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Analytical results and sample locality map of heavy-mineral-concentrate and rock samples from the Organ Mountains Wilderness Study Area (NM-030-074), Dona Ana County, New Mexico

By

Tracy A. Delaney[1], Gordon W. Day[2], Robert L. Turner[1], and Janet L. Jones[1]

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[1]U.S. Geological Survey, DFC, Box 25046, MS 973, Denver, CO 80225
[2]Retired from U.S. Geological Survey

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral values, if any. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Organ Mountains Wilderness Study Area (NM-030-074), Dona Ana County, New Mexico.

INTRODUCTION

In the fall of 1984, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Organ Mountains Wilderness Study Area, Dona Ana County, New Mexico.

The Organ Mountains Wilderness Study Area (WSA) comprises about 11 mi^2 (28.5 km^2) (7,283 acres) in the eastern Dona Ana County, New Mexico. The study area is located about 15 miles east-northeast of Las Cruces, New Mexico (fig. 1).

The WSA has a semi-arid climate and is drained by intermittent streams. Ponderosa pine is the dominant vegetation on the upper part of the mountains with pinyon pine and juniper at lower elevations. The lower mountain slopes contain mountain mahogany, oak, mesquite, and cresote shrubs.

The topographic relief in the study area is about 3000 ft (914 m), with a maximum elevation of 8010 ft (2441 m). Access to the study area is obtained by U.S. highway 70 on the north side, a graveled road on the west side, and a paved road on the east side.

The Organ Mountains WSA is situated within the Basin and Range Physiographic Province. The major portion of the study area is a quartz monzonite batholith of Tertiary age which was intruded into Paleozoic sedimentary rocks (limestone, dolomites, and shales).

METHODS OF STUDY

Sample Media

Heavy-mineral-concentrate samples provide information about the chemistry of certain minerals in rock material eroded from the drainage basin upstream from each sample site. The selective concentration of minerals, many of which may be ore related, permits determination of some elements that are not easily detected in stream-sediment samples.

Analyses of unaltered or unmineralized rock samples provide background geochemical data for individual rock units. On the other hand, analyses of altered or mineralized rocks, where present, may provide useful geochemical information about the major- and trace-element assemblages associated with a mineralizing system.

Sample Collection

Heavy-mineral-concentrate samples were collected at 17 sites (plate 1). Twelve rock samples were collected at 8 sites. Sampling density was about one sample site per 0.65 mi^2 for the heavy-mineral concentrates and about one

