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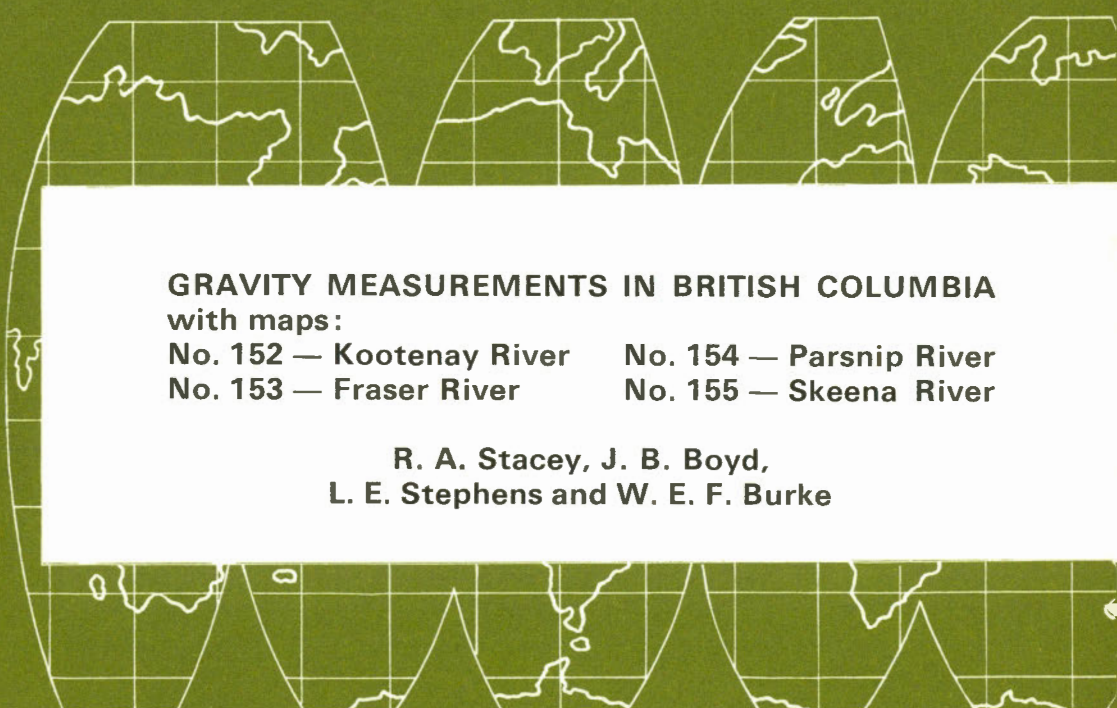

GRAVITY MEASUREMENTS IN BRITISH COLUMBIA
with maps:

No. 152 — Kootenay River
No. 153 — Fraser River
No. 154 — Parsnip River
No. 155 — Skeena River

R. A. Stacey, J. B. Boyd,
L. E. Stephens and W. E. F. Burke

DEPARTMENT OF ENERGY, MINES AND RESOURCES
OTTAWA, CANADA 1973

GRAVITY MAP SERIES

of the

EARTH PHYSICS BRANCH

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CONTENTS

GRAVITY MEASUREMENTS IN BRITISH COLUMBIA

R. A. Stacey, J. B. Boyd,
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ABSTRACT - Gravity maps 152, 153, 154 and 155 correspond to the 1:1,000,000 scale N.T.S. mapsheets 82, 92, 93 and 103 and cover southwestern Alberta, southern British Columbia, the continental shelf off British Columbia and part of the adjacent Pacific Ocean. The Bouguer anomalies have been contoured at 10 mgal intervals and are based on gravity measurements every 12 to 15 kilometres on land and over the continental shelf, and ship-board gravity meter measurements over the Pacific Ocean. The terrain corrections have been computed using either a rectangular or a circular graticule, or a combination of both, depending on the scale of the available topographic maps.

The major change in the Bouguer anomaly field is from positive values over the Pacific Ocean to negative values over the mountains of British Columbia - the actual change in the Bouguer anomalies being approximately -100 mgal per kilometre increase in the elevation. Over 90 per cent of this observed relationship between the Bouguer values and the elevation of a region can be accounted for by assuming some form of isostatic compensation for the topography. In areas of subdued relief, such as the plains of Alberta, the interior plateau and the continental shelf of British Columbia, the changes in the Bouguer anomalies can be related to density variations in the surface rocks.

