ONNWER 82
File 3

Logged in 11/28/83
Open

USGS-OFR-83-616

USGS-OFR-83-616

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

AEROMAGNETIC MAP OF YUCCA MOUNTAIN AND SURROUNDING REGIONS, SOUTHWEST NEVADA

by

M. F. Kane and R. E. Bracken

Open-File Report 83-616

Prepared in cooperation with the
Nevada Operations Office
U.S. Department of Energy
(Interagency Agreement DE-AI08-78ET44802)

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Company names are for descriptive purposes only and do not constitute endorsement by the U.S. Geological Survey.

Denver, Colorado
1983

Copies of this Open-File Report
may be purchased from

Open-File Services Section
Branch of Distribution
U.S. Geological Survey
Box 25425, Federal Center
Denver, Colorado 80225

PREPAYMENT IS REQUIRED

Price information will be published
in the monthly listing
"New Publications of the Geological Survey"

FOR ADDITIONAL ORDERING INFORMATION

CALL: Commercial: (303) 234-5888
FTS: 234-5888

USGS-OFR-83-616 USGS-OFR-83-616

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

AEROMAGNETIC MAP OF YUCCA MOUNTAIN AND SURROUNDING REGIONS, SOUTHWEST NEVADA

By

M. F. Kane and R. E. Bracken

CONTENTS

Illustrations

Abstract

Magnetic anomalies over Yucca Mountain and surrounding areas are largely caused by variations in magnetic properties and shapes, including structural offsets, of the extensive volcanic units that underlie the region. In a few places the anomalies are caused by intrusions. Correlation between magnetic properties measured from rock samples and those derived from rock unit-magnetic anomaly associations is excellent. Anomaly characteristics, extensive magnetic gradients, and marked changes in the regional magnetic field can be coupled with the magnetic properties of the rock units to delineate structural boundaries. Three major boundaries are indicated by contrasts in regional magnetic expressions. Less extensive but more clearly indicated boundaries in the immediate vicinity of Yucca Mountain are interpreted from a distinctive pairing of northerly-trending linear positive and negative anomalies which are caused by vertical displacement in generally gently dipping volcanic beds. The displacement between beds is located approximately along the border line between the linear anomaly pairs. One series of pairs of more northeasterly trend lies over the general location of a change from moderately thick to very thick volcanic units that was interpreted from gravity data. Several low amplitude but distinctively shaped anomalies in areas underlain primarily by sedimentary strata indicate the presence of intrusions and faults.

Data Source and Compilation

For ease of reference the magnetic map is divided into 15 quadrants, each equivalent to a 7 $1/2$ minute quadrangle, and labeled alphabetically from west to east and north to south; individual anomalies or anomaly clusters referred to in the text are marked by numbers. Data for quadrants A and F are taken from a survey of the Lathrop wells area (U.S. Geological Survey, 1978) in which they were measured along north-south flight lines at an average height of 1000 feet (300 m) above terrain and an average spacing of 1/2 mile (800 m). Data from quadrants K through O are also taken from the Lathrop Wells survey but were measured along east-west flight lines at an average height of 400 feet (120 m) above terrain and an average spacing of 1/4 mile (400 m). The remainder of the quadrants are from a survey of the Timber Mountain area (U.S. Geological Survey, 1979) in which they were measured along east-west profiles at an average height of 400 feet (120 m) above terrain and an average spacing of 1/4 mile (400 m). The contouring is based on data points transposed to a regular grid with 75 m spacing.

Although there are flight-height variations of as much as 400 feet (120 m), the data used in the compilation are essentially those measured during the survey except for the level adjustments for tie lines and the Earth's main field. The data thus retains the highest possible frequency content so that the maximum amount of information on shallow sources is preserved. Inspection of a map using all the data showed portions of flight lines that exhibited an evident mismatch with adjacent flight lines, usually in the form of a linear anomaly oriented in the flight-line direction. These portions of lines were removed before producing the final contour map. The magnetization of the rocks underlying the boundary between the surveys flown at different heights is such that the only possiblity of a serious discrepancy is along the boundary between A and B; detailed interpretation of data across this boundary would need to take the change in survey height into account.