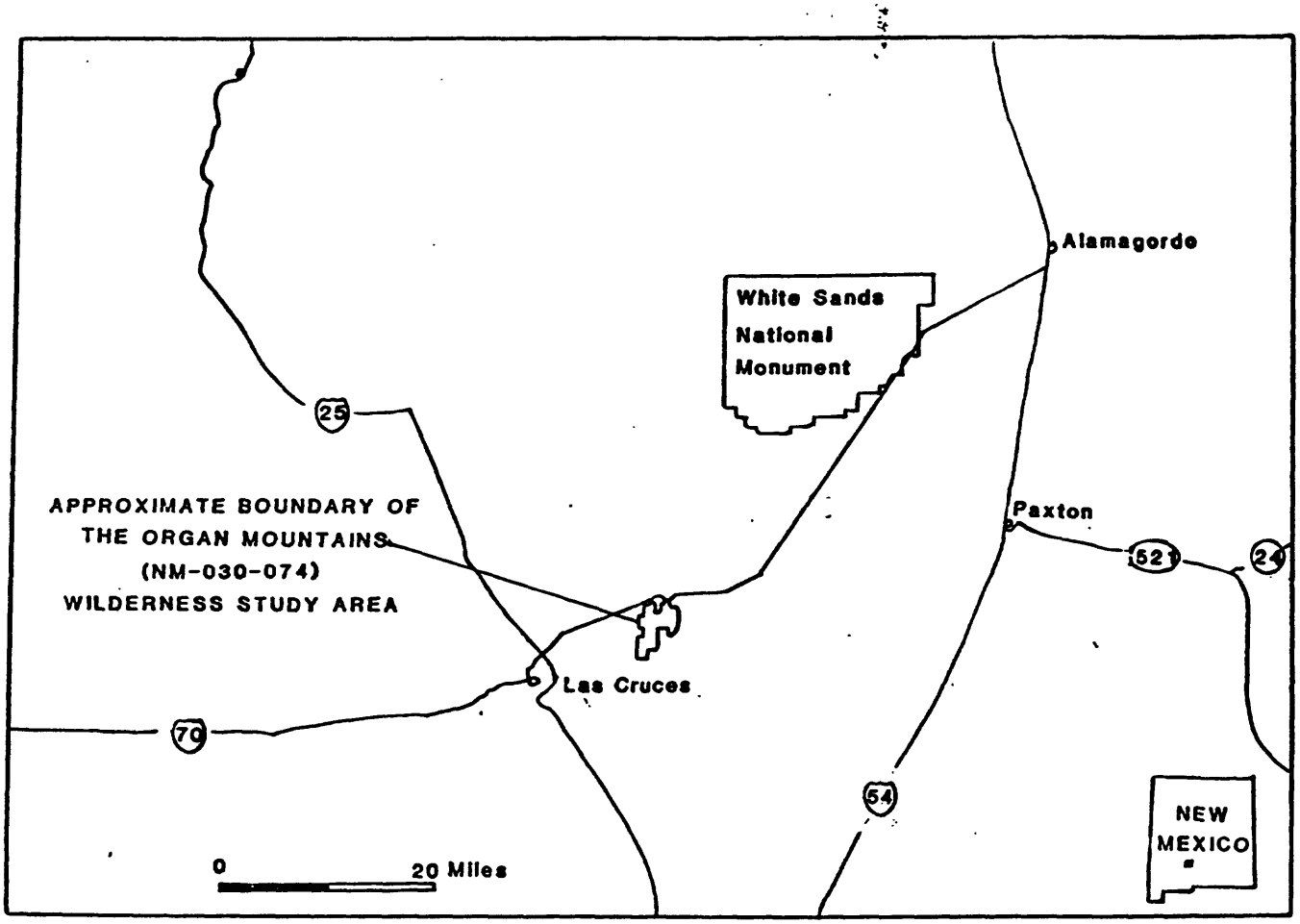

Figure 1. Location map of the Organ Mountains Wilderness Study Area (NM-030-074), Dona Ana County, New Mexico.

sample per 1.38 mi^2 for the rocks. The area of the drainage basins sampled ranged from .25 mi^2 to 4 mi^2.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from active alluvium. Each bulk sample was screened with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Rock samples

Rock samples were collected from various types of occurrences in the vicinity of the plotted site location. Descriptions of rock samples are in table 5.

Sample Preparation

After the samples were air dried, bromoform (specific gravity 2.8) was used to remove the remaining quartz and feldspar from the heavy-mineral-concentrate samples that had been panned in the field. The resultant heavy-mineral sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily magnetite, and the second fraction, largely ferromagnesian silicates and iron oxides, were saved for archival storage. The third fraction (the least magnetic material which may include the nonmagnetic ore minerals, zircon, sphene, etc.) was split using a Jones splitter. One split was hand ground for spectrographic analysis; the other split was saved for mineralogical analysis. These magnetic separates are the same separates that would be produced by using a Frantz Isodynamic Separator set at a slope of 15° and a tilt of 10° with a current of 0.2 ampere to remove the magnetite and ilmenite, and a current of 0.6 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

Rock samples were crushed and then pulverized to minus 0.15 mm with ceramic plates.

Sample Analysis

Spectrographic method

The heavy-mineral-concentrate and rock samples were analyzed for 31 elements using semiquantitative, direct-current arc emission spectrographic methods. The analyses for heavy-mineral-concentrate samples were performed by analysts in the Branch of Exploration Geochemistry using the method of Grimes and Marranzino (1968); analyses for rock samples were performed by analysts in the Branch of Analytical Chemistry using a modified method of Myers and others (1961) by Crock and others (1987). The elements analyzed and their lower limits of determination are listed in table 1. For arsenic (As), gold (Au), cadmium (Cd), lanthanum (La), and thorium (Th), the lower limits of determination of the two analytical methods varies. The values in the parentheses are the limits of determination for Myers and others (1961). Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any

given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the analytical method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements, iron, magnesium, calcium, and titanium, are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Organ Mountains WSA are listed in tables 3 and 4.