RÉSUMÉ - Les cartes gravimétriques 152, 153, 154 et 155 correspondent aux coupures 82, 92, 93 et 103 du S.N.R.C., au 1:1,000,000, et couvrent le sud-ouest de l'Alberta, le sud de la Colombie-Britannique, le plateau continental au large de la Colombie-Britannique et une partie adjacente de l'océan Pacifique. Les anomalies de Bouguer sont représentées par des courbes de niveau à intervalle de 10 mgal, basées sur des mesures de la gravité levées tous les 12 à 15 kilomètres sur terre et le plateau continental, et sur des mesures au gravimètre prises à bord de navires sur l'océan Pacifique. Les corrections sur le terrain ont fait l'objet de calculs à l'aide d'un graticule rectangulaire ou circulaire, ou d'une combinaison des deux, selon l'échelle des cartes topographiques disponibles.

Le changement majeur dans le domaine des anomalies de Bouguer consiste en un passage des valeurs positives dans le Pacifique aux valeurs négatives dans les montagnes de la Colombie-Britannique - le changement réel dans les anomalies de Bouguer étant d'environ -100 mgal par kilomètre d'altitude. On peut expliquer plus de 90 p. 100 des relations observées entre les valeurs de Bouguer et l'altitude d'une région par une certaine forme de compensation isostatique de la topographie. Dans les régions au relief réduit comme les plaines de l'Alberta, le plateau intérieur et le plateau continental de la Colombie-Britannique, les changements dans les anomalies de Bouguer peuvent être reliés aux variations de densité dans les roches de surface.

INTRODUCTION

The Gravity Maps Nos. 152, 153, 154 and 155 accompanying this report show the Bouguer anomaly field over southern British Columbia and southwestern Alberta (Figure 1). All the observations (approximately 4,200) have been made by personnel of the Gravity Division of the Earth Physics Branch, Department of Energy, Mines and Resources, except for southern Vancouver Island (Walcott, 1967), the southern part of the Coast Mountains where the measurements were made by members of a topographic survey party from the Mapping and Charting Establishment of the Department of National Defence under the supervision of Gravity Division personnel, and the area of ship-board gravity meter measurements over the Pacific Ocean which was covered as part of the C.S.S. Hudson's circumnavigation of the Americas during 1970.

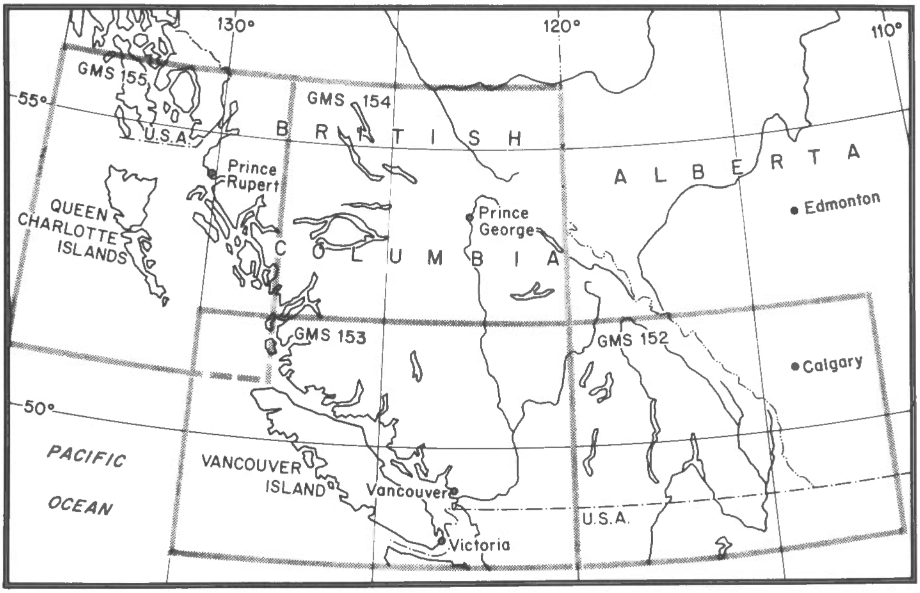

Figure 1. Location of Gravity Maps 152 to 155.