Geologic Setting

The map covers the southern part of the volcanic caldera complex that is centered around Timber Mountain (Byers and others, 1976). Sedimentary strata which range in age from upper Precambrian to middle Paleozoic form a framework

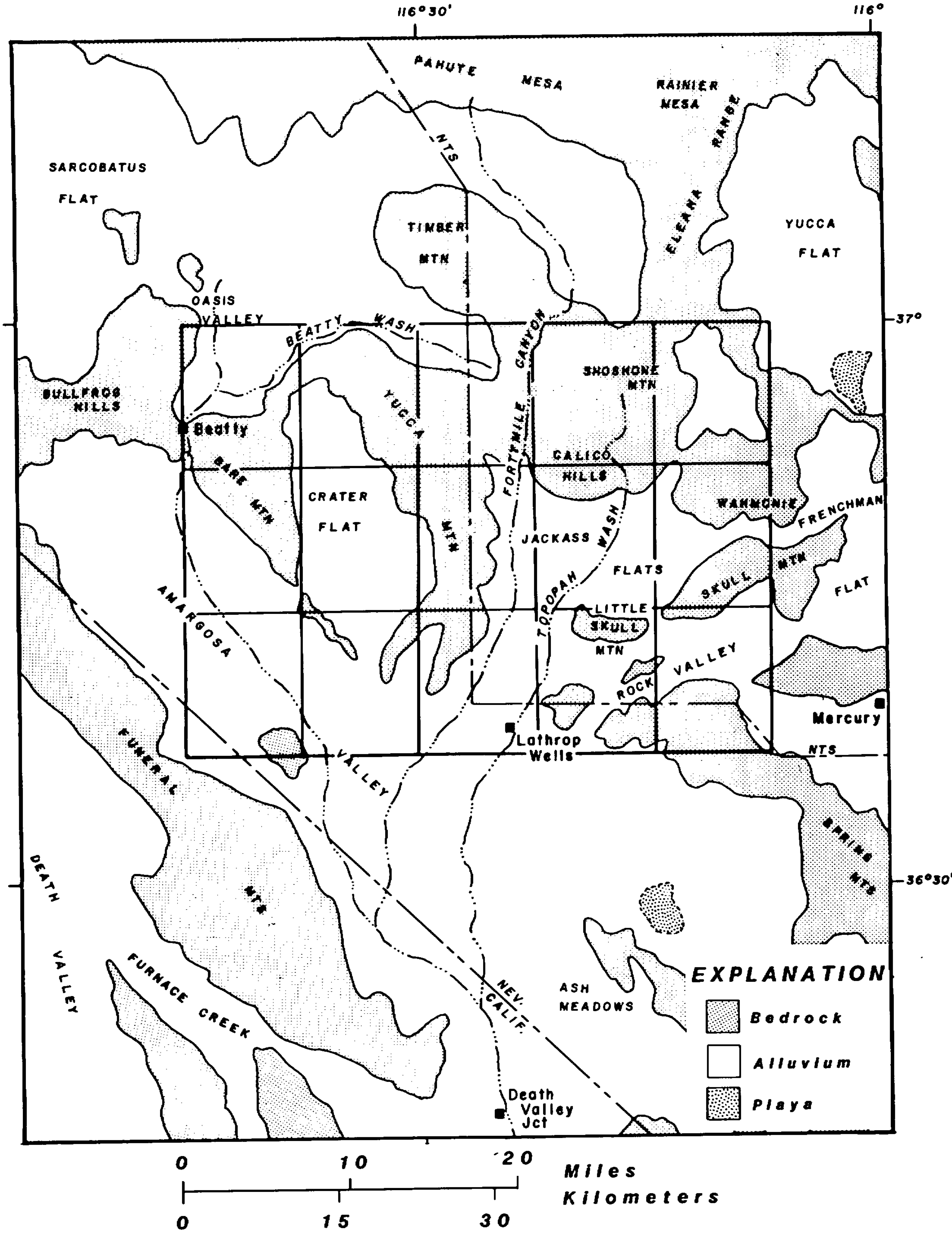

Figure 1.—Geographic features of the report area.

for the caldera complex and crop out in the west, southwest, southeast and northeast parts of the map area (Cornwall, 1972). The region within the framework of sedimentary stata is underlain almost wholly by volcanic rocks except in the northeast where strata of Paleozoic age are brought to the surface by structural displacements including that probably caused by emplacement of a pluton (Snyder and Oliver, 1981; Maldonado and others, 1979). Two isolated areas of intrusive rock are also present in the northeast part of quadrant J and appear to be part of a much larger subjacent intrusive mass (Ponce, 1981). The volcanic rocks which form units of significant thickness in the survey area are those typical of caldera complexes and range from welded ash flow tuffs through subordinate ash-fall tuff to lava flows. Although the primary magnetic expression over the area is caused by magnetic contrasts between various volcanic units and by the overall contrast of magnetic volcanic units with the nonmagnetic sedimentary strata, a few anomalies appear to be caused by magnetic igneous or crystalline rock within or below the sedimentary strata, and/or by alteration of sedimentary strata by igneous intrusion (Baldwin and Jahren, 1982; Gordon D. Bath, oral commun., 1982).

