRIASSIC BELT

TrPza AMPHIBOLITE, SILICEOUS, PHILLLITE AND SCHIST, QUARTZITE, AND MARBLE (Triassic and Paleozoic)

SYMBOLS

CONTACT--Dashed where approximately located.

NORMAL FAULT--Dashed where approximately located.

THRUST FAULT--Dashed where approximately located. Sawteeth on upper teeth.

STRIKE AND DIP OF FOLIATION--Includes S_1, S_2
Inclined
Vertical

TREND AND PLUNGE OF LINEATION--Includes F_1, F_2, F_3

TREND AND PLUNGE OF OVERTURNED SYNFORM

TREND AND PLUNGE OF OVERTURNED ANTIFORM

MINE

PROSPECT

BOUNDARY OF ROADLESS AREA--Approximately located

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geophysical survey of the Condrey Mountain Roadless Area in the Klamath and Rogue River National Forests, Siskiyou County, California. The Condrey Mountain Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

INTRODUCTION

The Condrey Mountain Roadless Area lies within the Klamath Mountains geologic province, a province composed of four eastward-dipping imbricate thrust slices or belts consisting predominantly of marine arc-related volcanic and sedimentary rocks, but also including significant amounts of ultramafic and other ophiolitic rocks (Irwin, 1981). From west to east the four Klamath Mountains thrust slices are called the western Jurassic belt, the western Paleozoic and Triassic belt, the central metamorphic belt, and the eastern Klamath belt. The Condrey Mountain Roadless Area is located within a structural window in the western Paleozoic and Triassic belt, a window in which the structural dome comprised of the Condrey Mountain Schist is exposed (Coleman and others, 1983). North, east and south of the roadless area, the Condrey Mountain Schist is separated from the overlying western Paleozoic and Triassic belt by a low-angle regional thrust, whereas to the west the two units are in high-angle fault contact (Coleman and others, 1983).

The Condrey Mountain Schist consists mainly of sedimentary and volcanic rocks metamorphosed to greenschist facies. Metasedimentary rocks are exposed over most of the eastern and central parts of the structural window. Metavolcanic rocks occupy the western part of the window but also occur in small exposures within the metasedimentary rocks and along the eastern and southern margins of the window. Tabular bodies of metaserpentinite, the largest of which crops out near White Mountain, are contained within the metasedimentary rocks. Densities of hand samples from 11 sites scattered throughout the Condrey Mountain window average 2.66 ± 0.05 (1σ) g/cm^3. The four samples of metavolcanic rocks yielded a higher average density than the seven samples of metasedimentary rocks (2.71 ± 0.04 g/cm^3 versus 2.63 ± 0.03 g/cm^3).

Along the western edge of the Condrey Mountain Roadless Area, numerous narrow north-trending zones of mineralized schist extend from near Copper Butte on the south, northward to Elliot Creek (Coleman and others, 1983). These zones contain abundant pyrite mineralization associated with pyrrhotite, chalcopyrite, galena, and sphalerite. The Blue Ledge mine area, 2 mi north-northeast of Copper Butte, is located in a zone of mineralized schist.

The western Paleozoic and Triassic belt that nearly surrounds the Condrey Mountain Schist is a melange of sedimentary, volcanic, and ultramafic rocks metamorphosed to amphibolite facies (Coleman and others, 1983). Only two samples of the metamorphic melange were collected near the Condrey Mountain Roadless Area, but extensive sampling of this unit southwest of the roadless area yielded an average sample density of 2.86 ± 0.15 g/cm^3 (112 samples) (Jachens and others, 1983).

GEOPHYSICAL MAPS

Geophysical maps were compiled and constructed from gravity and aeromagnetic surveys of the study area in order to assist the geologic mapping and the mineral resource assessment of the Condrey Mountain Roadless Area. The isostatic residual gravity map (fig. 1) primarily reflects lateral density variations within the upper crust beneath the region, whereas the aeromagnetic map reflects the distribution of magnetization in the underlying rocks. Because different rock types are often characterized by contrasting densities and magnetic properties, the geophysical maps can be used to extend the geologic mapping into areas covered by surficial deposits and to determine the subsurface locations and attitudes of boundaries between such rock units.

