

## Gravity Base Station Network, Oregon

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**Abstract.** Values of observed gravity are given for 32 base stations that were established in Oregon with a LaCoste-Romberg geodetic gravity meter. These stations were tied directly with the international gravity base station at Carnegie Institution, Washington, D. C.; airport stations at Seattle, Washington, and Portland, Oregon; and the Golden Gate Park station, San Francisco, California (see *Woollard and Rose* [1963] for station descriptions). The accuracy of the gravity measurements is estimated to be within  $\pm 0.3$  mgal.

**Introduction.** Regional gravity studies have been conducted by members of the Geophysical Research Group at Oregon State University during the past few years. These studies include (a) measuring gravity at various locations in the state and at sea off the Oregon coast and (b) compiling gravity data obtained from other organizations. The necessity of having an accurate base network for the gravity measurement program was recognized by *Rinehart et al.* [1964], who used a small airplane to establish gravity base stations in Oregon. *Woollard and Rose* [1963] established ten gravity stations in Oregon as part of the international gravity network. The data given in this paper augments and corrects values of gravity given by *Rinehart et al.* and *Woollard and Rose*. The general locations of the gravity base stations in Oregon are shown in Figure 1. In some instances, more than one station is within the proximity of any given point on the map.

**Instrumentation and procedure.** Gravity for this research was measured by a LaCoste-Romberg geodetic gravity meter (meter G-2) made available by the U. S. Naval Oceanographic Office. This meter was recalibrated on the European calibration line in 1963. For the values of gravity encountered in this work, the calibration factor ranged from 1.2973 to 1.2981 mgal per dial division.

The gravity base stations at the Physics-Chemistry Building, Oregon State University, Corvallis, Oregon, and Portland International Airport, Portland, Oregon, were tied twice directly with the gravity base station at the Carnegie Institution of Washington, D. C. The

gravity meter was transported by airplane between Portland International Airport and Friendship International Airport, Maryland, and read in Washington, D. C., by members of the U. S. Naval Oceanographic Office.

The gravity meter was transported by automobile when gravity measurements were made relative to Corvallis, Oregon. Two observers accompanied the instrument at all times. The instrument was set up and read by the first observer and checked by the second. It was clamped and allowed to sit for five minutes. Then, the second observer unclamped the instrument and read it. The first observer checked the last reading. This procedure was repeated until consistent readings were obtained. Thus, the stability and reading of the meter were checked at each station.

The average instrument drift for this work was less than that shown in Figure 2. However, these data show salient features of the instrument drift, such as a large deviation from a linear drift (see Seattle stations, Figure 2) and the method that was used to correct for the drift. For example, stations at Corvallis, Salem, Portland, and Seattle were occupied at the times given in Figure 2. Correction for drift was made by taking the station reoccupied closest to the midtime of the traverse and assuming linear drift between the times of occupation. The drift for each station that was occupied twice at greater time intervals was proportionally distributed about the drift of the midstation. This process was continued until the drift of the original base was removed.