Chemical methods

Other analytical methods used on rock samples from the Organ Mountains Wilderness Study Area are summarized in table 2. The analytical method used for determining As, Bi, Cd, Sb, and Zn is a modification and adaptation by Crock and others (1987) for the inductively coupled plasma method (ICP) based on the method of O'Leary and Viets (1986).

Analytical results for rock samples are listed in tables 3, and 4, respectively.

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered into a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form (STATPAC) for computerized statistical analysis or publication (VanTrump and Miesch, 1977).

DESCRIPTION OF DATA TABLES

Tables 3 and 4 list the results of analyses for the samples of heavy-mineral concentrate and rock, respectively. For the two tables, the data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers correspond to the numbers shown on the site location map (plate 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "icp" indicates inductively coupled plasma-atomic emission spectroscopy. A letter "N" in the tables indicates that a given element was looked for but not detected at the lower limit of determination shown for that element in table 1. If an element was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. If an element was observed but was above the highest reporting value, a "greater than" symbol (>) was entered in the tables in front of the upper limit of determination. If an element was not looked for in a sample, two dashes (--) are entered in tables 3 and 4 in place of an analytical value. Because of the formatting used in the computer program that produced tables 3 and 4, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) carry one or more nonsignificant digits to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeros.

ACKNOWLEDGMENTS

A number of our colleagues also participated in sample collection, preparation and analyses of these samples: collection, Allen Phillips and Rick Graff; preparation, Tom Peacock; and analyses, Mollie Malcolm and Paul Briggs.

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TABLE 1.--Limits of determination for the spectrographic analysis of rocks based on a 10-mg sample

[The values shown are the lower limits of determination assigned by the Grimes and Marranzino method, except for those values in parentheses, which are the lower values assigned by the Myers and others method. The spectrographic limits of determination for heavy-mineral-concentrate samples are based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks.]

Elements	Lower determination limit		Upper determination limit
	Percent		
Iron (Fe)	0.05		20
Magnesium (Mg)	.02		10
Calcium (Ca)	.05		20
Titanium (Ti)	.002		1
	Parts per million		
Manganese (Mn)	10		5,000
Silver (Ag)	0.5		5,000
Arsenic (As)	200	(700)	10,000
Gold (Au)	10	(15)	500
Boron (B)	10		2,000
Barium (Ba)	20		5,000
Beryllium (Be)	1		1,000
Bismuth (Bi)	10		1,000
Cadmium (Cd)	20	(30)	500
Cobalt (Co)	5		2,000
Chromium (Cr)	10		5,000
Copper (Cu)	5		20,000
Lanthanum (La)	20	(30)	1,000
Molybdenum (Mo)	5		2,000
Niobium (Nb)	20		2,000
Nickel (Ni)	5		5,000
Lead (Pb)	10		20,000
Antimony (Sb)	100		10,000
Scandium (Sc)	5		100
Tin (Sn)	10		1,000
Strontium (Sr)	100		5,000
Vanadium (V)	10		10,000
Tungsten (W)	50		10,000
Yttrium (Y)	10		2,000
Zinc (Zn)	200		10,000
Zirconium (Zr)	10		1,000
Thorium (Th)	100	(200)	2,000

TABLE 2.--Chemical methods used

[ICP = inductively coupled plasma spectroscopy]

Element or constituent determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Reference
Arsenic (As)	rock	ICP	5	Crock and others, 1987.
Antimony (Sb)	rock	ICP	2	
Zinc (Zn)	rock	ICP	2	
Bismuth (Bi)	rock	ICP	2	
Cadmium (Cd)	rock	ICP	0.1	

TABLE 3 -- RESULTS OF ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE ORGAN MOUNTAINS BLM WILDERNESS STUDY AREA, DONA ANA COUNTY, NEW MEXICO

