HOKKAIDO UNIVERSITY

Title	Preliminary report on a Gravimetric Survey on Volcano Hakone, Japan
Author(s)	YOKOYAMA, Izumi; SAITO, Tatsuki
Citation	Journal of the Faculty of Science, Hokkaido University. Series 7, Geophysics, 2(2), 239-245
Issue Date	1965-03-20
Doc URL	http://hdl.handle.net/2115/8665
Type	bulletin (article)
File Information	2(2)_p239-245.pdf

Instructions for use

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

[Journal of the Faculty of Science, Hokkaidô University, Japan, Ser. VII, Vol. II, No. 2, 1964]

Preliminary Report on a Gravimetric Survey on Volcano Hakone, Japan

Izumi YOKOYAMA and Tatsuki SAITO

(Received Nov. 10, 1964)

Volcano Hakone is situated at a distance of about 80 km from Tokyo and has been fairly well studied from the standpoint of geology. As a series of gravimetric studies on the calderas in Japan, the writers carried out the survey on this volcano which has a caldera measuring about 10 km in diameter. Inside of this caldera, there are Lake Asinoko and 6 central cones which were formed by the post-caldera activities.

In this paper, the gravity values and gravity anomalies observed at each station and the distribution of the Bouguer anomalies are reported as preliminary. Detailed discussions on the subterranean structure of the caldera and comparative studies with other calderas will be postponed to the future papers.

The gravimetric surveys on the volcano were carried out twice, in 1961 and 1963. The former survey was made in co-operation with the Geographical Survey Institute by means of a North American Gravimeter. The latter was supplementary and made by means of a LaCoste & Romberg Gravimeter of the Hokkaido University. Reading accuracies of a single observation by these gravimeters are almost the same, about 0.04 mgal. Both surveys were standardized by the gravity value (g=979.7231 gal) at the pendulum station at the Fujiya Hotel, Miyanosita. As for the observation points, many bench marks for precise levels and spot heights were occupied and heights of many points on the new roads, the "Hakone Bypath" and the "Asinoko Skyline", were determined on reference to their construction elevations. In the former survey, heights of the remaining stations were determined by photogrametric method and in the latter, by a precise microbarometer of the American Paulin System, both accuracies being within about 3 meters at worst. The number of the observation points reached 120. Their distribution is shown in Fig. 1.

To obtain the gravity anomalies, the authors take the density of the earth-crust as 2.67 gr./cc and the vertical gradient of gravity as 0.3086 mgal/

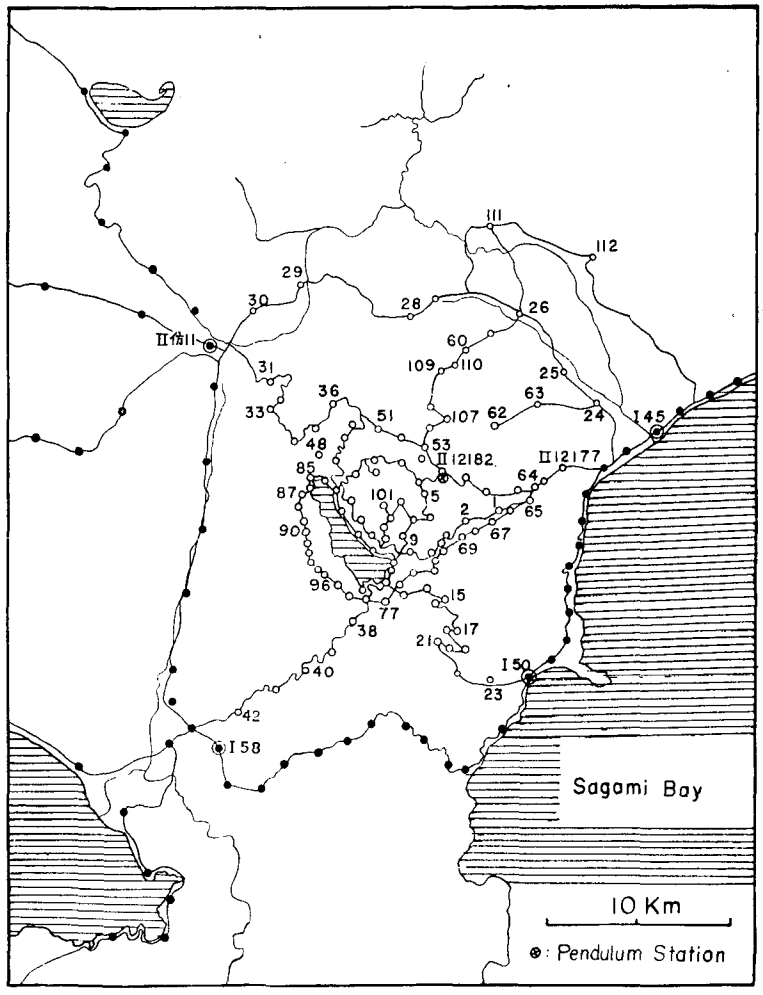

Fig. 1. Distribution of the gravity stations on and around Volcano Hakone. Hollow circles denote the stations of the present survey.

meter and neglect the topographic corrections. The results are tabulated in Table I where "Observed value" is the gravity value at the height given in column under the designation "Height" and the distribution of the Bouguer anomalies is shown in Figs. 2 and 3. At some stations along the "Asinoko Skyline" which runs the caldera rim at the west of Lake Asinoko, on the central cones, and at the eastern caldera rim, topographical effects on the gravity values

Table I. Observed values and the anomalies.