It was noted at two stations that orientation

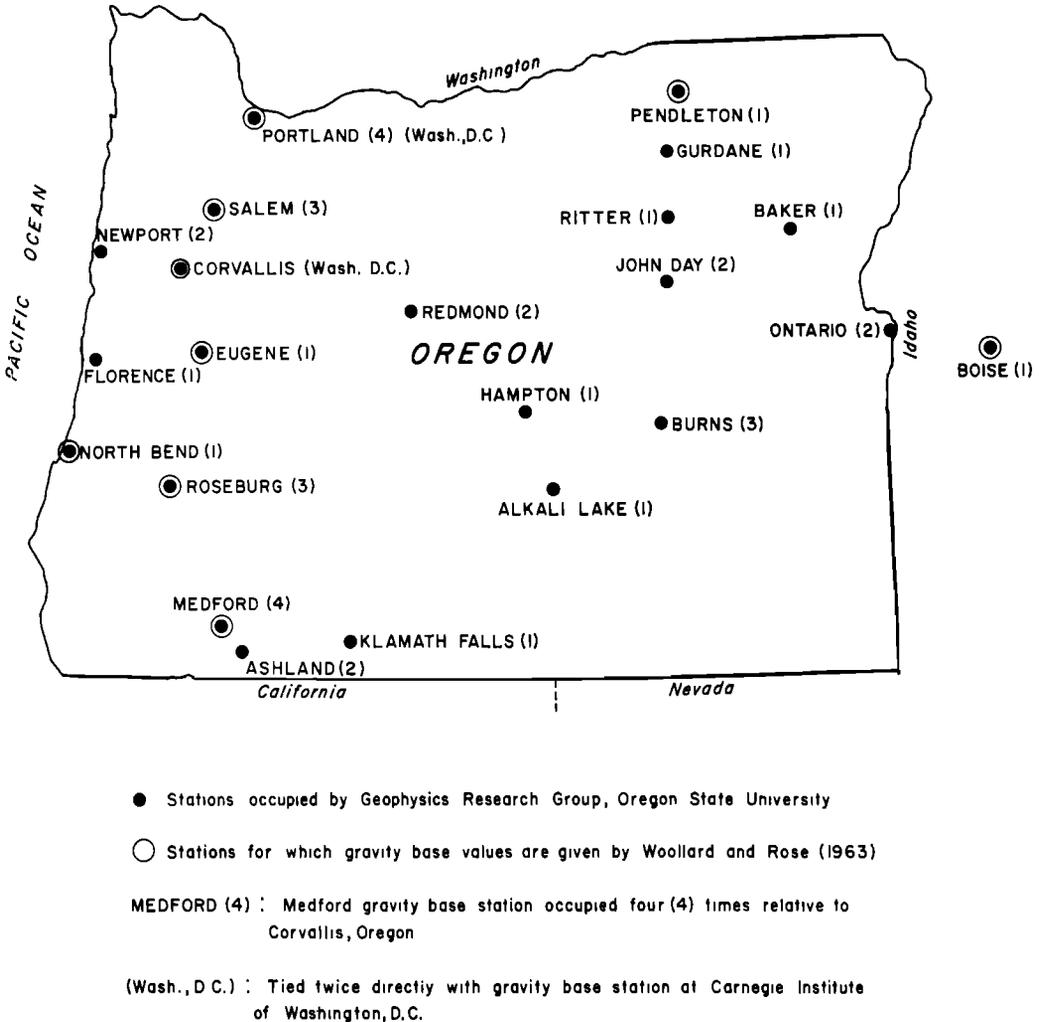


Fig. 1. Map of Oregon showing locations of gravity base stations.

of the instrument affected the readings by 0.05 and 0.08 mgal (see Salem station, Figure 2). This was probably caused by a magnetic force field.<sup>1</sup> After this effect was observed, the instrument orientation was kept constant for all stations.

*Discussion.* The data presented in Tables 1, 2, and 3 are corrected for instrument drift and tides. The maximum deviation from the mean

<sup>1</sup>This effect has been noted by G. P. Woollard and J. C. Rose (personal communications) for other instruments, and it can be removed by demagnetization by the manufacturer.

reading at each station is shown for stations that were occupied two or more times. When all deviations (including maximums) were considered, the average was found to be 0.04 mgal, and the standard deviation was 0.03 mgal.

Gravity values for base stations in Oregon published by Rinehart et al. differ from data presented in this paper by as much as 1.4 mgal. Comparison of the two sets of data showed that the calibration factor for the instrument they used varied so that the difference between the two sets of data is about 3.5 mgal/1000 mgal.

Published gravity base values [Woollard and

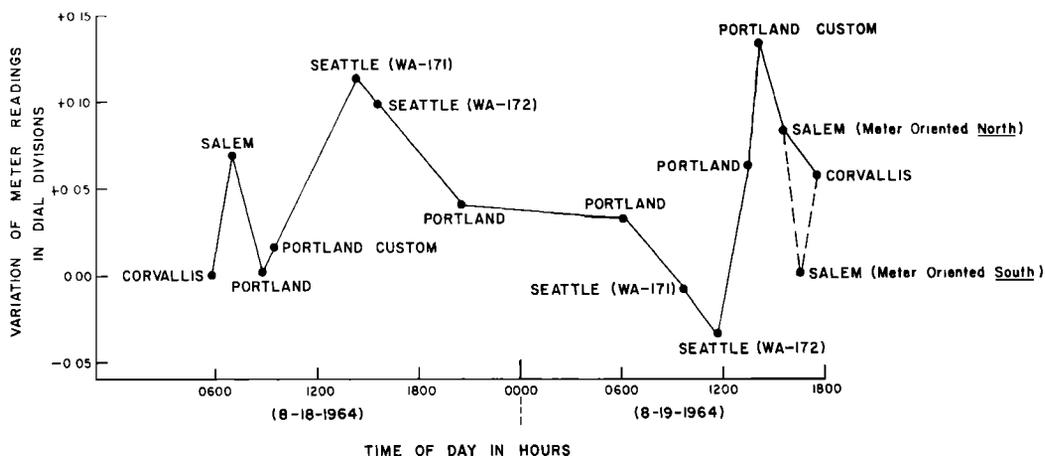


Fig. 2. Sample curve showing greater than average instrument drift.