Magnetized Rock Units

There are three types of rock units that are known to give rise to magnetic anomalies within the map area. The first is a group of lava flow units including young basalt lavas of Quaternary age that are negatively polarized, a group of basalt and mafic lavas of Tertiary age which are positively polarized, and two rhyolite lavas of Tertiary age, that of Shoshone Mountain which is positively polarized, and that of Fortymile Canyon which is negatively polarized (Gordon D. Bath, 1980, oral commun.). The anomalies caused by these rock units are generally intense, commonly irregularly shaped and internally complex, and tend to occur as isolated features. Their morphology reflects their mode of emplacement which includes sudden discharge, rapid cooling, and multiple events.

The second is a group of volcanic tuffs which are older than the lava flow units of the previous paragraph. They are divided in terms of increasing age into the Timber Mountain, Paintbrush, and Crater Flat Tuffs, all of Tertiary age. The Rainier Mesa Member of the Timber Mountain Tuff has strong negative polarization; the Tiva Canyon Member of the Paintbrush Tuff has a negative polarization which ranges from strong as an intercaldera unit to moderate elsewhere; the Topopah Spring Member of the Paintbrush Tuff has moderate positive polarization but substantial thickness (up to 1000 feet); the Bullfrog Member of the Crater Flat Tuff has moderate positive polarization and the Tram unit of the Crater Flat Tuff has strong negative polarization (Bath, 1968; Gordon D. Bath, oral commun., 1982; Joseph G. Rosenbaum, oral commun., 1982). The tuff units were laid down as widespread ash-flow sheets whose lateral extent greatly exceeds their thickness. As such, magnetic anomalies should only be observed at the edges of the sheets or where there is an abrupt variation in thickness. The amplitude of the anomaly will increase with magnetic intensity and thickness but stacking of units of opposite polarity will produce some cancellation of anomaly amplitude. The magnetization of the principal magnetic tuff units can be combined in order of increasing age (and depth) into the Rainier Mesa and Tiva Canyon Members which are negative, the Topopah Springs and Bullfrog Members which are positive and the Tram unit which is strongly negative (Joseph G. Rosenbaum, 1982, oral commun.) The most important consideration in evaluating the magnetic effect of these units however, is that magnetic anomalies will form along the boundaries where the sheets are offset vertically (Bath and others, 1982). For a verticallydisplaced positively-magnetized unit, for example, a linear magnetic low will form along and outside the boundary and a linear magnetic high will form along and inside the boundary. If a negatively magnetized bed is brought adjacent to a positively magnetized bed by vertical offset the effect along the boundary is additive. Both situations can occur for the volcanic tuff units described above.

The Wahmonie Formation is composed mainly of rhyodacitic to dacitic lavas with related tuff, tuff breccia, and tuffaceous sandstone (Florian Maldonado, written commun., 1982). The primary anomaly sources are the lavas which are positively polarized. The Wahmonie is discussed separately because it is older and more extensive and complex than the lava flow units described above. It represents in part some combination of types one and two.

The third type is made up of igneous intrusions. Knowledge of them is in most places inferential since with one exception (Wahmonie) they are not exposed. Their existence may be inferred either by the presence of otherwise unexplainable anomalies (for example within an area underlain by sedimentary rock) or by alteration effects on overlying rock units (Baldwin and Jahren, 1982; Maldonado and others, 1979). The anomalies caused by the intrusions may result from magnetic minerals within the intrusion or by the alteration of surrounding rocks by fluids and heat.

Magnetic anomalies

The distribution of anomalies on the map reflects for the most part the distribution of the volcanic units associated with the caldera complexes. The border of the flat magnetic field extending easterly across the southern part of A (1) and then south along the boundary between F and G outlines the north and east edges of Bare Mountain, a range composed mostly of rocks of lower Paleozoic age (Cornwall, 1972). The northern half of the boundary between F and G is underlain by alluvium however, so that it isn't clear whether the eastern margin of the Paleozoic sedimentary strata extends east of the boundary as suggested by the flat magnetic field. Near the common corner of F, G, K, and L the northeast edge of the outcrop of sedimentary rocks swings southeast and ends at a point (2) about halfway diagonally across quadrant L. The sedimentary strata are next exposed underlying much of the southern third of quadrant N (3) with the northern limit of exposure trending north of east and crossing near the middle of the boundary between N and O (4), then turning easterly to cross near the midpoint of the east boundary of quadrant O (5). It seems clear that the abrupt change from anomalous magnetic field to flat magnetic field that trends south of east across L and east across M marks the approximate contact between the stratified sedimentary rocks and the volcanic units associated with the caldera.