Gravity data for the adjacent areas of central and southern Alberta have been published in earlier Gravity Map Series by Buck (1967) and for northern Alberta by Walcott and Boyd (1971). The regional gravity survey of the coastal area and detailed surveys of the Strait of Georgia and Juan de Fuca Strait between Vancouver Island and the mainland have also been published previously (Stacey, Stephens, Cooper and Brule, 1969; Stacey and Steele, 1970), but are incorporated in the present maps to illustrate the relationship between these areas and the interior of British Columbia. Dehlinger, Couch, McManus and Gemperle (1970) have published a free air anomaly map of the northeast Pacific Ocean off British Columbia based on ship-board gravity meter measurements along northeast-southwest tracks 30 km apart and extending 300 km off-shore. The data of Dehlinger *et al.* have not been included in this present series of maps.

Subsequent sections of this report outline the fieldwork, the reduction of the instrument readings to Bouguer anomalies, and the special problems of calculating terrain corrections. This is followed by a brief description of the geology and of the interpretation of the gravity field.

FIELDWORK

The personnel and the instruments they used each year, the areas covered and the nature of the various surveys are summarized in Table I.

Base Station Network

The gravity value at each control station is based on a value of 980.6220 gals for the National Reference Pier in Ottawa. Calgary, Edmonton and Fort St. John along the eastern margin of the survey area are part of the North American Calibration Line and these, together with Vancouver, are part of the World Gravity Network. All these stations, plus Prince George and Prince Rupert, are part of the National Base Network. The descriptions for an additional 200 base stations, listed by 1:1,000,000 mapsheets, can be obtained on request from the Gravity Division, Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa, Ontario, K1A OE4, Canada.

LaCoste and Romberg gravity meters were used for all the main ties except in southern Vancouver Island where a Worden gravity meter was used by Walcott (1967). The underwater gravity meter surveys are tied to the land network at Victoria, Kitimat and Prince Rupert, and the surface meter surveys are tied to Victoria.

The Gravity Measurements

The field methods and transportation used in the course of the survey of southern British Columbia in 1954, the coastal region, and the detailed surveys of the straits between Vancouver Island and the mainland and the gravity measurements made aboard C.S.S. Hudson have been described elsewhere (Garland and Tanner, 1957; Stacey *et al.*, 1969; Stacey and Steele, 1970; Srivastava, 1971), so only the work in the interior of British Columbia will be described in this report. Up to and including 1966 most of the gravity measurements were made along roads at 5-8 km intervals using either station wagons or four wheel drive vehicles. In 1966 a Canadian National Railways track inspectors railcar was used along the Rocky Mountain Trench between Red Pass Junction (70 km west of Jasper) and Prince George, and again through the Coast Mountains between Smithers and Prince Rupert. In 1967 a similar railcar belonging to the Pacific Great Eastern Railway Co. (now the British Columbia Railway Co.) was used for a traverse through the southern part of the Coast Mountains between Squamish and Lillooet. In 1966 boats were used for traverses along Babine, Stuart, Trembleur, Quesnel and Horsefly Lakes.

The first air supported regional survey work in the interior (station interval 10-15 km) was carried out during the latter part of the 1966 season in the northern part of the area using a Hiller 12E and Bell 47G3B1 helicopter. In 1968 a Bell 47G3B1 was chartered for the season to enable the observers to reach mountain top stations in southern British Columbia and in 1970, the Military Charting Establishment party working in the Coast Mountains north of Vancouver used two Jet Rangers. In 1971 a turbine powered Alouette II was used in the course of the small survey in the vicinity of Quesnel to gain experience with this type of machine and, as the tests proved satisfactory, this type of machine was chartered for the 1972 survey.

Ties between the main control stations in the area have been made by utilizing scheduled airline connections, while long range ties between these and other control stations have been made using chartered aircraft such as the Cessna Crane and Skymaster and the Piper Apache. Shorter range

Table I

Summary of Fieldwork by Earth Physics Branch Personnel (1954-72)