Rose, 1963] for Corvallis, Medford, North Bend, and Roseburg, Oregon, differ from the values presented in Table 2 by 1.2 to 1.5 mgal. However, one re-evaluation of their data decreases this difference to 0.2 to 0.3 mgal, which is the range of agreement between data in Table 2 and their base values at Eugene, Pendleton, Portland (Custom House), and Salem, Oregon. The gravity base values given in this paper agree with values given by Woollard and Rose within: (a) 0.1 mgal for base values at Seattle, Washington; Portland, Oregon; and Boise, Idaho; (b) 0.2 mgal for the base values at Redding and San Francisco (Golden Gate Park), California; and (c) 0.5 mgal for the base at Chico, California.

Comparisons of gravity base values given in Tables 2 and 3 with values at San Francisco, California, and some Oregon bases given by J. C. Harrison and C. E. Corbato (personal communication) and Rodger Chapman (personal communication) agreed within 0.1 and 0.2 mgal.

The data presented in this paper are believed to be accurate to about 0.1 mgal. However, the aforementioned comparisons showed variations of about 0.3 mgal in many cases. Hence, this would seem to impose on the data an outside limit of accuracy of about 0.3 mgal. The data for this work are tide corrected, and comparisons are affected up to a few tenths of a milligal if the other data are not tide corrected.

TABLE 1. Values of Gravity and Station Descriptions for Corvallis and Portland, Oregon, Relative to Base at Carnegie Institution of Washington, D. C. (980100.6 mgal)

Station	Observed Gravity,* mgal	Maximum Deviation, mgal	Latitude (N) Longitude (W)	Elevation, ft	Description
Corvallis, OSU-PC	980573.14†	±0.02	44°34.1' 123°16.5'		At the base of steps to the east of the Physics-Chemistry Building and to the south of the loading platform.
Portland Airport	980648.26†	±0.01	45°35.0' 122°36.0'	23.0	WA-142‡

\* Corrected for instrument drift and tides.

† Station occupied two times.

‡ Woollard and Rose [1963].

TABLE 2. Values of Gravity and Station Descriptions for Gravity Bases in Oregon Relative to Base at Physics-Chemistry Building, Corvallis, Oregon

Station	Observed Gravity,* mgal	Maximum Deviation	Latitude (N) Longitude (W)	Elevation, ft	Description
Alkali Lake Airport	980048.01 (1)†		43°05.3' 119°57.5'		N edge of landing strip, in line with center line of road leading to landing strip from HWY 395.
Ashland	980162.42 (2)	±0.02	42°11.7' 122°41.8'	1877.0	0.5 mi. N of HWY 66, SE corner of junction of RR and N. Mt. Ave., same elevation as RR tracks at crossing.
Baker Airport	980287.46 (1)		44°50.5' 117°48.4'	3368.0	Ground level and against first step of Federal Aviation Agency facility, NW corner of building.
Baker	980264.85 (1)		44°46.8' 117°50.7'	3408.4	N of Baker, 0.3 mi. S of drive-in theater, N of Oregon Forest Service building, 10 ft. S of center line of gravel road and 75 ft. E of center line of U. S. 30; same elevation as BM (nail on power pole).
Burns Airport	980107.19 (3)	±0.08	43°35.5' 118°57.3'	4141.0	Base of S corner of doorway to West Coast Airlines terminal, W wall of building, against outside wall.
Corvallis Airport	980568.81 (1)		44°30.0' 123°17.0'	245.0	WA-255†
Corvallis, OSU-PC	980573.14		44°34.1' 123°16.5'		Base of steps E of Physics-Chemistry Building and S of loading platform.
Corvallis, OSU-Oc	980572.36 (2)	±0.02	44°34.1' 123°16.7'		6 ft. E of center line of main doors of Oceanography Building, against wall and outside.
Corvallis, OSU-KL	980573.89 (2)	±0.01	44°34.0' 123°16.5'		On E side of Kerr Library, under fire escape ladder against corner of building, N of loading platform.
Corvallis, OSU-SG	980576.64 (2)	±0.06	44°34.0' 123°16.5'		Centerline of sidewalk under S pedestrian entrance gateway to Oregon State University at SW corner of 11th St. and Campus Way.
Eugene Airport	980514.51 (1)		44°07.2' 123°13.2'	365	WA-140†
Eugene Pendulum Station	980489.90 (1)		44°02.7' 123°05.6'	422	U 232§
Florence Airport	980549.30 (1)		43°58.7' 124°06.5'	51.0	Center line of doors and under W entrance to hangar.
Gurdane	980343.14 (1)		44°20.50' 119°00.40'	3265.0	Along HWY 395 at junction of road leading W to Gurdane, 17 mi. SW from Pilot Rock, NW corner of junction, 10 ft. SE of BM (P-32).
Hampton Airport	980096.38 (1)		43°40.5' 120°14.2'	4416.0	Base of SW corner of service station, outside and against wall.
Klamath Falls	979993.47 (1)		42°13.9' 121°47.7'		At Klamath Falls near intersection of E Main St. and Owen Ave., about 150 ft. S of intersection, 6 ft. E of curb, 3 ft. N of telephone pole, at centerline of sidewalk, in front of Mills Grade School.
Klamatha Falls OTI	979984.47 (1)		42°15.3' 121°47.1'		At SW base of columns at SW corner of classroom building at Oregon Technical Institute, opposite corner of cement walk around building, center of radius of curvature of depression in the column.
John Day	980242.91 (2)	±0.09	44°25.0' 118°57.35'	3081.6	Directly on BM T-194 on SW corner of bridge over Canyon Cr., along U. S. HWY 26.

