

CHAPTER III. METEOROLOGICAL CONDITIONS AT THE TIME OF THE ERUPTION OF 1914(THE SAKURA-JIMA ERUPTIONS AND EARTHQUAKES II [On the Sound and Ash-precipitation Areas of, and on the Level Changes caused by, the Eruptions of 1914, with Historical Sketches of Earlier Sakura-jima Outbursts])

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Karasu-jima, Hikinohira, and Nabe-yama. In other words, the centre of eruptive activity has gone back, after a sort of shifting of radius of disturbance, in 1914 to an old site, but not to the N.W. compartment, which is thus likely not to become the scene of eruption even in future.

### CHAPTER III. METEOROLOGICAL CONDITIONS AT THE TIME OF THE ERUPTION OF 1914.

**20. Meteorological elements for 1913.** During the 12 months preceding the eruption of Jan. 1914, the meteorological conditions at Kagoshima were abnormal in no special way. Thus, according to Tables X and XI the mean barometric pressure and air temperature in 1913 were respectively 751.7 mm and 16°.4 C, while the corresponding quantities during the 5 years, 1906–1910, were 751.4 mm and 16°.5 C. The amount of the precipitation in 1913 was, however, only 1604 mm and much smaller than the average value of 2337 mm for the 5 years interval above referred to.

**21. Weather in Kagoshima at the time of eruption.** At the commencement of January 1914, the weather at Kagoshima was changeful, there being in particular an unusual amount of snow-fall on the morning of the 8th. On the day of the actual eruption and during the three previous days, namely, from the 9th to the 12th, the barometer was steadily very high and ranged between 773.0 and 769.2 mm, while the wind velocity was low and varied from 2.3 to 3.5 m/sec. In fact, till 6 a.m. on the 13th, whole Japan was under an exceptionally high atmospheric pressure and the weather was calm and clear at most places, as was also characteristic of the great Sakura-jima eruption of 1779 and of the

tremendous outbursts of Asama-yama in 1783. Again, on the 12th (Jan. 1914), the first powerful outbursts occurred at about 10 a.m., when the barometric pressure was at a maximum (770.1 mm). At 2 p.m., on the 13th, there appeared a centre of barometric depression of 754 mm in Yellow Sea, off the Shantung promontory, and another also of 754 mm at the mouth of the Yang-tsze, causing the pressure over Japan to fall to 770-764 mm. In consequence of this it rained in Chosen and it became cloudy over Japan; in the city of Kagoshima there being a precipitation of rain at midnight of the 12th. On the 14th, at 6 a.m., these depression centres moved across Japan Sea, and caused rain in North Kyushu, Shikoku, and the W. part of Main Island; the pressure falling to 754-761 mm over Japan, with westerly or southerly wind. Thunder storms occurred on the 14th as follows:—Between 0 and 3 a.m., in Kyushu and western portion of Main Island; at 7-8 a.m., in Shikoku, and southern part of Kii; at 2-3 p.m., in the provinces of Noto, Kai, and Musashi; and at 9-11 p.m., in Echigo and Uzen.

It might be supposed that the powerful eruptions on the 12th and 13th (Jan. 1914) had caused some increase in the air temperature about Kagoshima. But, in reality, the heating effect, whose existence is very difficult to ascertain, seems to have been quite insignificant. Thus, according to Table XIV, on the 13th the air temperature which was below  $11.^{\circ}1$  C in the morning was suddenly increased at and after 10 a.m. to over  $15.^{\circ}0$  C. This is, however, not to be attributed to the volcanic agency, as a similar and more abrupt change in thermometer reading took place also at Nase, in the island of Ōshima (Lyukyu), which is situated at a distance of 373 km to the S.W. of Sakura-jima, and where the air temperature was increased on the same morning from  $11.^{\circ}3$  C

at 6 a.m. to  $20^{\circ}.3$  C at 10 a.m. The cause of the sudden temperature change was in the predominance of the southerly winds at the time in question, whose velocity was at Nase suddenly increased to 5.4 m/sec. (10 a.m.) and 12.1 m/s (2 p.m.).