Year	Area	Period	Personnel	Transport	Inst.	Control Stns	Detail Stns
1954	Southern British Columbia	July 1-Aug.31	G.D. Garland J.G. Tanner	Car	N137	38	474
1960	S. Vancouver Island	Dec. 9-16	A.K. Goodacre	Car	W546	35	47
1963	Qu. Charlotte Is., Vancouver Island mainland	Aug. 6-Sept.2	J.G. Tanner J.B. Boyd	Float Plane car	G9 W35	26	193
1966 (land)	Qu. Charlotte Is., northern mainland	May 21-Aug.23	R.A. Stacey P. Fernandez-Davila J. Buchan T. Dean	Float Plane Stn Wagon Jeep Railcar Boat	G9 W431	65	1370
(under-water)	Dixon Entrance, mainland fiords, Qu. Charlotte Str., Str. Georgia	Aug. 30-Sept.22	B.G. Brule R.A. Stacey L.E. Stephens	C.N.A.V. "Laymore"	G25A H2G	-	234
1967 (land)	Qu. Charlotte Is., northern mainland Vancouver Island	July 28-Sept.14	R.A. Stacey P. Fernandez-Davila	Stn wagon Truck Railcar Helicopter Float Plane	G75 W546	15	393
(under-water)	Hecate Strait, Qu. Charlotte Snd., West of Vancouver Is.	Aug. 16-Sept. 11	R.V. Cooper L.E. Stephens J. Panar	C.N.A.V. "Laymore"	G25A H2G	-	316
1968 (land)	South-central British Columbia	May 20-Sept.7	J.B. Boyd L.E. Stephens J. Jensen	Car Truck Helicopter Aeroplane	G75 W573	41	515
(sea)	Str. of Georgia Juan de Fuca Str.	Sept. 4-30*	R.A. Stacey R.V. Cooper A.K. Goodacre	C.S.S. "Parizeau"	S35 H2G G25A	-	2400 (line-km)
1970	Southern Coast Mountains	May 23-Aug.20	J.B. Boyd & M.C.E. topo. survey party	Helicopter (2)	G7 G74	6	379
1971	Quesnel, central British Columbia	July 21-Aug.1	J.B. Boyd R.V. Cooper J. McCance	Stn wagon Helicopter	G172 W546	4	167
1972	Central British Columbia	June 1-Aug.14	W.E.F. Burke J.A. Grant M.J. Austin	Stn wagon Truck Helicopter	G7 G9 G278 W807	23	1459

*Only 5.5 days were spent in the Straits, the remainder being S.W. of Van. Is.

ties have been made by car and helicopter, whichever was more convenient. Detail station traverses begin and end at control stations, usually with less than five hours between the control station readings.

Horizontal Control

The problems of horizontal control in the coastal region have been discussed elsewhere (Stacey *et al.*, 1969; Stacey and Steele, 1970; Srivastava, 1971) only that relevant to the positioning of the gravity observations in the interior is covered in this report. Prior to 1968 the position of each gravity station was scaled from the best available topographic map - usually at a scale of 1:50,000 along the main highways and 1:250,000 elsewhere. From 1968 onwards the majority of the gravity observations were made at points with known horizontal co-ordinates that had been established by topographic surveyors (see below). The accuracy with which the points can be scaled is ±25 m from 1:50,000 maps and ±100 m from 1:250,000 maps and for the pre-determined points used since 1968 the estimated accuracy is ±3 m.

Vertical Control

First order vertical control points (geodetic benchmarks) have been used whenever possible, but these points are generally restricted to the main highways and the railroads. Lower order control established in the course of precise horizontal triangulation work has been used where available, in this case they are limited to east-west strips along the International Boundary, the Trans-Canada Highway, a line across the province passing through Williams Lake, and along the northern trans-provincial highway between Prince George and Prince Rupert. Another line runs north-south through the interior of the province along the Cariboo and Hart Highways.

In 1967 the problem of vertical control between these lines was discussed with the Surveys and Mapping Branch of the Department of Energy, Mines and Resources and they undertook to provide, in the course of their normal survey work, a grid of points at 10-15 km intervals with an elevation accurate to ±3 m. These points were to be as far as possible from abrupt changes in the topography in order to minimize the terrain corrections in the reduction of the gravity measurements. To build up this grid of points the topographic surveyors constructed a network of lines 30-40 km apart with stations every 10-15 km along each line and side shots to positions a similar distance on either side of the mainline stations. The elevation of each station relative to those adjacent to it was established by simultaneous vertical angle measurements between each pair of points and distances were determined by electronic methods. This network was then tied whenever possible to geodetic benchmarks to obtain the actual elevation of all the points. The errors in the vertical and horizontal co-ordinates of the points established in this way are believed to be less than 1 m and 3 m respectively. In this manner, Surveys and Mapping Branch field parties completed south-central and southeastern British Columbia during 1967 and 1968; parties from the Mapping and Charting Establishment of the Department of National Defence, working to the same specifications, covered the Coast Mountains south of Bella Coola and the area southwest of Williams Lake during 1968 and 1970 and the Surveys and Mapping Branch of the British Columbia Department of Lands, Forests and Water Resources covered the northern part of the Coast Mountains between Smithers and Prince Rupert in 1968.