Station	φ 35°N	λ 139°E	Height (*m*)	Normal value (*mgal*) 979,	Observed value (*mgal*) 979,	Free-air anomaly (*mgal*)	Bouguer anomaly (*mgal*)
BM II 12177	14.6	08.2	34.29	766.20	791.68	36.1	32.2
II 12179	13.8	06.4	94.59	765.07	786.03	50.2	39.6
II 12180	13.9	05.4	184.61	765.21	770.53	62.3	41.6
II 12181	14.2	04.6	328.63	765.63	740.80	76.6	39.8
II 12182	14.4	03.8	420.26	765.91	724.90	88.7	41.6
II 12178	14.2	07.5	50.66	765.63	791.48	41.5	35.8
No. 1 駒沢橋	13.3	05.7	198	764.36	773.88	70.6	48.5
2 独標	13.0	04.6	258.2	763.94	757.59	73.3	44.4
3 新千鳥橋	12.6	04.1	378	763.37	733.08	86.4	44.1
4 旧道彎曲点	12.0	03.4	642	762.52	676.06	111.7	39.8
BM II 12183	14.2	03.0	614.00	765.63	683.00	106.8	38.1
No. 5 学園前	13.7	03.3	673	764.93	670.62	113.4	38.1
6 鷹巣山入口	13.1	03.3	802	764.08	639.78	123.2	33.5
7 芦之湯入口	13.0	02.7	844	763.94	628.63	125.2	30.7
8 六地蔵	12.6	02.4	858	763.37	626.65	128.1	32.0
9 薺池	12.1	02.6	755	762.66	652.50	122.8	38.4
10 独標	11.8	02.0	726	762.24	660.62	122.4	41.2
11 金波館	12.0	02.1	718	762.52	660.21	119.3	38.9
12 箱根町	11.1	01.7	722	761.24	659.86	121.4	40.6
13 孫助山南彎曲点	10.5	02.1	890	760.39	625.05	139.3	39.7
14 中継所入口	10.8	03.1	990	760.82	602.70	147.4	36.6
15 彎曲点	10.6	04.0	858	760.54	635.18	139.4	43.4
16 〃	10.6	03.5	840	760.54	652.62	151.3	57.3
17 〃	09.5	04.6	586	758.98	694.81	116.7	51.1
18 〃	09.6	04.2	528	759.13	712.49	116.3	57.2
19 〃	09.2	04.9	398	758.56	736.93	101.2	56.6
20 〃	09.2	04.3	286	758.56	765.34	95.0	63.0
21 広河原	09.4	03.8	216	758.84	778.20	86.0	61.8
22 湯河原入口	08.8	04.3	137	758.00	797.05	81.3	66.0
23 小学校	08.3	05.6	37	757.29	811.62	65.8	61.6
BM I 50	08.5	06.8	4.75	757.57	810.89	54.8	54.2
No. 24 穴部独標	16.5	09.3	18	768.89	790.86	27.5	25.5
25 沼田独標	17.5	08.1	23	770.31	797.61	34.4	31.8
26 関本	19.1	06.4	52	772.57	795.68	39.2	33.4
27 関場トンネル	19.5	03.6	246	773.14	748.03	50.8	23.3
28 地蔵堂	18.9	02.5	356	772.29	726.40	64.0	24.1
29 竹之下	19.9	58.8*	333	773.71	718.78	47.8	10.6
30 独標	18.9	57.1*	435.6	772.29	695.97	58.2	9.4
BM 仿11	18.0	57.7*	472.79	771.02	688.84	63.7	10.8
No. 31 東山	16.9	57.9*	500	769.46	688.21	73.0	17.1
32 寒沢橋	16.4	58.1*	685	768.75	650.87	93.5	16.9
33 展望台	16.2	57.7*	767	768.46	631.84	100.1	14.2
34 長尾峠	15.3	58.6*	902	767.19	610.10	121.5	20.5
35 峠道	15.7	59.4*	810	767.75	628.47	110.7	20.0
36 姥ケ茶屋	16.4	59.8*	726	768.75	655.86	112.4	30.7