Anomalies in the region outside the caldera complexes.--There are several magnetic anomalies or groups of anomalies within the region underlain by sedimentary strata. A distinct low-amplitude magnetic high occupying about 2 square km is present in the northern part of quadrant F (6). The area is underlain completely by the sedimentary strata of Bare Mountain so that the cause of the anomaly must be an underlying intrusive which is either magnetic itself or has caused magnetization of the enclosing sedimentary strata by alteration. A second group of anomalies, of both positive and negative sign, is present in the northeast part of quadrant K (7). The area of the anomalies is underlain by alluvium except for isolated outcrops of volcanic rock belonging to the Timber Mountain-Paintbrush Tuffs; the anomalies most likely indicate the presence of tuff members of this group. The sharp appearance of the anomalies suggests the sources are not deep except for that of the northwesternmost anomaly. The small linear high (8) trending northeast across the northern part of the boundary between K and L corresponds with a latite lava flow (Cornwall, 1972).

The members of the group of anomalies extending southeastward from the northwest corner of L (near 8) to the middle of the boundary between L and M (9) correspond mostly with members of the Timber Mountain-Paintbrush Tuffs (positive anomalies). The sharp positive anomaly just west of the middle part of the boundary between M and L (just northwest of 9) coincides with the normally magnetized basalt of Lathrop Wells (Crowe and Carr, 1980).

The northern part of a strong negative anomaly (10) with a peripheral positive anomaly on the north is present in the southeast corner of quadrant M. The combined anomalies almost certainly represent the dipole effect from a single source which could be an intrusive or extrusive mass. A broad linear high trends north and then northeast from the dipole anomaly and may indicate the emplacement of volcanic units with a distribution similar to that of the anomaly. The gradients along the linear high get progressively steeper to the north and northeast suggesting that the source may be getting shallower in that direction. The linear anomaly also forms the boundary between a relatively flat magnetic field to the west and an anomalous one to the east suggesting that its source may be along a structural boundary.

This broad north to northest-trending linear high also appears to mark a change in the character of the transition zone between the volcanic units to the north and the sedimentary strata to the south. The magnetic anomalies along the transition zone west of the linear high have orientations that are discordant with the strike of the zone and are broad and relatively intense. East of the high several anomalies of probable volcanic source are aligned parallel or at a low angle to the strike of the zone and the change in the magnetic field from north to south along the transition zone is generally less abrupt. Although amplitudes in the magnetic field south of the transition zone are generally low (except 10) some of the anomalies have a distinctive trend. The most pronounced of these anomalies is a weak high (11) that trends south of west from the central part of quadrant O to the southwest corner of N. It corresponds in its entirety to a mapped overthrust with upper plate to the north and a component of left lateral motion (Florian Maldonado, written commun., 1982). The thrust occurs partly in an alluviated area between outcrop areas of sedimentary rocks. The anomaly could be caused by a displacement in magnetic crystalline basement below the sedimentary strata or by an offset in volcanic strata.

A second correspondence between a mapped fault and a magnetic feature may be seen in the east part of quadrant N (just west of 4). The active magnetic field that is present in most of the northern half of N changes to a more subdued field across a southwest trending boundary that crosses the N-O border about a kilometer south of its northern limit. This boundary corresponds to a fault with left-lateral movement (Florian Maldonado, written commun., 1982). The fault extends northward through the region underlain by volcanic rocks and is colinear with the Wahmonie intrusion (Ponce, 1981). A left lateral movement of 2 to 4 km would realign magnetic patterns across the fault and produce an appearance of continuity in the magnetic field.

Northern quadrants.--The anomalies in the western two thirds of quadrant A (12) correspond with volcanic units north of the northern edge of Bare Mountain. The prominent westerly-oriented magnetic high in the southwest part of the quadrant (just northwest of 1) is associated with basalts of Pliocene to Recent age, (Paul P. Orkild, written commun., 1982). One of the most intense anomalies of the entire region is a magnetic low that is located along the northern part of the A-B border (13). The anomaly is associated with the Tram unit of the Crater Flat Tuff and its polarity agrees with the magnetization measurements on samples from the Tram which are strongly negative (Joseph G. Rosenbaum, oral commun., 1982). The less intense negative anomaly centered about two thirds way south along the A-B border corresponds in part with a region underlain by the Rainier Mesa Member of the Timber Mountain Tuff; its polarity also agrees with sample measurements.

