Report on the Changes in the Land-Level in Connection with the Simabara Earthquake of 1922.

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(*With Plates* I and II.)

Realizing that, in connection with the earthquake that shook Simabara and environs on the 8th of December, 1922, some displacement more or less in the land-level would be inevitable, the late Dr. Omori, with the assistance of the Imperial Academy, succeeded in arranging for a survey of the affected area at the hands of the Land Survey Department. This body promptly organized a suitable surveying party and commenced work in June, 1922, but Dr. Omori, unfortunately, did not live to see the completion of the work. The survey was, however, pushed forward, and with the aid of funds augmented by our Committee in October of the same year, the work was in due course brought to a conclusion when reports on the result of the survey were presented by the two members of the Survey, Messrs. Y. Ogata and J. Onohara. It is with much pleasure that I take this opportunity to offer our thanks to the Imperial Academy who sponsored the undertaking, and to the governing council of the Land Survey Department as well as to the two gentlemen above mentioned.

A perusal of the reports makes it clear that changes in the land-level did take place, thus vindicating our anticipations. It must be noted, however, that the last surveys were made as far back as 30 years ago; the section between Isahaya and Kutinotu in July–September, 1894, and that between Isahaya and Hukabori during October–December, 1897. While in the circumstances, some changes more or less during the interval must be expected, the mean tide-level at the Hukabori Tide-gauge station showed a rise of only 2 or 3 cm., which difference, when compared with the results of the surveys for sea-level made before and after the interval in question, is altogether negligible in the first approximation. The outstanding changes observed in the land-level will now be given.

(1) Between benchmarks No. 5381 and 5394, that is between Kigitu and Nagasaki, the maximum uplift reached 64.5 cm. It is likely that these marks were once removed without any notice being given to the military authorities.

(2) Between benchmarks No. 4265 and 4270, that is between Isahaya and Aino, the maximum elevation was 8.3 cm., and the minimum depression 7.2 cm.

(3) Between benchmarks No. 4288 and 4290, that is in the northern part of the area affected by the earthquake in question, the maximum elevation was 34.2 cm. These marks were also once removed.

(4) Leaving Isahaya and following the eastern coast of the Simabara peninsula, we reach at its southern extremity the village of South Arima. In this section of the country, with the exception of the E. extremity of the peninsula between B. M. No. 4287 and 4292, there was an allround uplift of from about 3 cm. to 6 cm., whereas about Kutinotu no elevation at all could be detected. On the other hand, the E. extremity of the peninsula showed a slight depression in comparison with the adjacent land.

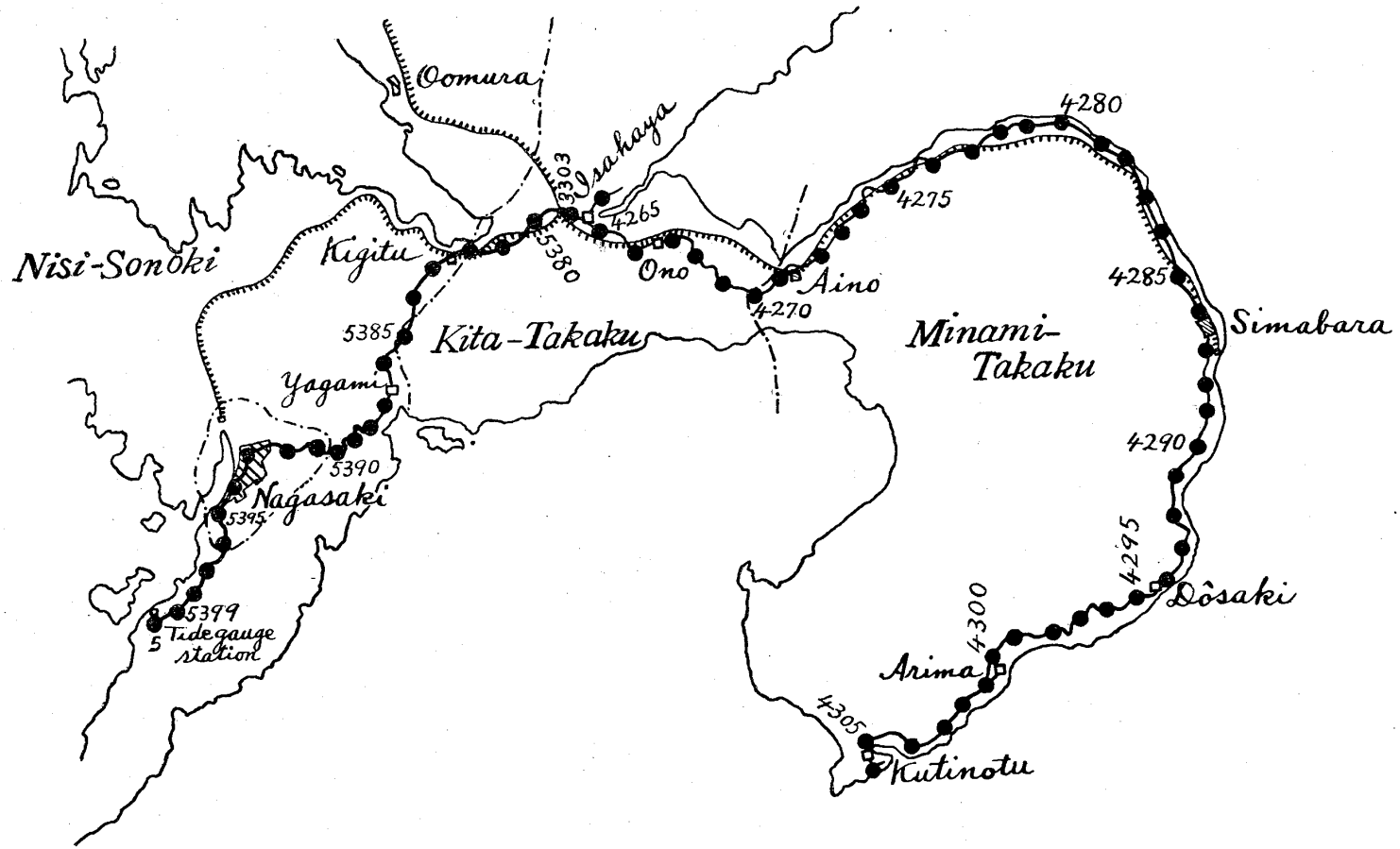
While it is a matter for regret that this survey covered only the northern and eastern coastlines, leaving out the western coastline, considering that the latter section had never been previously surveyed, it was unavoidable. Another matter to which attention may be called is the fact that the change in sea-level during a period of more than 23 years as observed at Hukabori, and just referred to, would seem to suggest a subsidence of as much as 2–3 cm., rather than an elevation.