GRAVITY DATA

Gravity data in the vicinity of the Condrey Mountain Roadless Area were obtained from Snyder and others (1982). The observed gravity data had been reduced to Bouguer anomalies using a density of 2.67 g/cm^3 and were corrected for the effects of terrain out to a radius of 103.6 mi. Uncertainties in the Bouguer anomalies arising from uncertainties in station elevations, terrain corrections, and gravimeter drift probably are less than 1-2 mGal for most of the gravity data, although larger errors could exist for data in areas of extreme topographic relief.

The Bouguer gravity field over the study area and surrounding regions reflects both shallow crustal density distributions and variations of crustal thickness consistent with the concept of isostasy (Oliver, 1980). In order to isolate that part of the gravity field that arises from near-surface density distributions, the isostatic residual gravity map (fig. 1) was constructed from the Bouguer gravity data by removing a regional field computed from a model of the Moho or crust-mantle interface (Roberts and others, 1980). The geometry of the Moho was determined from topography averaged over 3 by 3-minute compartments by assuming complete local Airy-type isostatic compensation with a topographic density of 2.67 g/cm^3, normal sea level crustal thickness of 15.6 mi, and density contrast across the Moho of 0.40 g/cm^3. The gravity effect of the model Moho out to a radius of 103.6 mi was calculated at each station using a computer program by Jachens and Roberts (1981). The effects of topography and isostatic compensation for all regions at distances greater than 103.6 mi were taken from the maps of Karki and others (1961).

GRAVITY INTERPRETATION

The most prominent feature of the gravity field in the vicinity of the Condrey Mountain Roadless Area is a major regional gravity low centered over the Condrey Mountain Schist (fig. 1). To the west and east, the gravity field over the surrounding western Paleozoic and Triassic belt reaches values more than 30 mGal higher than those at the bottom of the gravity low. Within the regional low, a local, low-amplitude gravity high (about 5 mGal in amplitude) occurs roughly over the core of the Condrey Mountain structural dome.

The gravity data are qualitatively consistent with the density data and with the structural interpretation of Coleman and others (1983), in which the low density Condrey Mountain Schist once was completely covered by the high density rocks of the western Paleozoic and Triassic thrust sheet and has been later exposed by domical uplift and erosion. Quantitative modeling of the gravity data along profile A-A' (fig. 1) indicates that the western contact between the Condrey Mountain Schist and the western Paleozoic and Triassic belt is nearly vertical, whereas the eastern contact dips eastward at approximately 30° near the surface and less steeply at depth (fig. 2). The overlying plate is approximately 4 mi thick west of the roadless area and reaches a thickness of 2.5 mi or more east of the roadless area. In order to account for the local gravity high, we have included a region near the core of the dome that has a slightly positive density contrast with respect to the surrounding metasediments (fig. 2). We have shown this region cropping out at the surface but the gravity data could be satisfied as well by a region of positive density contrast that is not exposed.

AEROMAGNETIC DATA

The aeromagnetic map of the Condrey Mountain Roadless Area (U.S. Geological Survey, 1982) was compiled from surveys flown during March 1981. Total intensity magnetic data were collected along flight lines oriented east-west and spaced approximately 0.5 mi apart. Data also were collected along two north-south flight lines. The surveys were flown at a height of 1000 ft above the average terrain. Because the area surveyed contains considerable topographic relief, actual ground clearance varied between 300 ft and 2500 ft.

A residual magnetic map was generated by subtracting the International Geomagnetic Reference Field--1975 (updated to the month flown) from the data. The data were contoured by computer using a grid with dimensions of 508 ft.