Magnetic anomalies of quadrants B, C, and D were interpreted previously by Kane and others (1981). A summary of their conclusions is as follows. They suggest that a major structural boundary extends southeast from the middle part of the west edge of the negative anomaly associated with the Tram unit (13) to about two-thirds of the way east along the border between C and H (14). Northeast of the boundary magnetic anomalies are generally broad and have a west to northwest orientation whereas southwest of the boundary anomalies are more typically linear and northerly oriented. A gravity high is also coincident with the entire magnetic zone northeast of the boundary and is interpreted as the expression of a horst. The magnetic anomalies to the northeast are associated with well-identified magnetic units like the Tram unit, the tuff of Chocolate Mountain and the Rhyolite Lavas of Fortymile Canyon. The anomalies to the southwest are usually associated with broad exposures of the Rainier Mesa and Topopah Spring Members.

Northerly oriented linear anomalies in the southeast corner of C correspond to outcrop areas of Topopah Spring Member (northeast of 14) of similar geometry. The pronounced positive anomalies in the northeast corner of C (15) are associated with mafic lavas of Miocene age. The heterogeneous magnetic field covering much of quadrant D (16) is caused by rhyolite lavas of Fortymile Canyon on the west and by a combination of complexly faulted magnetic units and a partial cover of positively magnetized rhyolite lavas of Shoshone

Mountain in the east. The broad magnetic high in the southeast corner of D (17) corresponds to a similarly broad outcrop area of Shoshone Mountain lavas underlain in turn by Topopah Spring tuff. Both volcanic units may combine to cause the anomaly. The magnetic anomalies in the northwest (18) and southeastern part (19) parts of E, and east of the eastern boundary of E (20) are associated with faulted welded ashflow tuff units and are most probably caused by them. Again individual highs and lows correspond with tuff units of appropriate magnetization.

The broad zone of flat magnetic field extending along the southern part of quadrant D (except for anomaly 17) and occupying much of quadrant E corresponds to a region partly underlain by sedimentary strata and partly by volcanic rocks. The precise nature of the bedrock is obscured by alluvial cover over substantial areas and the character of rock magnetization is complicated by alteration presumably caused by an underlying igneous intrusion. The broad magnetic anomaly in the northern part of quadrant I (21) for example, is caused at least in part by alteration of the normally nonmagnetic Eleana argillite (Baldwin and Jahren, 1982; Maldonado and others, 1979) by the inferred intrusion. The flat magnetic field in the southwest part of quadrant E may be caused by alteration of the volcanic units but the flatness of the field to the northeast is more likely due to the presence of underlying sedimentary strata.

Anomalies of Crater Flat and Yucca Mountain.--The magnetic field of quadrant G is divided into a northern third composed of subdued anomalies and a southern two thirds with relatively more intense anomalies. The sharp magnetic lows in the southern area (22,23,24) correlate with basalts of Quaternary age (Paul P. Orkild, written commun. 1982). The broad low along the western margin (25) is probably caused by a broad accumulation of negatively magnetized tuffs. The sharp magnetic high in the southwesternmost corner (26) is covered by alluvium. It is probably caused by a buried basalt. The most prominent magnetic feature of the area is a broad high centered in the southern part of quadrant G (27) whose shape is somewhat obscured by basalt-associated magnetic lows around its periphery. A drill-hole over the anomaly penetrated these basalts, nearly 300 m of Topopah Spring Member and more than 140 m of densely welded Bullfrog Member (Carr, 1982). Both volcanic units have appropriate magnetic properties to cause the anomaly if they thicken towards its center. Carr (1982) suggests that the anomaly is caused by a resurgent dome in a caldera associated with the Bullfrog.

The subdued magnetic field of the western part of the northern third of G may be due to underlying tuff units which have little vertical relief. The linear features of the eastern third of G (29 for example) are principally due to vertical offsets of similar orientation in the volcanic tuffs. The boundary between the northern area of subdued magnetics and southern area of intense anomalies would appear to mark a structural boundary of some type. The boundary will be considered in a subsequent paragraph.

The Yucca Mountain area occupies the western two thirds of quadrant H and a triangular area in the southwest corner of quadrant C. Rock units similar in lithology and structure are also present in the northwest quarter of M, the northeast quarter of L, the northeast part of G and the southeast part of B. The anomalies of this region are typically elongate to the north or northeast and commonly exhibit a pairing of negative and positive anomalies. As stated for the eastern part of G, the anomalies appear to reflect similarly oriented vertical structural offsets in the tuff underlying this region. In general the linear magnetic highs correlate with exposures of the Topopah Springs Member. The linear lows are commonly over areas underlain by alluvium located on the west side of exposures of the Topopah Spring tuff. Faults downthrown to the west are also indicated along most of the Topopah Spring exposures. Rainier Mesa Member of negative magnetization is present near or over many of the linear lows but it is generally draped over the structure rather than being downdropped in place (Paul P. Orkild, oral commun., 1982). It seems clear that the linear anomaly pairs are principally the result of vertical offset along north to northeast trending faults which leads to the dipole expression of a magnetic low on the west and a high in the east. The cause of the high is the positively magnetized Topopah Spring Member possibly augmented by the underlying Bullfrog Member. The parallel low to the west must be at least in part a dipole effect but it may be augmented by the younger negatively magnetized units (Rainier Mesa and Tiva Canyon Members). Whatever the precise cause the anomalies clearly mark the location of faults of similar orientation. Several of the broad magnetic lows in the southwest part of B correlate with Rainier Mesa Member exposures of similar breadth and are probably caused by these units together with the subjacent Tiva Canyon Member. Magnetic highs can also be correlated with exposures of Topopah Spring Member along the northeast boundary of Yucca Mountain (southwest corner of C).