For detailed gravity surveys (station spacing less than 10-15 km) Wallace and Tiernan barometric altimeters have been used in pairs. Whenever possible the altimeter traverses have been less than one hour in duration and within a vertical envelope of 300 m, wet and dry bulb temperatures have been noted at each station. Errors under these circumstances and with good weather conditions are less than ±5 m, but it has been shown by reading the altimeters at known elevations in the course of the regional survey work in the mountains, without regard to the above conditions, that the errors can increase to ±50 m.

REDUCTION OF THE OBSERVATIONS

Land and Underwater Gravity Meter Measurements

The gravity value at each observation point has been corrected to sea level assuming the normal free air vertical gradient of gravity (-0.3086 mgal/m). The difference between the resulting value and the theoretical value of gravity for the latitude of the observation (based on the International Gravity Formula of 1930) is the free air anomaly. For the Bouguer anomaly a further correction has been made for the attraction of an infinite horizontal slab of rock, density 2.67 g/cm^3, between the observation point and sea level. The terrain correction necessary for the complete Bouguer anomaly reduction is discussed later in this section.

The observed gravity value at the station on the sea floor has first been corrected to sea level using the normal free air vertical gradient of -0.3086 mgal/m and then the attraction of the layer of seawater above the instrument has been removed assuming it to be in the form of an infinite horizontal slab with a density of 1.03 g/cm^3. The gravity value as it would be observed at sea level is then obtained by replacing the infinite horizontal slab of seawater below the surface equivalent of the underwater station. The difference between this value and the theoretical value of gravity at the latitude of the observation is the free air anomaly. For the Bouguer anomaly a further correction has been made for the mass deficiency of the seawater, density 1.03 g/cm^3, with respect to rock of standard density 2.67 g/cm^3. Terrain corrections to the underwater measurement have been made to those observations taken in the fiords of the mainland.

A detailed description of the procedures used to reduce the land and underwater gravity observations to free air and Bouguer anomalies has been given by Tanner and Buck (1964).

Ship-board Gravity Meter Measurements

The analogue record from the LaCoste and Romberg air/sea gravity meter corresponding to the gravity variations was digitized at five-minute intervals whenever the cross-coupling correction was less than 15 mgal and the record showing the position of the beam in the gravity meter was steady. The instrument readings were converted to their milligal equivalent using the tables provided by the manufacturer, and the actual values of the earth's gravity field corresponding to these converted readings have been computed relative to the control station at Esquimalt. The time for each gravity value has been corrected by -1.5 or -3.0 minutes, depending whether the reading had been averaged over a period of three or six minutes, and then related to a position on the straight line approximation to the ship's track. The ship's mean speed and heading over the period of the straight line segment of the track containing the time of the reading, plus the latitude at the time of the reading, are used to compute the Eötvös correction.

The free air anomaly is the difference between the observed gravity value corrected for the Eötvös effect, and the theoretical gravity value at the latitude of the observation derived from the International Gravity Formula of 1930. For the Bouguer correction the water below the ship is replaced by rock in the form of an infinite horizontal slab with a thickness equal to the depth of water and density 1.64 g/cm^3 - the difference between the standard density of 2.67 g/cm^3 for the Earth's crust and that of seawater, 1.03 g/cm^3.

Terrain Corrections

Three methods have been used to compute the terrain effects, the particular method used depending on the scale of the topographic maps available in the vicinity of each observation point. (For a review of the methods used and the accuracy to be expected under different conditions, see Stacey and Stephens, 1970).

(a) *Prism method* (Nagy, 1966). The topography in the vicinity of the station is divided into vertical rectangular prisms, the height of each prism being the difference between the elevation of the observation point and the elevation at the centre of the prism. The grid is based on the Universal Transverse Mercator (UTM) system and an area 50 by 50 km centred approximately on the station is divided into prisms 1 by 1 km. In the immediate vicinity of the station, an area 3 by 3 km is subdivided on a grid 200 by 200 m to give a better representation of the topography close to the reading point. This method has been used for stations on the Queen Charlotte Islands and at the northern end of Vancouver Island.