Be that as it may, it appears that there occurred, besides a slight upheaval of land for the most part of the peninsula, a very characteristic topographical change, which may be regarded as accompaniments of the present earthquakes, at two places, namely, one at the isthmus connecting the peninsula to the main land, and the other at the eastern extremity of the peninsula. This may suggest that there were two seismic centres, one in the heart of peninsula no. 4 and the other in the bottom of Tidiwa Bay no. 2 As, of the two centres, the former accompanied more conspicuous changes than the latter, it may be said that the most active centre was situated in the bottom of Tidiwa Bay.

Precise Levelling between Hukabori and Kutinotu: Comparison of the Heights before and after the Simabara Earthquake of Dec. 8, 1922.

Bench mark	Height in 1925 α	Height in 1894–1897 β	Height difference $\alpha-\beta$	Bench mark	Height in 1925 α	Height in 1894–1897 β	Height difference $\alpha-\beta$
	m	m	cm.		m	m	cm.
Tide gauge station	4.2112	4.2112	+ 0.00	5398	2.3226	2.3074	+ 1.52
5	3.0954	3.0474	+ 4.80	5397	141.6720	141.6482	+ 2.38
5399	7.0652	7.0516	+ 1.36	5396	46.9539	46.9259	+ 2.86

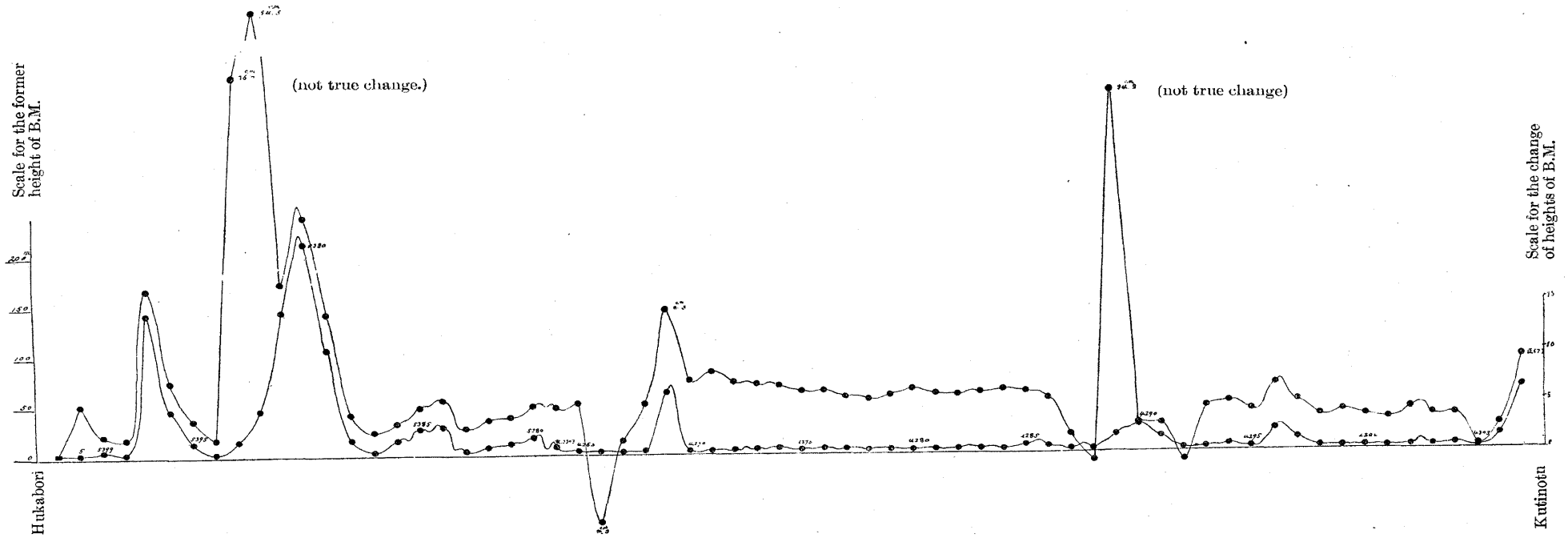
Map showing B.M. line from Hukabori to Kutinotu.