AEROMAGNETIC INTERPRETATION

The aeromagnetic map reflects the distribution of magnetization in the rocks of the survey area. Individual anomalies can arise both from variation of magnetization within the rocks and from topographic effects in areas where the surface rocks are magnetic. Because most of the rocks exposed at the surface in the vicinity of the Condrey Mountain Roadless Area are nonmagnetic or weakly magnetic, the influence of topography on the aeromagnetic map is minimal. At high geomagnetic latitudes such as those of the Condrey Mountain Roadless Area (about 65°), steep boundaries between regions of differing induced magnetization are associated with magnetic gradients, and the steepest part of the gradient generally occurs above the boundary (Vacquier and others, 1951).

The magnetic field over much of the area surveyed is smooth and featureless but prominent magnetic anomalies are associated with bodies of metaserpentinite contained within the Condrey Mountain Schist and with the contact between the Condrey Mountain Schist and the overlying western Paleozoic and Triassic belt. Within the Condrey Mountain Roadless Area, the large magnetic anomaly associated with the tabular White Mountain metaserpentinite body indicates that this body dips toward the west and that its subsurface extent is considerably larger than its surface exposure. This body continues in the subsurface both west and south of its surface exposure and probably is about 2 mi wide (east-west) and about 3 mi long (north-south). Three small, roughly circular magnetic highs occur within the roadless area and are associated with small exposures of metaserpentinite. These three anomalies are located 2.5 mi north of White Mountain, 2.1 mi east of White Mountain, and 0.5 mi south-southeast of Scraggy Mountain, respectively. The bodies that cause these anomalies probably are small, with characteristic lateral dimensions of a few thousand feet or less. The 1.5 mi diameter, roughly circular anomaly located 3 mi northeast of Scraggy Mountain probably also reflects a small metaserpentinite body, one which is not exposed at the surface.

Aeromagnetic traverses pass above or close to seven zones of mineralized schist including the one containing the Blue Ledge mine area. The height that the magnetometer passed above these zones varied from place to place, the closest pass being approximately 750 ft. We have examined the aeromagnetic profile data and the aeromagnetic map over the zones of mineralized schist and have not been able to identify any anomalies associated with them. However, the presence of pyrrhotite within these zones suggests that lower-level traverses or ground magnetic surveys could possibly reveal magnetic anomalies associated with this mineralization.

The large magnetic highs in the western part and in the extreme northeast corner of the map occur above the western Paleozoic and Triassic belt and indicate that here the rocks of this unit are more magnetic than the adjacent Condrey Mountain Schist. Quantitative modelling of the magnetic anomaly associated with the western contact between these two units confirms the near vertical attitude of this boundary as inferred from the gravity data. Along flight line 7, the magnetic data constrain the attitude of the contact to be within approximately 15° of vertical.