Fig. 21 gives the weather map for the morning of the day of the Sakura-jima eruption, while fig. 22 illustrates the variations in the course of the daily meteorological elements at Kagoshima during the month of January, 1914.

**22. Weather in Japan, Jan. 10th–20th, 1914.** The following is a brief tri-daily description of the barometric distribution over Japan during the 10 days about the time of the eruption of Sakura-jima. Amongst the others the general condition of weather at 6 a.m. on the 17th was almost identical with that for the 12th (Jan. 1914), the day of the outburst.

10th, 6 a.m. Three centres of low barometric pressure of 766, 762, and 764 mm, existed over Yellow Sea, off the coast of Genzan (Chosen), and in the N. part of Japan Sea respectively. High pressure of 770–774 mm covered the central and S. portions of Japan.

10th, 2 p.m. Low centres of 762, 762, and 760 mm were in the N.E. part of Chosen, in Central Japan, and in the N. part of Japan Sea. The pressure was high (770 mm) along and off the S. coast of Honshu.

10th, 10 p.m. Low centre of 754 mm was in the S. part of Karafuto, thence increasing to 768 mm over the S. part of Japan. High pressure area of 770 mm was off the S. coast of Honshu and in E. China.

11th, 6 a.m. The pressure varied from 768 mm over Chosen and Kyushu to 752 mm at the S.E. part of Karafuto. Winds were slight and irregular in the W. half of Japan, but generally W.ly or S.W.ly in the N. half.

11th, 2 p.m. The pressure increased from 754 mm in Soya Strait to 768 mm in Kyushu and the W. part of Honshu, with a high centre of 770 mm in the N.E. part of China. Strong W.ly winds prevailed.

Fig. 21. Weather Map for Jan. 12th, 1914, 6 a.m.