Given the general cause of the linear anomalies described above, there are several regional characteristics of the magnetic field that seem worth noting. One concerns orientation of anomaly axes. South of the border between G-H and L-M many of the linear anomalies have a northeast trend. North of the border in the eastern part of G and western part of H, most of the anomalies trend northerly for a distance about two thirds of the way northwards across the quadrant; farther north the linear-anomaly axes appear to swing back to northeast. Three of the most distinctive magnetic linear highs associated with Topopah Spring Member (31,32,30) in this region appear to be arranged en echelon from the southwest corner of H to the southwest corner of C. Another regional characteristic concerns boundaries. There are three major discontinuities between groups of like-trending linear anomalies. The first trends slightly south of west nearly along the border between G-L and H-M; the second trends slightly south of west and separates the southern two-thirds of G-H from the northern third; the third is the southeast-trending boundary extending from the northeast corner of B (13) to the southern part of C (near 14). Still another regional characteristic concerns an arrangement of linear anomalies that trend northeast and then north across the southwest and west parts of the region of linear anomalies. The more sharply defined lows correlate generally with alluviated areas and to some extent with exposures of Rainier Mesa Member; they start in the northwest part of M, trend northeast and then north along the east part of of H (33,34,35,36). They are bordered to the east by less sharply defined magnetic highs which are associated with Topopah Springs Member. Together the series of anomalies appear to define a continuous structure that may extend northward into the southeast part of C.

Anomalies of Jackass Flats.--Much of quadrant I is underlain by alluvium. Positive anomalies (37,38) of the south-central part correlate with limited exposures of Topopah Springs Member and basalt of Tertiary age respectively (Florian Maldonado, written commun., 1982). Farther south, anomalies in the north-central (39) and northeastern (40) parts of N correlate with exposures of tuff and basalt respectively. A notable correlation is a moderately positive magnetic anomaly (41) that trends north across the central border area between I and N and correlates with a similarly oriented exposure of Topopah Spring Member.

Many of the anomalies of quadrant J correlate with lava flows. The magnetic high southeast of the common corner of I, J, N and O is associated with basalt. The northeastern of two linear magnetic highs (42) that extend

