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GEOLOGICAL SURVEY

Principal facts for seventy-four gravity stations in the
northern California Cascade Mountains

by
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and
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This report is preliminary and has not been reviewed for
conformity with U.S. Geological Survey editorial standards.

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Explanation of the headings of the accompanying table of principal facts are as follows.

STATION IDENTIFICATION

Station numbers preceeded by the letters sh or sha are on or at the base of Mt. Shasta. The prefixes mh and dav refer to gravity profiles on Medicine Lake Volcano. All stations were taken with LaCoste and Romberg¹ gravity meter G-550. For a complete description of the gravity reduction procedures currently in use by the U.S. Geological Survey (USGS) for defining the corrections and anomalies, see Cordell and others (1982).

LATITUDE AND LONGITUDE

Values listed are in degrees and minutes to the nearest one hundredth of a minute. These positions were surveyed in with a laser theodolyte for all stations except for sh01-sh11. To obtain these postions, gravity stations were transferred from U.S. Forest Service and USGS aerial photographs to USGS 1:62,500 topographic quadrangle maps and then were digitized.

¹Use of tradenames is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.

ELEVATION

Elevations are in feet to the nearest tenth. All elevations were surveyed in with a laser theodolite and are accurate to the nearest tenth of a foot except for stations sh01-sh11. These elevations were read on a Kern¹ PG2 stereo plotter from USGS aerial photographs. Several elevation readings were taken for each station and averaged to obtain the station elevation. Errors associated with this method are: (1) errors in the setup of the photogrammetric model, (2) possible errors in benchmark or spot-elevation values, (3) the difference between our reading of benchmarks and the actual value; about 10-15 feet, and (4) the scatter of elevation data collected for each gravity station about some mean value, assumed to be the real station elevation. These errors were not evaluated due to a lack of information for analysis.

OBSERVED GRAVITY

Values are to the nearest hundredth of a milligal. All stations are relative to IGSN-71 (Morelli, 1974) tied to a base at Klamath Falls, Oregon, having observed gravity equal to 979981.91 mgals except for stations sha01-sha17. These are relative to Menlo Park base station "A" which has a value of 979944.34 (Morelli, 1974).

THEORETICAL GRAVITY

Values were calculated using the Geodetic Reference System 1967 (International Association

of Geodesy, 1971).

TERRAIN CORRECTIONS

Most of the stations were corrected for terrain by computer from the station to 166.7 km (Richard Godson, unpublished program, U.S. Geological Survey), implementing the procedure of Plouff (1977). Some of the inner zone (Hammer zones D-F, Hammer, 1939) terrain corrections were done by template. Although the density used in these corrections was 2.2 g/cm^3 , the value in the terrain correction column is for 2.67 g/cm^3 . This density was obtained by a modified Nettleton profiling technique described in Finn and Williams (1982).

FREE-AIR ANOMALY

Free-air anomaly values are in milligals. The free-air correction was obtained by the following calculation: observed gravity - theoretical gravity - free-air anomaly = free-air correction.

COMPLETE BOUGUER ANOMALY

Complete Bouguer anomaly values are in milligals using densities of 2.2 and 2.43 g/cm^3 .

REFERENCES CITED

- Cordell, L., Keller, G. R., and Hildenbrand, T., 1982, Bouguer gravity map of the Rio Grande Rift: U.S. Geological Survey Geophysical Investigations Map GP-949.
- Finn, Carol, and Williams, D. L., 1982, Gravity evidence for a shallow intrusion under Medicine Lake Volcano in northern California: *Geology*, v. 10, p. 503-507.
- Hammer, Sigmund, 1939, Terrain corrections for gravimeter stations: *Geophysics*, v. 4, p. 184-194.

International Association of Geodesy, 1971, Geodetic reference system 1967:

International Association of Geodesy Special Publication no. 3 (Bureau
Central Association International Geodesie, Paris), 116 p.

Morelli, C., ed., 1974, The International Gravity Standardization Net 1971:

International Association of Geodesy Special Publication no. 4, 194 p.