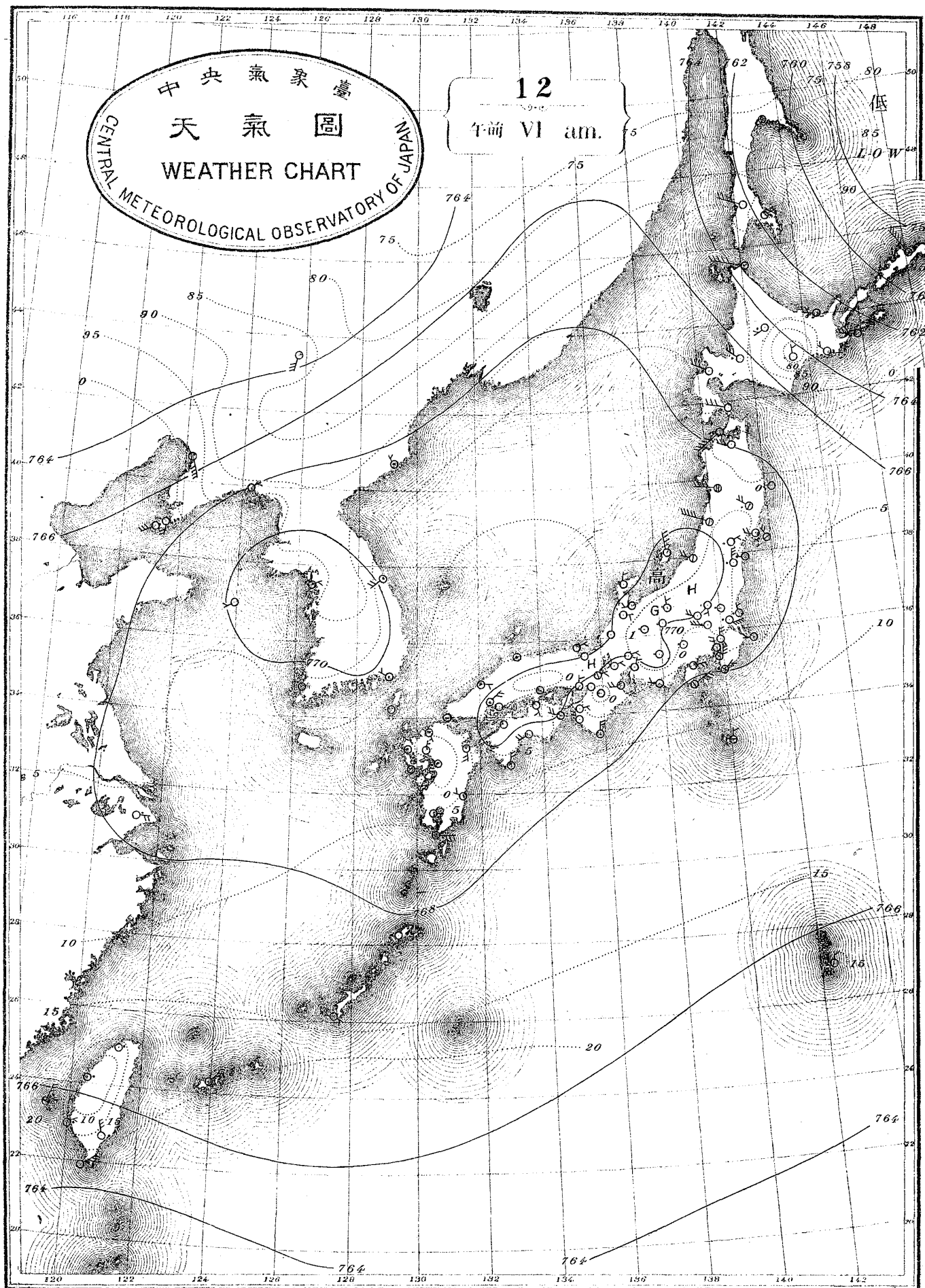
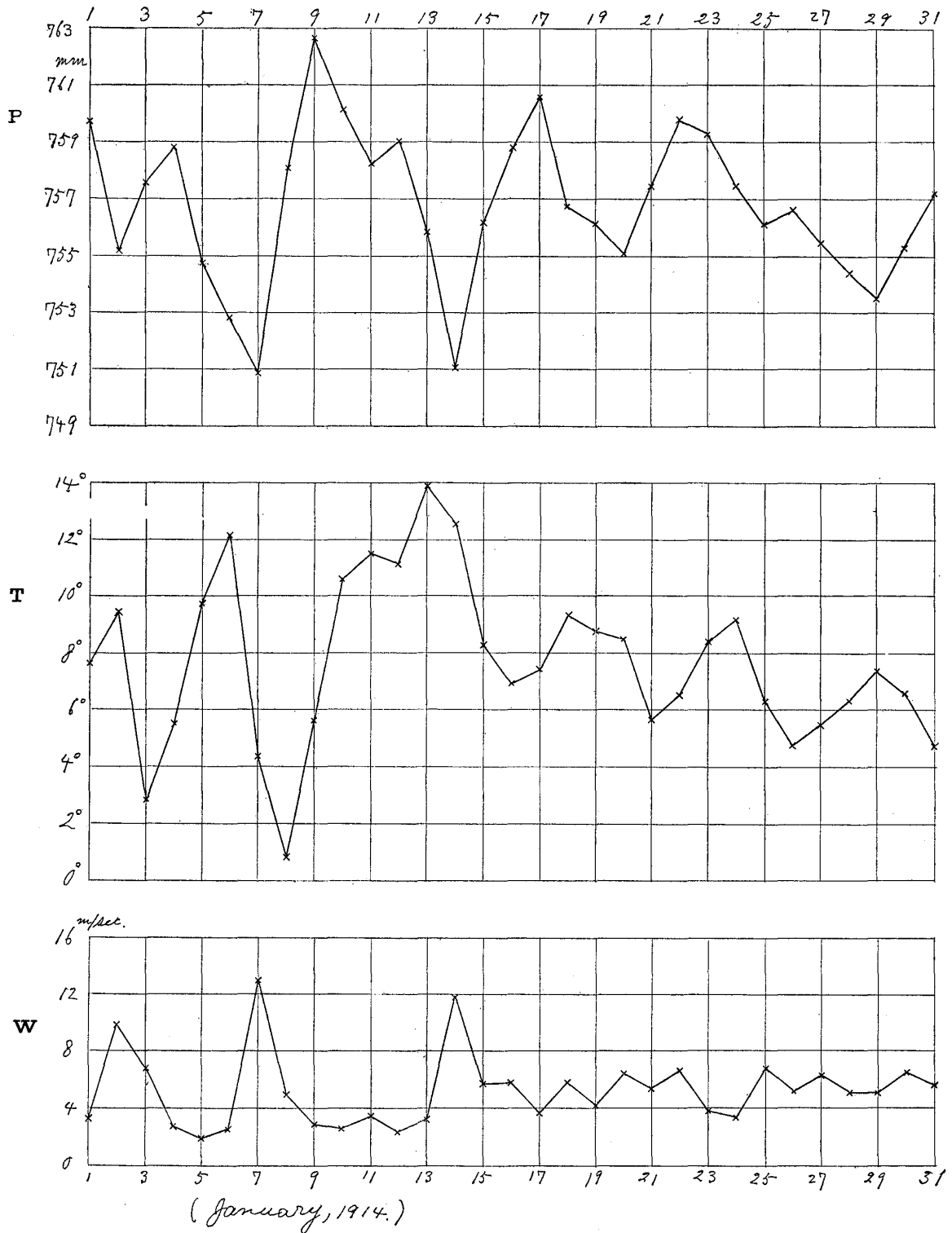