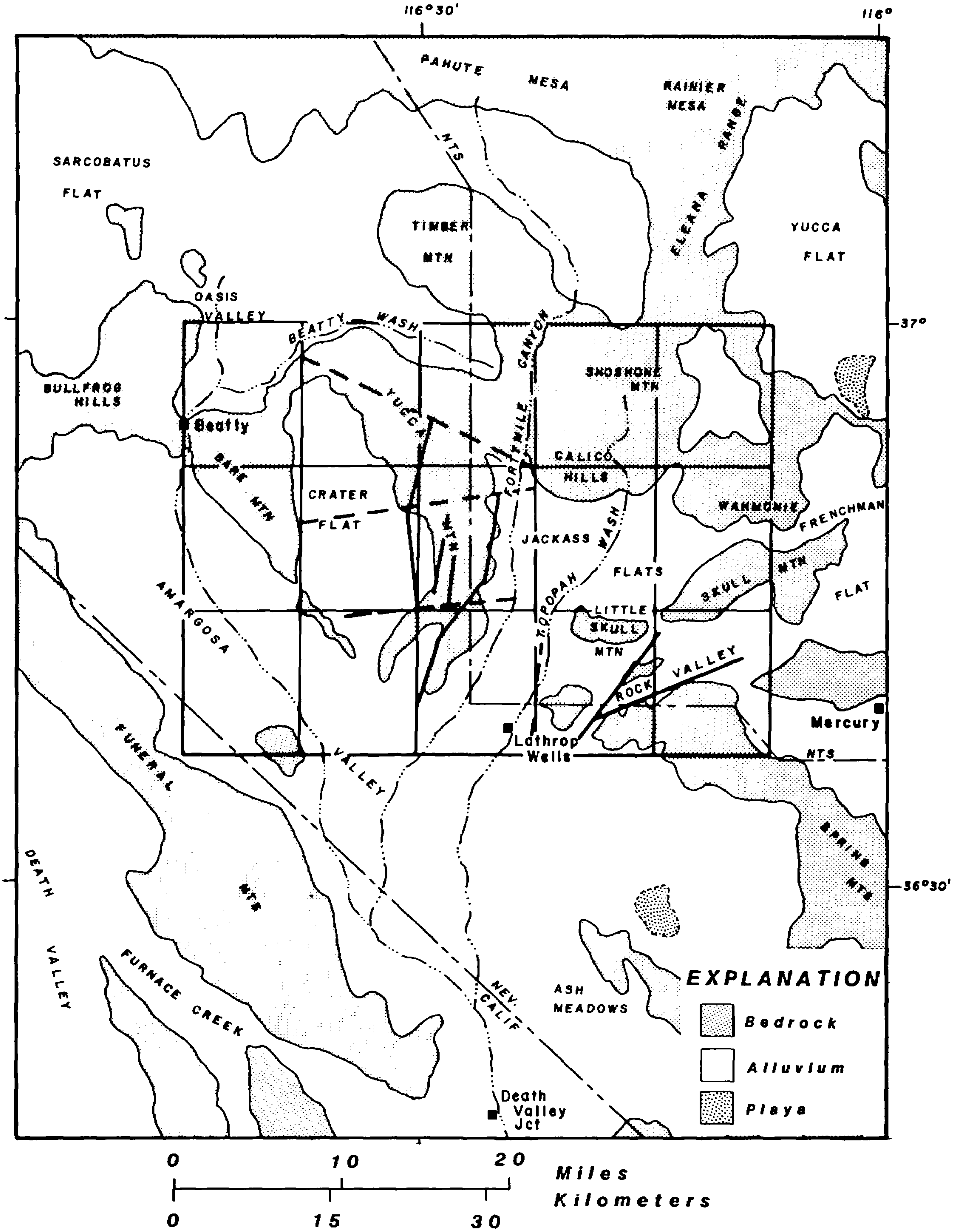

Figure 2.--Structures indicated by aeromagnetic data. Solid line where anomaly shape implies offset in magnetized rock units; dashed line where structural alignment, probably faulting, is indicated by discontinuities, gradient, and (or) contrast in regional magnetic expression.

northeast from the corner also corresponds with an exposure of basalt. It seems clear that the magnetic highs as a group mark the extent of a linear emplacement of basalt that occurs along the northwest side of a fault zone discussed in the initial section (concerning anomalies in the region outside the caldera complex). In the northwest part of J a narrow, southeast trending positive anomaly (43) with an intense peak is associated with the basalt of Kiwi Mesa. Directly northeast of (43) the parallel magnetic low (44) and adjacent parallel high (45) correspond respectively to broad exposures of Rainier Mesa and Topopah Spring Members.

The broad magnetic high with three distinct peaks and northeast orientation that occupies much of the northeast part of J (46) correlates with the Wahmonie intrusive (Ponce, 1981). The intense highs (47 for example) around this feature generally coincide with the Wahmonie Formation which is composed largely of rhyodacitic to dacitic lavas. The intense magnetic highs (48 for example) that are aligned northeast in the southeast part of J also correlate with the Wahmonie Formation. Several of the lows (49 for example) and highs (50 for example) peripheral to the intense highs correlate with exposures of Rainier Mesa and Topopah Spring Members respectively.

Summary

The magnetic anomalies of the map area are explainable in most cases by the magnetic properties of the mapped volcanic units. In the west the principal cause is displacement or thickness variation in magnetized tuff units; in a few places the cause is lava flows, mainly basalt. In the north central area which includes the southern fringe of the Timber Mountain caldera and the Claim Canyon caldron segment, anomalies are caused both by magnetized tuff units and lava flows. The lava flows are principally rhyolites although there is one notable occurrence of anomalies associated with mafic lavas. In the east the primary causes of anomalies are lava flows of mafic and intermediate composition with a few cases of bedded tuffs and two cases of probable intrusions. Broad areas of flat magnetic field generally indicate the location of underlying sedimentary strata including a region in the northeast where sedimentary strata are surrounded by volcanic rock.