(b) *Cylinder method* (Bible, 1962). The topography in the vicinity of the station is divided into segments of vertical cylinders, the height of each segment being the difference between the elevation of the observation point and the mean elevation of the terrain within the segment. Bible has prepared tables giving the effect of segments of standard size and various heights within 22 km (zone M) of the observation point. By changing the density of each segment depending whether it is water filled, all rock, or a combination of both, the tables have been used to compute the terrain corrections for the underwater stations along the fiords of the mainland. Where all the compartments are rock filled (i.e. have positive elevations), a computer program has been used instead of the tables to calculate the correction.

(c) *Combination of cylinder and prism models*. Mean elevations for areas 2.5' latitude and 5.0' longitude have been prepared for most of British Columbia and these data provide the basis for calculating regional terrain corrections. The topography in the immediate vicinity of each station is divided into segments of a vertical cylinder using Bible's graticule to zone K (outer radius 10 km). This approach, which is generally used at present, is sufficiently flexible to take advantage of any scale map to represent the topography close to the station without repeated digitization of the more distant areas when the station spacing is greater than 10 km. For more detailed gravity surveys it is sometimes advantageous to use a more specialized model to avoid too much repeated digitization of the topography around each observation point.

Principal Facts

The estimated errors in the Bouguer anomalies before the addition of the terrain corrections is ±1 mgal where the elevation and the horizontal co-ordinates of the observation point are the result of the topographic survey work since 1967, otherwise the estimated error is ±2 mgal. The accuracy of the terrain corrections is dependent on the accuracy of the available topographic maps and the ruggedness of the terrain, so is best expressed as a percentage of the computed value of the correction. For 1:50,000 maps with a contour interval of 100 feet the error is less than 10 per cent of the computer value, and for 1:250,000 maps with a contour interval of 500 feet, the error is less than 20 per cent (Stacey and Stephens, 1970).

Principal facts listings (giving the station numbers, their latitude and longitude, elevation or depth, the free air and Bouguer anomalies and the terrain correction) can be obtained on request from the Gravity Division, Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa, Ontario, K1A OE4, Canada. Computer plots of the Bouguer anomaly values can also be obtained at any scale and projection at the above address. Copies of the Bouguer anomaly maps accompanying this report are available at cost as clear plastic overlays for the 1:1,000,000 geological maps.

INTERPRETATION OF THE BOUGUER ANOMALY FIELD

General Description

The Bouguer values over the Interior Plains (Figure 2) decrease from -80 mgal near the eastern margin of Map 152 to between -140 and -160 mgal over the Rocky Mountains. Gradients in this region are generally less than 1 mgal/km. Between the Rocky Mountain Trench and the Coast Mountains the mean value is about -100 mgal over the northern part of the Interior Plateau, decreasing southwards to about -140 mgal with a minimum of -200 mgal over the northern part of the Purcell Mountains and the adjacent part of the Rocky Mountain Trench. Throughout this region gradients are much steeper than over the Plains, generally being greater than 2 mgal/km. Farther west, the minimum Bouguer value over the Coast Mountains is -190 mgal, the mean value is between -140 and -160 mgal, and there is a well defined gradient perpendicular to the coast of the mainland with Bouguer values increasing from -160 mgal over the axis of the Coast Mountains to near 0 mgal along the coastline. The mean Bouguer value over Vancouver Island is about 10 mgal and gradients are similar to those in the interior of the Cordillera. In the western part of Map 155 the Bouguer values rise to +70 mgal over the Queen Charlotte Islands, and to over +200 mgal over the Pacific Ocean.