Fig. 22. Variation in the Mean Daily Barometric Pressure, Air Temperature, and Wind Velocity, during January, 1914.

P....Barometric Pressure. T....Air Temperature. W....Wind Velocity.



11th, 10 p.m. The pressure was high (770 mm) from China and Chosen to the neighbourhood of Shimonoseki, thence decreasing to 754 mm off the N.E. coast of Hokkaido. In the latter, strong W. winds prevailed, while in the rest of Japan the winds were northerly.

12th, 6 a.m. The pressure was high (770 mm) over Inland Sea, the N. part of Shikoku, and the western and central parts of Main Island. Low pressure of 764 mm was over S. Manchuria.

12th, 2 p.m. Entire Japan and the S. half of Chosen were enclosed within the isobar of 768 mm, with the centre of high pressure (770 mm) over Uzen, Ugo, and the Hokuriku provinces. Low pressure centre of 758 mm was over Manchuria.

12th, 10 p.m. Shikoku and nearly whole of Kyushu and Main Island were enclosed within the isobar of 770 mm, with the centre of maximum pressure of 772 mm over Echigo and Uzen. The centre of low pressure of 760 mm was in Manchuria.

13th, 6 a.m. Nearly the whole Shikoku and Main Island were enclosed in the isobar of 770 mm, the centre of max. pressure (772 mm) being over the central part of the latter. Low pressure centre (758 mm) was in Manchuria.

13th, 2 p.m. High pressure centre (768 mm) passed to the S.E. corner of Honshu and the adjacent sea region. Low centres of 751, 756, and 756, were respectively at the mouth of the Yang-tzse, at the Shantung promontory, and in the N. part of Japan Sea.

13th, 10 p.m. As before, the high pressure centre (764 mm) was at the S.E. corner of Honshu and to its E. Low centres of 750 and 748 mm were at the middle parts of Chosen.

14th, 6 a.m. Isobars were parallel to the Japanese islands, the pressure being 754 to 760 mm over Kyushu to Hokkaido. Two low centres of 744 and 746 mm were respectively to the E. of Genzan and off Vladivostoc, in Japan Sea. Winds were generally strong and westerly in Kyushu and Shikoku.

14th, 2 p.m. Two low centres, each of 740 mm, moved a little northwards in Japan Sea, the pressure being 760 to 744 mm over Japan, at whose S. and central parts strong W. winds prevailed.