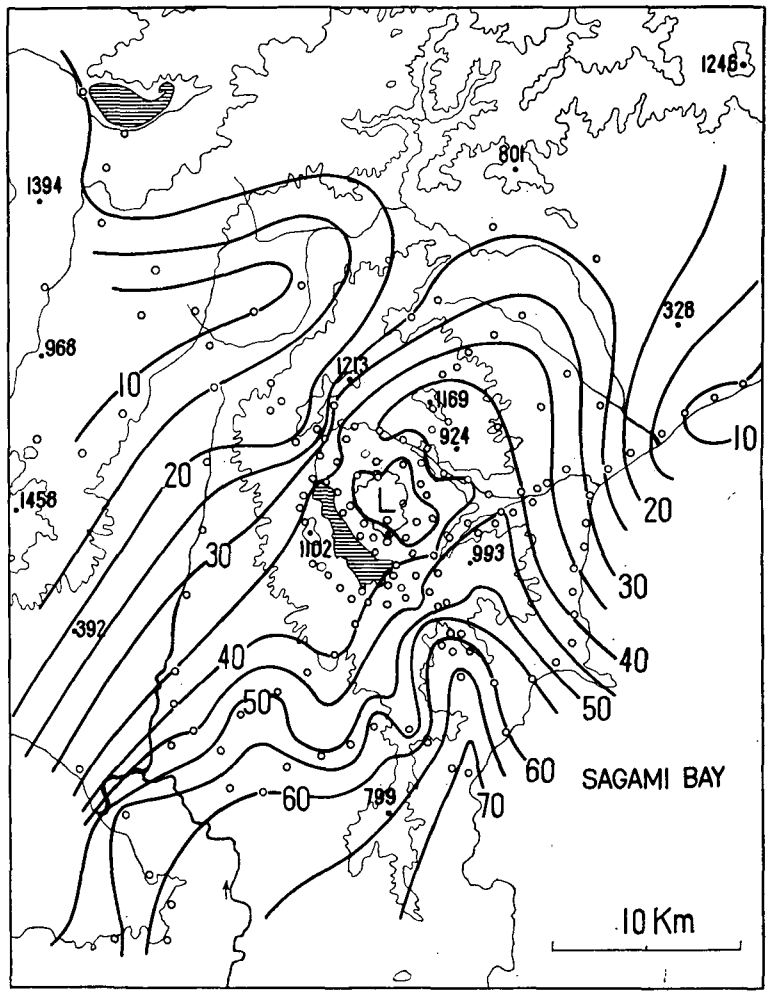

Fig. 2. Distribution of the Bouguer anomalies on and around Volcano Hakone. Unit is *mgal*. Small solid circles denote the height in *meters*.

1963. The authors wish to express their hearty thanks to the members of the Geographical Survey Institute who made the survey in co-operation with them. Acknowledgement is also made of the partial financial support of this survey through a grant from the Ministry of Education for which the authors are grateful.

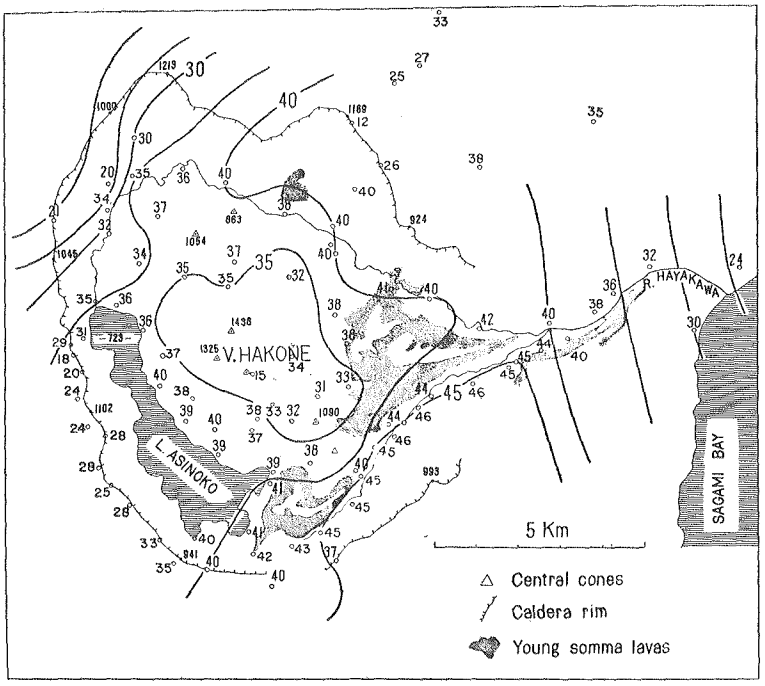

Fig. 3. Distribution of the Bouguer anomalies on Hakone Caldera. Unit is *mgal*. Small solid circles denote the height in *meters*.

References

1) KUNO, H.: Explanatory Text Geol. Map in Japan, Atami (1952).
2) Geographical Survey Institute: Gravity Survey in Japan (3), III. Gravity Survey in the Kantô and Chūbu District, Bull. G. S. I., IX (1964), 155-340.
3) TSUBOI, C. and FUCHIDA, T.: Relative Gravity Determination by Means of Short Wireless Wave Communication (in Japanese), Zisin, I, **9** (1937), 546-560.