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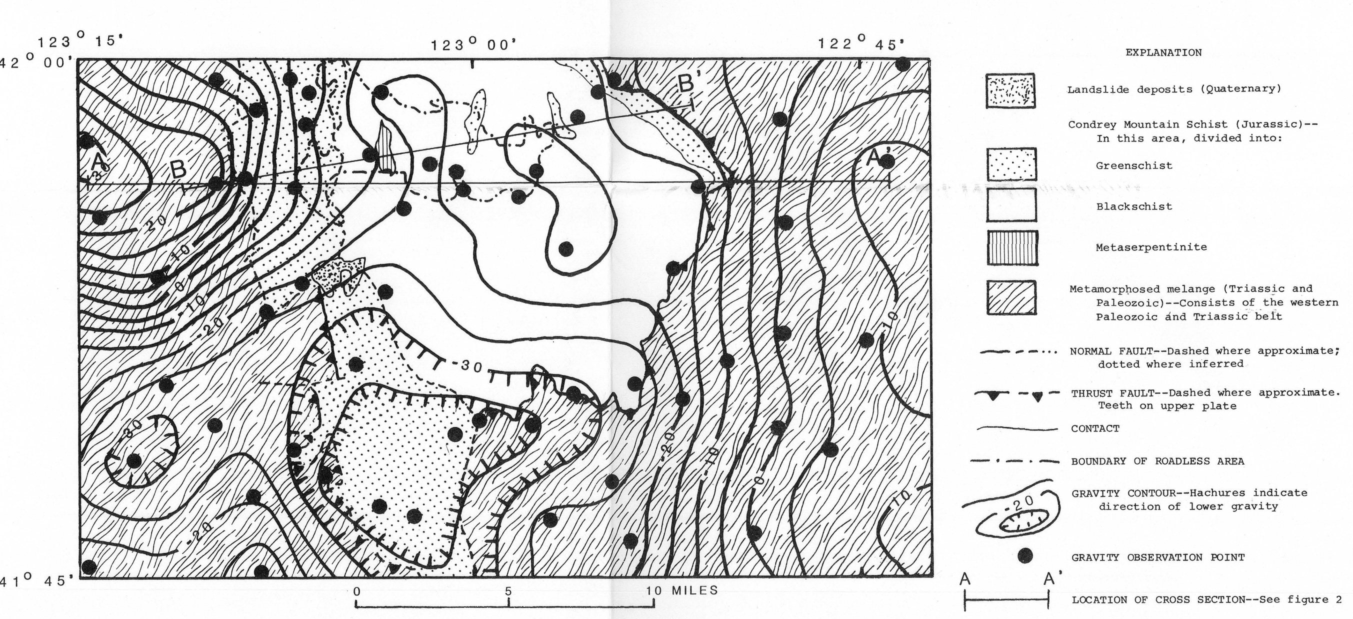


Figure 1--Isostatic residual gravity map and simplified geology of the Condrey Mountain Roadless Area and vicinity. Contour interval is 5 mGal. Geology from Coleman and others (1983) and from a compilation by C. G. Barnes (written commun., 1982). Gravity data from Snyder and others (1982).