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
OM001H	32 22 53	106 32 58	.1	1.00	5.0	.1	100	N	N	N
OM002H	32 23 11	106 32 57	.2	.10	1.0	.7	150	N	N	N
OM003H	32 23 36	106 32 55	.2	.05	.5	.7	100	N	N	N
OM004H	32 23 57	106 32 56	.2	.05	2.0	.5	100	N	N	N
OM005H	32 24 26	106 33 4	.2	.05	5.0	1.0	150	N	N	N
OM006H	32 24 29	106 33 3	.2	.10	20.0	1.0	300	N	N	N
OM007H	32 25 38	106 35 24	.2	.05	2.0	.7	50	5	N	N
OM008H	32 21 31	106 36 45	.3	.50	2.0	.7	200	N	N	N
OM009H	32 21 48	106 36 47	.2	.50	5.0	.2	150	N	N	N
OM010H	32 22 5	106 36 45	.2	.10	1.0	1.0	100	N	N	N
OM011H	32 22 39	106 36 49	.2	.20	1.0	.5	200	N	N	N
OM012H	32 23 12	106 36 49	1.0	.20	.7	1.0	200	N	N	N
OM013H	32 23 38	106 37 0	.5	.05	2.0	2.0	200	N	N	N
OM014H	32 23 55	106 37 2	.5	.50	7.0	1.5	500	7	N	N
OM015H	32 24 46	106 36 40	.2	.05	5.0	.7	100	N	N	N
OM016H	32 24 43	106 36 41	.2	.05	5.0	2.0	150	N	N	N
OM017H	32 24 52	106 36 48	.3	.50	5.0	1.5	200	N	N	N

TABLE 3 -- RESULTS OF ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE ORGAN MOUNTAINS BLM WILDERNESS STUDY AREA, DONA ANA COUNTY, NEW MEXICO--Continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
OM001H	N	100	N	10	N	200	<20	<100	100	N	>2,000	N
OM002H	N	100	N	10	N	200	20	N	150	N	>2,000	300
OM003H	N	N	N	10	N	N	<20	N	150	N	>2,000	N
OM004H	N	50	N	10	N	N	<20	500	150	N	>2,000	300
OM005H	N	100	N	10	N	200	20	300	200	N	>2,000	300
OM006H	N	N	N	20	N	N	20	100	500	N	>2,000	N
OM007H	N	200	N	10	N	200	20	100	150	N	>2,000	N
OM008H	N	20	N	20	N	500	<20	N	200	N	>2,000	N
OM009H	N	500	N	10	N	N	<20	N	150	N	>2,000	N
OM010H	N	N	N	20	N	N	<20	N	500	N	>2,000	N
OM011H	N	100	N	15	N	N	<20	N	50	N	>2,000	N
OM012H	N	70	N	20	N	N	20	N	300	N	>2,000	N
OM013H	N	70	N	50	N	N	20	N	700	N	>2,000	N
OM014H	N	1,000	N	50	N	N	50	N	300	5,000	>2,000	N
OM015H	N	200	N	50	N	N	<20	N	300	N	>2,000	N
OM016H	N	500	N	50	N	N	20	N	700	1,000	>2,000	N
OM017H	N	200	N	20	N	N	20	N	300	1,000	>2,000	N

TABLE 4 -- RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE ORGAN MOUNTAIN BLM WILDERNESS STUDY AREA, DONA ANA COUNTY, NEW MEXICO