Plouff, Donald, 1977, Preliminary documentation for a Fortran program to

compute gravity-terrain corrections based on topography digitized on a
geographic grid: U.S. Geological Survey Open-File Report 77-535, 45 p.

sheet gravity
collected summer 1981
Meter ID: g-550

Date: 06/15/82

BOUGUER GRAVITY DATA

STATION	L O C A T I O N S	G R A V I T Y	C O R R E C T I O N S	A N O M A L I E S
IDENTIFICATION	LATITUDE LONGITUDE	OBSERVED THEORETICAL	TERRAIN BOUGUER CURV SPECIAL	FREE COMPLETE-BOUGUER SPEC
proj	sta-id deg min deg min	(in ft)		AIR d1=2.20 d2=2.43 FIELDS
sheet:sh01	41 26.35 -122 6.20	6405.0 ca	5.10 -180.00 -1.25	55.56 -120.58 -139.00
sheet:sh02	41 27.48 -122 6.75	6384.0 ca	4.14 -178.29 -1.24	44.59 -130.80 -149.14
sheet:sh03	41 26.80 -122 7.30	6765.0 ca	5.88 -190.12 -1.25	62.05 -123.44 -142.83
sheet:sh04	41 26.65 -122 7.90	7012.0 ca	7.17 -197.06 -1.25	68.61 -122.53 -142.52
sheet:sh05	41 26.10 -122 8.00	7388.0 ca	9.05 -207.63 -1.24	78.66 -121.16 -142.05
sheet:sh06	41 26.65 -122 7.80	7004.0 ca	7.07 -196.84 -1.25	68.45 -122.57 -142.54
sheet:sh07	41 27.50 -122 6.70	6717.0 ca	9.09 -188.77 -1.25	62.47 -118.47 -137.38
sheet:sh08	41 24.80 -122 7.08	7100.0 ca	8.31 -199.53 -1.25	63.37 -109.11 -129.23
sheet:sh09	41 28.90 -122 14.50	5670.0 ca	6.77 -159.35 -1.22	50.13 -103.66 -119.73
sheet:sh10	41 27.85 -122 10.00	7093.0 ca	8.20 -199.34 -1.25	71.17 -121.21 -141.33
sheet:sh11	41 29.65 -122 10.60	4831.0 ca	21.35 -135.77 -1.15	-49.52 -165.09 -177.17
sheet:sh12	41 21.69 -122 10.93	8404.0 ca	25.02 -236.18 -1.18	110.97 -101.38 -123.58
sheet:sh13	41 23.66 -122 9.32	9111.0 ca	27.99 -256.05 -1.11	118.34 -110.82 -134.78
sheet:sh14	41 24.65 -122 8.65	8595.0 ca	17.25 -241.55 -1.16	105.30 -120.17 -143.74
sheet:sh15	41 27.19 -122 11.65	8799.0 ca	28.32 -247.28 -1.14	106.59 -113.51 -136.52
sheet:sh16	41 25.80 -122 14.78	8593.0 ca	21.85 -241.49 -1.16	111.57 -109.23 -132.31
sheet:sh17	41 24.23 -122 14.89	9084.0 ca	32.26 -255.29 -1.11	125.23 -101.91 -123.35
sheet:sh18	41 22.28 -122 12.34	9222.0 ca	34.85 -259.17 -1.09	125.53 -99.89 -123.45
sheet:sh19	41 23.26 -122 11.36	1107.0 ca	49.22 -312.14 -0.75	164.04 -99.64 -127.21
sheet:sh20	41 24.06 -122 10.12	10336.0 ca	37.49 -256.10 -0.87	152.04 -107.44 -134.57
sheet:sh21	41 24.57 -122 10.59	11171.0 ca	44.31 -313.94 -0.73	163.50 -106.86 -135.13
sheet:sh22	41 25.02 -122 10.91	11634.0 ca	48.99 -326.95 -0.62	170.07 -108.51 -137.63
sheet:sh23	41 24.89 -122 12.23	12366.0 ca	61.57 -348.09 -0.41	183.44 -103.48 -133.48
sheet:sh24	41 24.12 -122 11.93	13186.0 ca	75.11 -370.57 -0.15	190.78 -104.83 -135.73
sheet:sh25	41 24.56 -122 11.62	14157.0 ca	110.43 -397.86 0.21	187.02 -100.20 -130.22
sheet:sh26	41 24.50 -122 13.52	12001.9 ca	64.02 -337.29 -0.52	169.78 -104.01 -132.63
sheet:sh27	41 23.26 -122 13.11	10950.0 ca	42.65 -293.68 -0.89	154.61 -97.31 -123.65
sheet:sh28	41 22.34 -122 13.12	8369.0 ca	18.74 -235.20 -1.18	113.97 -103.68 -126.43
sheet:sh29	41 34.89 -121 39.65	6812.6 ca	3.35 -191.46 -1.25	110.77 -110.77 -130.57
sheet:sh30	41 35.11 -121 39.75	6820.2 ca	3.50 -191.67 -1.25	76.59 -112.82 -132.63
sheet:sh31	41 35.25 -121 39.68	6783.2 ca	3.07 -190.63 -1.25	79.67 -109.14 -128.88
sheet:sh32	41 35.42 -121 39.71	6759.6 ca	3.03 -189.97 -1.25	79.68 -108.51 -128.18
sheet:sh33	41 35.48 -121 39.87	6712.9 ca	2.93 -188.65 -1.25	77.66 -109.32 -128.87
sheet:sh34	41 35.69 -121 39.89	6689.8 ca	2.93 -188.00 -1.25	76.85 -109.47 -128.95
sheet:sh35	41 35.88 -121 39.95	6688.8 ca	3.14 -187.98 -1.25	76.45 -109.63 -129.09
sheet:sh36	41 35.80 -121 39.60	6783.3 ca	3.18 -190.63 -1.25	80.23 -108.47 -128.20
sheet:sh37	41 35.94 -121 39.52	6758.7 ca	3.18 -189.94 -1.25	79.04 -108.97 -128.63
sheet:sh38	41 35.89 -121 39.19	6707.7 ca	3.32 -193.09 -1.25	81.62 -109.40 -129.37
sheet:sh39	41 36.02 -121 39.15	6701.0 ca	3.53 -193.94 -1.25	84.41 -107.24 -127.28
sheet:sh40	41 36.35 -121 39.50	6646.4 ca	3.34 -186.79 -1.25	77.35 -107.35 -126.66