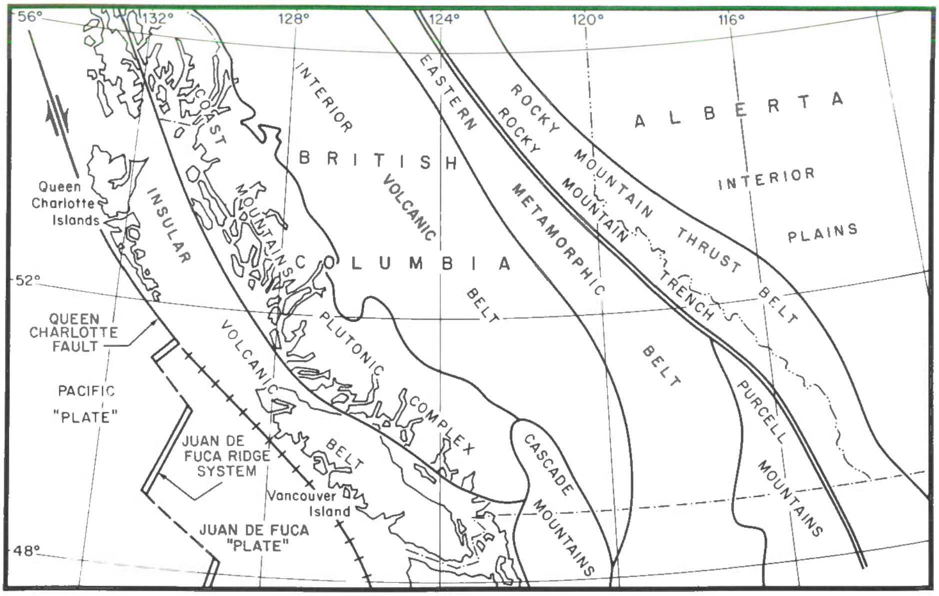

Figure 2. Physiographic and geological divisions of the Canadian Cordillera and the adjacent Pacific Ocean.

Relationship to Elevation

From the foregoing description it is apparent that the Bouguer values are most negative over the highest mountain ranges, approximately zero at sea level and become increasingly positive towards the Pacific Ocean. For the region between 112°W and 132°W* and from 49°N and 51°N the mean Bouguer anomaly ($\overline{BA}$) has been plotted against the mean elevation ($\overline{ELEV}$) for areas 30' latitude by 1° longitude (Figure 3) and a high degree of correlation is apparent.

$$\overline{BA} = 6.22 \times \overline{ELEV}^2 - 98.02 \times \overline{ELEV} - 8.30$$

$$\sigma = 22.2 \text{ mgal}$$

$$r = 0.96$$

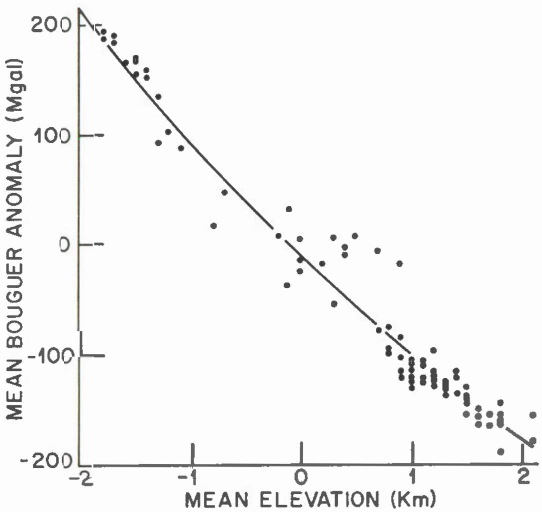

Figure 3. Mean elevation for areas 30' latitude by 1° longitude versus mean Bouguer values for the same areas.

This relationship can be largely accounted for by assuming some form of isostatic compensation for the topography (Stacey, 1973). It should be noted that this relationship is only valid for regional changes in elevation. For instance, the terrain corrected Bouguer anomalies have been plotted against station elevation for the area between 116°W and 122°W and from 49°N to 51°N (Figure 4) where the valleys are about 30 km wide and 1 km deep, and it is apparent that there is very little correlation between the two variables.

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* Data from Dehlinger *et al.* (1970) were used over the Pacific Ocean west of Vancouver Island.

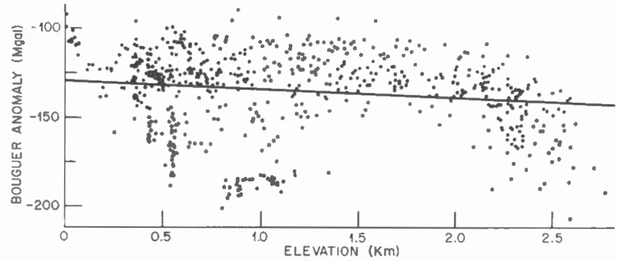

Figure 4. Elevation of gravity stations versus the Bouguer value at the stations for the area 49°N to 51°N from 116°W to 122°W.