TABLE 2. (Continued)

Station	Observed Gravity,* mgal	Maximum Deviation	Latitude (N) Longitude (W)	Elevation, ft	Description
Medford Airport	980236.21 (4)	±0.05	42°22.2' 122°52.2'	1330.0	WA-141†
Newport Airport	980596.51 (2)	±0.01	44°35.1' 124°03.6'		Centerline of doors and under E entrance to hangar.
Newport Coast Guard Station	980609.95 (2)	±0.03	44°37.6' 124°03.3'		Directly under overhead light at W end of paint locker.
Newport Marine Science Building	980610.24 (2)	±0.08	44°37.2' 124°02.8'	17.0	Center of electronics laboratory, Room 30A over chiseled X in floor.
North Bend Airport	980492.08 (1)		43°24.0' 124°15.4'	4.0	WA-256†
Ontario Airport	980304.13 (2)	±0.07	44°01.4' 117°00.39'	2189.0	Ground level against first step of westernmost entrance on N side of West Coast Airlines building.
Pendleton Airport	980511.18 (1)		45°41.5' 118°50.4'	1493.0	WA-55†
Pendleton Airport	980511.04 (1)		45°41.5' 118°50.4'	1493.0	E side, S end of building, 4 ft. E of center of baggage claim door, outside and at corner of building.
Portland Airport	980648.24 (4)	±0.08	45°35.0' 122°36.0'	23.0	WA-142†
Portland Custom House	980647.23 (2)	±0.04	45°31.4' 122°40.7'	21.0	U 229§
Redmond Airport	980261.65 (2)	±0.01	44°15.3' 121°09.1'	3077.0	5 ft. SE of center of main doorway SW side of terminal building, against outside wall.
Ritter	980256.45 (1)		44°50.18' 119°03.85'	4003.0	Along HWY 395 9 mi. N from Long Creek at junction of county road leading W to Ritter, E of triangulation station 'TAR,' W edge of blacktop of road.
Roseburg Airport	980427.87 (3)	±0.07	43°13.6' 123°22.0'	500.0	WA-257†
Salem Airport	980583.29 (3)	±0.01	44°54.7' 123°00.0'	207.0	WA-56†

\* Corrected for instrument drift and tides.

† Station occupied one time.

‡ *Woollard and Rose* [1963].§ *Behrendt and Woollard* [1961].

TABLE 3. Values of Gravity and Station Descriptions for Gravity Bases in California, Idaho, and Washington Relative to Base at Physics-Chemistry Building, Corvallis, Oregon

Station	Observed Gravity,* mgal	Maximum Deviation	Latitude (N) Longitude (W)	Elevation, ft	Description
San Francisco, Calif. (Golden Gate Park)	979986.51 (2)†	±0.01	37°46.2' 122°27.9'	242.3	GW-54‡
Redding Airport, Calif.	980129.08 (2)	±0.02	40°30.5' 122°17.5'	500	WA-208‡
Chico Airport, Calif.	980131.07 (3)	±0.11	39°47.0' 121°52.0'	237	WA-201‡
Boise, Idaho	980208.26 (1)		43°34.0' 116°13.4'	2858 0	WA-21‡
Seattle-Tacoma Airport, Wash.	980776.44 (2)	±0.00	47°26.5' 122°18.0'	416	WA-171‡
Seattle-Tacoma Airport, Wash.	980776.44 (2)	±0.00	47°26.5' 122°18.0'	416	WA-172‡

\* Corrected for instrument drift and tides.

† Station occupied two times.

‡ Woollard and Rose [1963].

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