sheate gravity
collected summer 1981
Meter ID: g-550

Date: 06/15/82

BOUGUER GRAVITY DATA

STATION IDENTIFICATION proj sta-id	L O C A T I O N S		ELE (in ft)	ST	G R A V I T Y OBSERVED	TERRAIN BOUGUER CURV	C O R R E C T I O N S		A N O M A L I E S				
	LATITUDE deg min	LONGITUDE deg min					SPECIAL	AIR	COMPLETE-BOUGUER SPEC	FIELDS			
sheaste:dev13	41 36.60	-121 39.50	6532.2	ca	979769.95	980313.02	3.00	-103.58	-1.25	0.00	71.03	-110.79	-129.80
sheaste:dev14	41 36.74	-121 39.75	6468.0	ca	979773.49	980313.23	2.93	-101.77	-1.25	0.00	68.33	-111.76	-130.59
sheaste:dev01	41 41.70	-121 43.34	4779.4	ca	979873.07	980320.65	0.63	-134.32	-1.14	0.00	1.79	-133.04	-147.14
sheaste:dev02	41 41.48	-121 43.66	4787.1	ca	979872.22	980320.32	0.63	-134.53	-1.14	0.00	1.99	-133.06	-147.18
sheaste:dev03	41 41.25	-121 43.85	4775.8	ca	979871.31	980319.98	0.67	-134.22	-1.14	0.00	0.36	-134.32	-146.40
sheaste:dev04	41 41.00	-121 43.97	4794.7	ca	979871.43	980319.60	0.68	-134.75	-1.14	0.00	2.63	-132.57	-146.71
sheaste:dev05	41 40.77	-121 44.08	4841.2	ca	979870.68	980319.26	0.70	-136.05	-1.15	0.00	6.60	-129.90	-144.17
sheaste:dev06	41 40.49	-121 44.04	4878.5	ca	979868.46	980318.84	0.73	-137.10	-1.15	0.00	8.31	-129.22	-143.60
sheaste:dev07	41 40.24	-121 44.00	4880.3	ca	979865.70	980318.46	0.76	-137.15	-1.15	0.00	6.09	-131.45	-145.83
sheaste:dev08	41 39.99	-121 44.00	4908.8	ca	979865.12	980318.09	0.77	-137.95	-1.15	0.00	8.56	-129.77	-144.24
sheaste:dev09	41 39.72	-121 43.99	4924.4	ca	979863.88	980317.69	0.82	-138.39	-1.15	0.00	9.16	-129.57	-144.07
sheaste:dev10	41 39.37	-121 44.00	4983.5	ca	979864.73	980317.16	0.87	-140.05	-1.16	0.00	16.12	-124.22	-138.90
sheaste:dev11	41 39.12	-121 44.04	5009.2	ca	979861.08	980316.79	0.94	-140.77	-1.16	0.00	15.26	-125.74	-140.48
sheaste:dev12	41 38.82	-121 43.92	5051.9	ca	979859.29	980316.34	1.13	-141.97	-1.17	0.00	17.93	-124.08	-138.93
sheaste:dev13	41 38.46	-121 43.97	5203.4	ca	979856.45	980315.80	1.05	-146.23	-1.18	0.00	29.88	-116.48	-131.78
sheaste:dev14	41 38.21	-121 43.97	5252.1	ca	979846.69	980315.42	1.10	-147.60	-1.19	0.00	25.06	-122.63	-138.07