Relationship to Surface Geology

In the course of the gravity surveys rock samples were collected, whenever possible, from the vicinity of the observation points for density measurements. The results of these measurements for samples collected from the central part of the southern Cordillera are summarized in Table I. Although the sedimentary rocks range in age from Proterozoic to Cenozoic, the comparatively small number of samples did not justify sub-dividing this category. The metamorphic rocks are mostly granitic gneisses from the Eastern Metamorphic Belt (Figure 2). The large standard deviation from the mean density for the volcanic rocks suggest a wide range of composition but, as it is very difficult to distinguish the various rock types from the hand specimens, this category has not been sub-divided. The low density of the plutonic rocks suggests that the majority of the samples are granitic (see Table II). Geological Survey of Canada personnel mapping the Coast Mountains have measured the density of virtually all the plutonic rocks collected and the results are given in Table III.

Table II

Density of rocks from the central part of the Cordillera

Rocktype	Density (g/cm^3)	No. of samples
Sediment	2.62±0.14	60
Metamorphic	2.67±0.10	103
Volcanic	2.65±0.19	65
Plutonic	2.62±0.10	98

From the density data it is to be expected that the Bouguer values will generally be less over the granitic batholiths and the areas of sedimentary rocks than over the metamorphic and volcanic rocks, and it is apparent in the central part of the Cordillera that the Bouguer values are 20 to 30 mgal less over the granitic rocks than they are over the intervening (generally volcanic) areas. Elsewhere, for instance, over the Coast Mountains and the Purcell Mountains, the deep-seated effects related to the compensation for the topography dominate the anomalies related to the near-surface geology.

Table III

Density of rocks from the Coast Mountains complex (Roddick and Hutchison, personal communication 1968)

Rocktype	Density (g/cm^3)	No. of samples
Granite	2.615	44
Quartz Monzonite	2.648	349
Granodorite	2.699	1023
Quartz Diorite	2.749	1179
Diorite	2.817	378

Because of the variable nature of the density of the volcanic rocks and to some extent, that of the plutonic rocks, systematic density measurements should be made before attempting to interpret the Bouguer anomaly in any given area. For instance, Ager and McMillan (1971) have completed a detailed gravity survey of the Guichon batholith (50°30' 121°W) and the model for the batholith that they produced is based on the results of approximately 1,000 density measurements.

On Vancouver Island local anomalies are often associated with density contrasts within the surface rocks (Stacey and Stephens, 1969), but these local effects are generally distorted by the large regional gradients in the vicinity of the island. West of Vancouver Island, the Shell (Canada) Ltd. drilling program has shown that there are approximately 3 km of Tertiary sediments on the southern part of the continental shelf (Shouldice, 1971), and seismic reflection profiles indicate a similar thickness at the foot of the slope (Hayes and Ewing, 1970). The sediments on the continental shelf correspond to a negative Bouguer anomaly, but any gravitational effect related to the sediment at the foot of the continental slope is obscured by the rapid increase of the Bouguer values perpendicular to the slope.

To summarize, most of the observed Bouguer anomaly is due to the effect of deep-seated masses compensating for the topography. This effect often distorts the relationship between the Bouguer values and the surface geology, but in areas such as the Interior Plateau, where the topography is fairly subdued, it is possible to interpret part of the Bouguer anomaly in terms of the surface geology. Density measurements suggest that lower Bouguer values can be expected over the sedimentary and granitic rocks than over the volcanic and metamorphic rocks.

The standard station interval for the regional gravity survey of Canada is 10-15 km and the minimum anomaly that one can expect to recognize from these measurements is 10 mgal in amplitude and 30 km in wavelength. However, the complexities of the geology in the Cordillera are such that the standard station interval results in a large number of isolations in the contouring and consequently it is often difficult to relate the gravity data to the surface geology, despite significant density contrasts between the various formations in the region. This problem became obvious in 1968 after the completion of the regional survey south of 51°N, so in 1972 an effort was made to reduce the station interval to 5-8 km over a large part of the Interior Plateau. Priority in reducing the station interval was given to the Interior Plateau because the Mesozoic rocks of the area contain a number of important copper and molybdenum deposits and earlier surveys suggested that gravity data were capable of delineating the Mesozoic geology below the cover of glacial debris and Cenozoic volcanics.

Acknowledgments

The gravity survey of British Columbia would not have been possible without the vertical and horizontal control and the detailed topographic maps provided by the Surveys and Mapping Branch of the Department of Energy, Mines and Resources, the Mapping and Charting Establishment of the Department of National Defence, and the Surveys and Mapping Branch of the British Columbia Department of Lands, Forests and Water Resources. Only with the continued assistance of these agencies will we be able to extend the gravity survey into the potentially resource-rich area of northern British Columbia.

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