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
OM002R1	32 23 11	106 32 57	3.00	.20	.70	.500	150	<.5	<700	<15	<10	1,500
OM002R2	32 23 11	106 32 57	.30	2.00	7.00	.100	700	<.5	<700	<15	<10	700
OM004R	32 23 57	106 32 56	.30	.05	.15	.100	30	<.5	<700	<15	<10	300
OM005R1	32 24 26	106 33 4	7.00	.15	.10	.150	70	1.0	<700	<15	<10	500
OM007R1	32 25 38	106 35 24	10.00	.30	.10	.200	100	150.0	<700	<15	<10	300
OM018R	32 24 8	106 36 0	10.00	.70	1.50	.030	>5,000	20.0	<700	<15	<10	70
OM019R	32 23 43	106 35 54	.15	<.02	.30	.007	70	2.0	<700	<15	<10	70
OM020R1	32 23 55	106 35 51	.70	.03	2.00	.010	2,000	300.0	700	<15	<10	20
OM020R2	32 23 55	106 35 51	.50	.02	3.00	<.002	100	150.0	700	<15	<10	20
OM020R3	32 23 55	106 35 51	3.00	<.02	.30	.005	150	100.0	1,500	<15	<10	70
OM020R4	32 23 55	106 35 51	1.00	.15	7.00	<.002	2,000	30.0	<700	<15	<10	<20
OM021R	32 22 2	106 35 38	2.00	7.00	15.00	.002	1,500	<.5	<700	<15	<10	<20

TABLE 4 -- RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE ORGAN MOUNTAIN BLM WILDERNESS STUDY AREA, DONA ANA COUNTY, NEW MEXICO--Continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s
OM002R1	2.0	<10	<30	5	<10	300	<30	5	20	<5	15	<100	5
OM002R2	1.5	<10	<30	<5	10	70	<30	<5	<20	<5	<10	<100	<5
OM004R	30.0	<10	<30	<5	<10	30	<30	<5	<20	<5	10	<100	<5
OM005R1	1.5	15	<30	5	<10	70	70	150	<20	7	700	<100	<5
OM007R1	2.0	700	<30	<5	<10	700	50	70	<20	<5	20,000	300	<5
OM018R	<1.0	<10	70	<5	<10	200	<30	20	<20	15	7,000	<100	<5
OM019R	<1.0	<10	<30	<5	<10	15	<30	<5	<20	<5	30	<100	<5
OM020R1	<1.0	<10	150	<5	<10	3,000	<30	200	<20	<5	15,000	1,000	<5
OM020R2	<1.0	<10	<30	<5	<10	1,000	<30	7	<20	<5	20,000	<100	<5
OM020R3	1.5	<10	<30	<5	<10	3,000	<30	70	<20	<5	20,000	2,000	<5
OM020R4	<1.0	<10	100	<5	<10	>20,000	<30	10	<20	<5	7,000	1,500	<5
OM021R	<1.0	<10	<30	<5	<10	300	<30	10	<20	5	70	<100	<5

TABLE 4 -- RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE ORGAN MOUNTAIN BLM WILDERNESS STUDY AREA, DONA ANA COUNTY, NEW MEXICO--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
OM002R1	<10	500	70	<50	15	<200	300	<200	<5	<2	.3	<2	46
OM002R2	<10	100	15	<50	15	<200	300	<200	7	<2	.2	2	34
OM004R	<10	<100	15	<50	<10	<200	30	<200	<5	<2	.1	<2	7
OM005R1	<10	150	30	<50	30	500	150	<200	<5	12	1.7	<2	490
OM007R1	<10	100	70	<50	15	300	100	<200	340	740	2.3	240	200
OM018R	<10	<100	20	<50	<10	>10,000	15	<200	330	4	61.0	21	13,000
OM019R	<10	<100	<10	<50	<10	<200	10	<200	<5	<2	.3	2	29
OM020R1	15	<100	10	<50	<10	>10,000	<10	<200	760	<2	86.0	660	10,000
OM020R2	10	<100	<10	<50	<10	700	<10	<200	720	<2	1.3	62	350
OM020R3	20	<100	<10	70	<10	3,000	<10	<200	1,400	<2	3.7	1,500	2,400
OM020R4	15	<100	<10	<50	<10	>10,000	<10	<200	790	3	73.0	1,400	34,000
OM021R	<10	<100	15	<50	<10	700	<10	<200	16	<2	1.5	51	460

Table 5. Description of rock samples

OM018R	mineralized rock
19R	siliceous
20R1	quartz vein
20R2	quartz vein
20R3	quartz vein
20R4	quartz vein
21R	mineralized rock from dump
OM002R1	quartzite
2R2	iron altered quartz monzonite
4R	altered quartz monzonite
5R1	iron-stained quartz monzonite
7R1	altered quartz monzonite