sheaste:dev15	41 37.90	-121 43.91	5304.7	ca	979844.13	980314.96	1.22	-149.08	-1.19	0.00	27.91	-121.14	-136.72
sheaste:dev16	41 37.67	-121 43.87	5336.4	ca	979842.02	980314.62	1.20	-149.97	-1.19	0.00	29.13	-120.83	-136.51
sheaste:dev17	41 37.35	-121 43.38	5390.6	ca	979840.42	980314.14	1.39	-151.49	-1.20	0.00	33.10	-118.20	-134.02
sheaste:dev18	41 37.14	-121 43.66	5460.9	ca	979837.59	980313.82	1.20	-153.47	-1.20	0.00	37.19	-116.28	-132.32
sheaste:dev19	41 36.91	-121 43.63	5536.8	ca	979833.18	980313.48	1.23	-155.60	-1.21	0.00	40.26	-115.33	-131.59
sheaste:dev20	41 36.74	-121 43.84	5596.2	ca	979823.86	980313.23	1.24	-157.27	-1.21	0.00	36.77	-120.47	-136.90
sheaste:dev21	41 36.47	-121 43.75	5604.4	ca	979823.56	980312.82	1.26	-157.50	-1.21	0.00	37.65	-119.80	-136.26
sheaste:dev22	41 36.21	-121 43.63	5614.8	ca	979823.37	980312.43	1.42	-157.79	-1.21	0.00	38.82	-118.77	-135.24
sheaste:dev23	41 36.12	-121 43.49	5642.2	ca	979828.43	980312.30	1.43	-158.56	-1.21	0.00	38.59	-119.75	-136.31
sheaste:dev24	41 36.06	-121 43.35	5661.5	ca	979821.62	980312.20	1.48	-159.11	-1.21	0.00	41.69	-117.15	-133.76
sheaste:dev25	41 36.00	-121 43.16	5708.8	ca	979817.84	980312.12	1.54	-160.44	-1.22	0.00	42.45	-117.67	-134.41
sheaste:dev26	41 35.83	-121 42.95	5788.5	ca	979813.54	980311.86	1.64	-162.68	-1.22	0.00	45.88	-116.37	-133.34
sheaste:dev27	41 35.48	-121 42.81	5904.7	ca	979804.95	980311.34	1.96	-165.94	-1.23	0.00	48.74	-116.47	-133.74
sheaste:dev28	41 35.26	-121 42.65	6008.4	ca	979797.72	980311.01	2.15	-168.86	-1.23	0.00	51.58	-116.35	-133.91
sheaste:dev29	41 35.04	-121 42.69	6122.1	ca	979790.09	980310.68	2.28	-172.05	-1.24	0.00	54.97	-116.03	-133.91
sheaste:dev30	41 34.78	-121 42.78	6268.7	ca	979781.14	980310.29	2.27	-176.17	-1.24	0.00	60.19	-114.95	-133.26
sheaste:dev31	41 34.57	-121 42.74	6387.9	ca	979775.33	980309.98	2.22	-179.52	-1.25	0.00	65.89	-112.65	-131.32
sheaste:dev32	41 34.47	-121 42.48	6397.6	ca	979773.15	980309.83	2.15	-179.79	-1.25	0.00	64.77	-114.12	-132.82