Pl. I.

Diagramatic view of the former heights and the changes of heights of B.M.

The heights of B.M. in 1894–1897 are indicated by the lower curve with the scale on the left hand side.
The changes of heights of B.M. relative to the above-mentioned curve are indicated by the upper curve with the scale on the right hand side.
Each dot indicates the position of B.M.



Precise Levelling between Hukabori and Kutinotu: Comparison of the Heights before and after the Simabara Earthquake of Dec. 8, 1922. (Continued.)

Bench mark	Height in 1925 α	Height in 1894–1897 β	Height difference $\alpha-\beta$	Bench mark	Height in 1925 α	Height in 1894–1897 β	Height difference $\alpha-\beta$
	m	m	cm.		m	m	cm.
5395	13.3503	13.3273	+ 2.30	4278	4.0062	3.9559	+ 5.03
5394	2.7586	2.7440	+ 1.46	4279	4.1786	4.1228	+ 5.58
*5393	15.0352	14.6728	+ 36.24	4280	3.8360	3.7760	+ 6.00
*3592	46.6466	46.0018	+ 64.48	4281	4.1764	4.1203	+ 5.61
5391	143.6248	143.5976	+ 2.72	4282	4.2254	4.1714	+ 5.40
5390	210.3740	210.3479	+ 2.62	4283	4.4294	4.3734	+ 5.60
5389	106.8628	106.8287	+ 3.41	4284	4.4759	4.4165	+ 5.94
5388	16.3916	16.3663	+ 2.53	4285	8.5423	8.4903	+ 5.20
5387	3.1283	3.1083	+ 2.00	4286	7.5696	7.5229	+ 4.67
5386	16.1633	16.1456	+ 1.77	4287	3.3882	3.3734	+ 1.48
5385	26.6275	26.6074	+ 2.01	4288	3.1712	3.1837	− 1.25
5384	29.9065	29.8798	+ 2.67	*4289	17.4938	17.1513	+ 34.25
5383	4.0029	3.9798	+ 2.31	4290	28.3879	28.3869	+ 0.10
5382	8.4753	8.4480	+ 2.73	4291	15.1645	15.1518	+ 1.27
5381	10.2860	10.2599	+ 2.61	4292	3.4829	3.4961	− 1.32
5380	18.7110	18.6801	+ 3.09	4293	3.7311	3.6887	+ 4.24
3303	8.8817	8.8427	+ 3.90	4294	6.6462	6.6034	+ 4.28
3303	8.8817	8.8427	+ 3.90	4295	4.5750	4.5363	+ 3.87
4265	4.8434	4.7966	+ 4.68	4296	21.7369	21.6918	+ 4.51
4266	3.0276	3.0988	− 7.12	4297	12.0113	11.9734	+ 3.79
4267	2.8812	2.8706	+ 1.06	4298	3.6481	3.6158	+ 3.23
4268	3.8414	3.7948	+ 4.66	4299	3.3483	3.3114	+ 3.69
4269	61.8540	61.7711	+ 8.29	4300	3.9871	3.9548	+ 3.23
4270	4.2160	4.1460	+ 7.00	4301	3.4725	3.4439	+ 2.86
4271	4.0771	3.9987	+ 7.84	4302	4.0689	4.0320	+ 3.69
4272	4.9610	4.8926	+ 6.84	4303	4.3557	4.3232	+ 3.25
4273	5.1619	5.0967	+ 6.52	4304	6.3451	6.3153	+ 2.98
4274	6.4285	6.3650	+ 6.35	4305	2.7348	2.7328	+ 0.20
4275	4.4967	4.4383	+ 5.84	4306	15.1522	15.1422	+ 1.00
4276	5.7650	5.7079	+ 5.71	(7)	61.3313	61.2914	+ 3.99
4277	4.7964	4.7448	+ 5.16				

* B. M. No. 5393, 5392 and 4289 had been removed from their original positions before the second survey was carried out.