Indications of structure in the area around the volcanic complex include the general limits of the emplacement of the volcanic rocks, and traces of faults cutting sedimentary strata and possible basement in the two southeastern quadrants (N and O). A summary of interpreted structural boundaries is given in Figure 2. Perhaps the most important boundary indicated in the area of Yucca Mountain is an east-west discontinuity in anomaly pattern that separates the northern third of G, H, and I from the southern two-thirds (Fig. 2). It includes a major change in the intensity of anomalies in the Crater Flat area, a discontinuity in linear anomalies in the Yucca Mountain area, and orientation of the Calico Hills regional magnetic anomaly in the Jackass Flats area. The magnetic anomalies are such that there is no clear indication of the nature of the discontinuity. A continuous fault or fault system is indicated in the west and southwest parts of the area typified by linear anomalies; it also seems to mark a division between northerly-trending regional structures on the west and northeasterly-trending regional structures on the east. The indicated fault system corresponds in part to the boundary between very thick and moderately thick volcanic units as interpreted from gravity data (Snyder and Carr, 1982). Perhaps the location of the faults was controlled by the underlying boundary.

Acknowledgment

Correlation and analysis of anomalies using geologic features were greatly facilitated by use of unpublished geology maps and text provided by Florian Maldonado and Paul P. Orkild of the U.S Geological Survey.

References Cited

Baldwin, M. J., and Jahren, C. E., 1982, Magnetic properties of drill core and surface samples from the Calico Hills area, Nye County, Nevada: U.S. Geological Survey Open-File Report 82-536, 27 p.

Bath, G. D., 1968, Aeromagnetic anomalies related to remanent magnetism in volcanic rock, Nevada Test Site: Geological Society of America Memoir 110, p. 135-146.

Bath, G. D., Dixon, G. L., and Rosenbaum, J. G., 1982, Relation of aeromagnetic anomalies to faulted volcanic terrains at the Nevada Test Site (abs.): Geological Society of America, Rocky Mountain Section, 35th Annual Meeting, Abstracts with Program, v. 14, n. 6, p. 302.

Byers, F. M., Jr., Carr, W. J., Orkild, P. P., Quinlivan, W. D., and Sargent, K. A., 1976, Volcanic suites and related cauldrons of Timber Mountain-Oasis Valley caldera complex, southern Nevada: U.S. Geological Survey Professional Paper 919, 70 p.

Carr, W. J., 1982, Volcano-tectonic history of Crater Flat, southwestern Nevada, as suggested by new evidence from drill hole USW-VH-1 and vicinity: U.S. Geological Survey Open-File Report 82-457, 23 p.

Cornwall, H. R., 1972, Geology and mineral deposits of southern Nye County, Nevada: Nevada Bureau of Mines and Geology, Bulletin 77, 49 p.

Crowe, B. M., and Carr, W. J., 1980, Preliminary assessment of the risk of volcanism at a proposed nuclear waste repository in the southern Great Basin: U.S. Geological Survey Open-File Report 80-357, 15 p.

Kane, M. F., Webring, M. W., and Bhattacharyya, B. K., 1981, A preliminary analysis of gravity and aeromagnetic surveys of the Timber Mountain area, southern Nevada: U.S. Geological Survey Open-File Report 81-189, 40 p.

Maldonado, Florian, Muller, D. C., and Morrison, J. W., 1979, Preliminary geologic and geophysical data of the UE25a-3 exploratory drill hole, Nevada Test Site, Nevada: U.S. Geological Survey report USGS-1543-6, 47 p.; available only from U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161.

Ponce, D. A., 1981, Preliminary gravity investigations of the Wahmonie site, Nevada Test Site, Nye Coundy, Nevada: U.S. Geological Survey Open-File Report 81-522, 64 p.

Snyder, D. B., and Carr, W. J., 1982, Preliminary results of gravity investigations at Yucca Mountain and vicinity, southern Nye County, Nevada: U.S. Geological Survey Open-File Report 82-701, 35 p.

Snyder, D. B., and Oliver, H. W., 1981, Preliminary results of gravity investigations of the Calico Hills, Nevada Test Site, Nye County, Nevada: U.S. Geological Survey Open-File Report 81-101, 42 p.

U.S. Geological Survey, 1978, Aeromagnetic map of Lathrop Wells area, Nevada: U.S. Geological Survey Open-File Report 78-1103, scale 1:62,500.

U.S. Geological Survey, 1979, Aeromagnetic map of Timber Mountain area, Nevada: U.S. Geological Survey Open-File Report 79-587, scale 1:62,500.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1983—681-143/470 REGION NO. 8

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

PLATE 1
"AEROMAGNETIC MAP OF YUCCA MOUNTAIN AND SURROUNDING REGIONS"

WITHIN THIS PACKAGE.

D-01A

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

PLATE 1
"AEROMAGNETIC MAP OF YUCCA MOUNTAIN AND SURROUNDING REGIONS"

WITHIN THIS PACKAGE.

D-01B