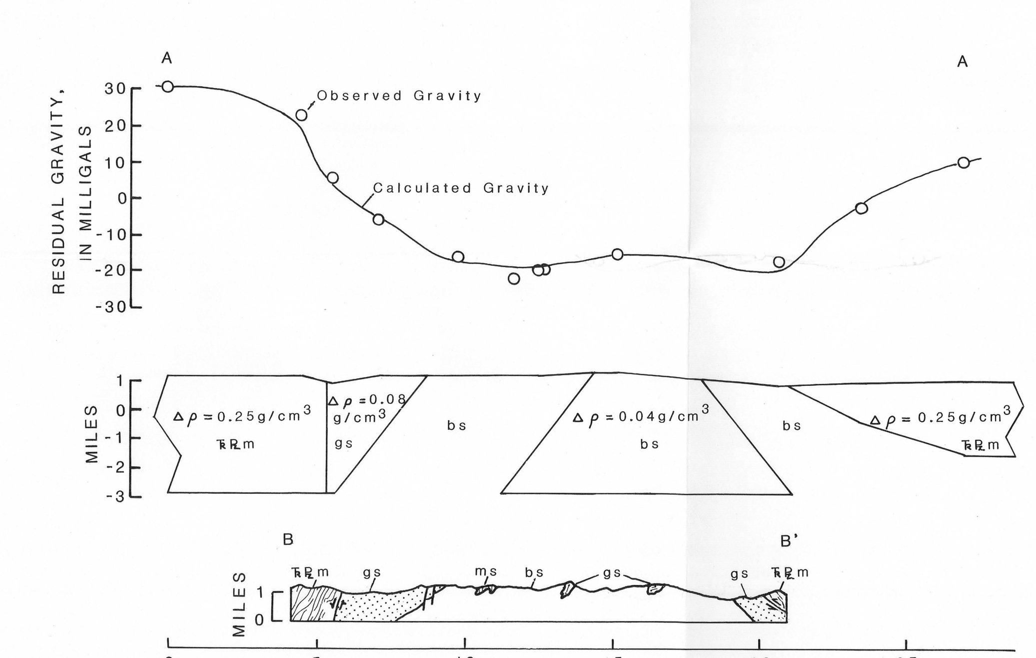
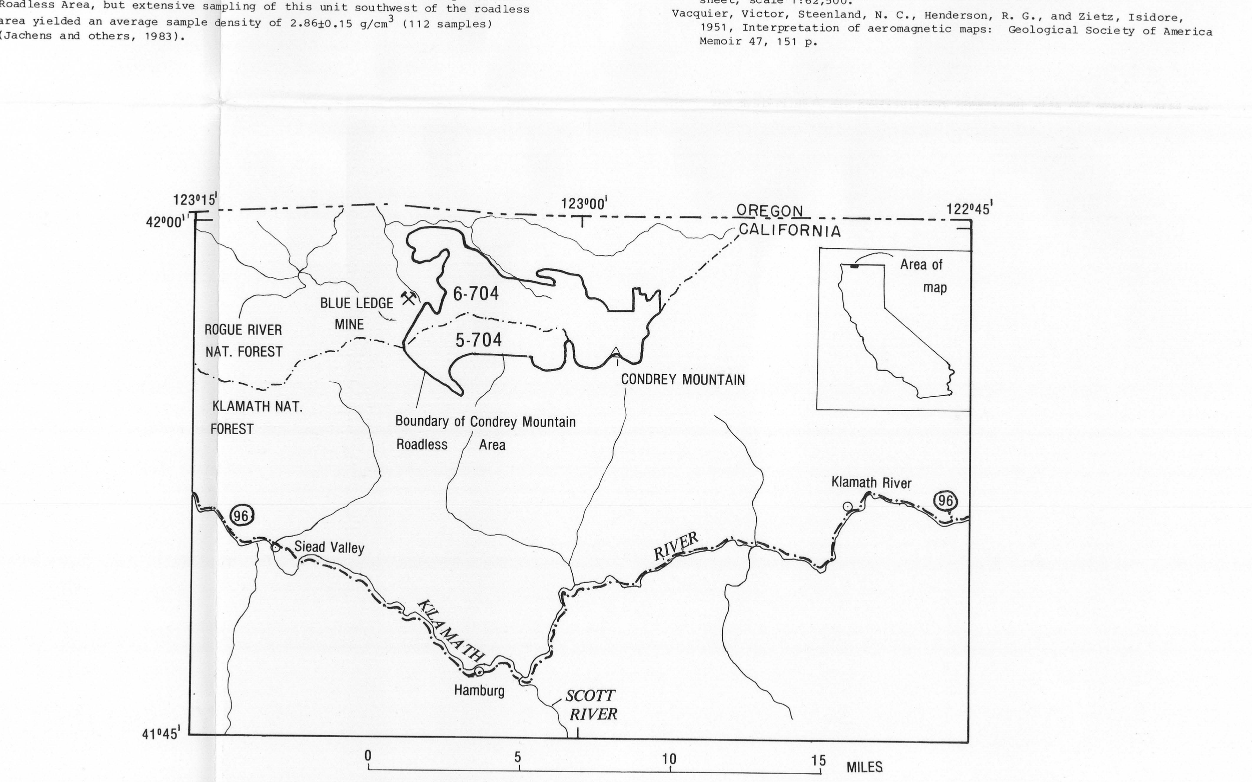


Figure 2--Gravity model along profile A-A' (fig. 1). Geologic symbols: TrPza-metamorphosed melange of western Paleozoic and Triassic belt; gs-greenschist; bs-blackschist; ms-metaserpentinite. Geologic cross section along profile B-B' from Coleman and others (1983).



Index map showing the location of the Condrey Mountain Roadless Area

AEROMAGNETIC MAP AND INTERPRETATION OF GEOPHYSICAL DATA FROM THE CONDREY MOUNTAIN ROADLESS AREA, SISKIYOU COUNTY, CALIFORNIA

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1983

Interior—Geological Survey, Reston, Va.—1983
For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225