14th, 10 p.m. Two low centres each of 736 mm passed to the N. part of Hokkaido. The pressure varied from 765 mm in Kyushu to 744 mm at Aomori. Strong W. winds prevailed over whole Japan.

15th, 6 a.m. A low centre of 736 mm existed to the N. of Hokkaido in Okhotsuk Sea, the pressure thence increasing up to 766 mm in Kyushu. Strong W. winds prevailed over whole Japan.

15th, 2 p.m. A low centre of 738 mm was at the N.E. of Hokkaido, the pressure thence increasing to 766 mm at the S.W. part of Kyushu. Strong W. winds prevailed over whole Japan.

15th, 10 p.m. A low centre of 750 mm was off the N.E. coast of Hokkaido, the pressure thence increasing to 767 mm at the S.W. part of Kyushu. Strong W. winds prevailed over whole Japan.

16th, 6 a.m. Pressure increased from 754 mm off the N.E. coast of Hokkaido to 768 mm in the W. part of Kyushu. W. winds prevailed over whole Japan.

16th, 2 p.m. There was a low pressure centre of 752 mm off the E. coast of Mutsu, while the high pressure of 772 mm extended over Yellow Sea and the E. coast of China. Strong W. winds prevailed all over Japan.

16th, 10 p.m. The pressure was high (772 mm) over China and Yellow Seas, thence decreasing to 756 mm off the N.W. coast of Hokkaido. W. winds prevailed over Japan.

17th, 6 a.m. The pressure was high (772 mm) over Kyushu, Shikoku, and in the W. and central parts of Honshu, thence decreasing to 760 mm off the N.W. coast of Hokkaido. Strong W. winds prevailed outside the high pressure area.

17th, 2 p.m. The pressure was high (772 mm) over the N.W. coast of Honshu and the adjacent sea area, and 770 to 764 mm over the greater portion of Japan.

17th, 10 p.m. The pressure was high (772-774 mm) over the central part of Honshu, and low (762 mm) to the N. of Hokkaido. A second high pressure area of 772 mm was in N.E. China. Winds were irregular and weak over Kyushu and the N. part of Honshu.

18th, 6 a.m. The pressure was high (770 mm) over the central part of



Honshu and slightly lower (766 mm) in the W. part of Japan, where it was rainy and slightly windy. A low pressure centre of 760 mm existed in the S. part of Karafuto.

18th, 2 p.m. There were two low pressure centres of 762 and 758 mm respectively off the S. coast of Kii and over the S. part of Karafuto. The pressure over Japan was from 766 mm in Kyushu to 762 mm in Hokkaido. Strong W. winds prevailed over whole Japan.

18th, 10 p.m. There were two low centres of 760 and 756 mm respectively off the E. coast of Awa-Kazusa peninsula and to the N. of Hokkaido, increasing up to 768 mm in W. Kyushu. Winds were generally westerly.

19th, 6 a.m. The pressure was high (766-767 mm) over the S.W. half of Japan, thence decreasing to 756 mm off the N.E. coast of Hokkaido. Wind was generally strong and westerly over the N. half of Japan, but it was calm or slightly windy over the other half.

19th, 2 p.m. The pressure was low (756 mm) to the N.E. of Hokkaido, thence increasing to 765 mm over the W. half of Japan. Wind was westerly nearly all over the country.

19th, 10. p.m. The pressure was high (774 mm) in the N.E. part of China, thence decreasing to 766 mm in the W. part of Kyushu and to 760 mm off the N.E. coast of Hokkaido. Over E. Kyushu, Shikoku, and Honshu, it was generally calm except at the S.E. part of the last-named island, where westerly winds prevailed.

20th, 6 a.m. The pressure was high (774 mm) over the N.E. part of China and Manchuria, thence decreasing to 762 mm off the Pacific coast of Japan. Over Japan, it was calm or there were slight westerly winds.

20th, 2 p.m. The pressure was high (776 mm) over N.E. China, thence decreasing to 760 mm off the S., S.E., and N.W. coasts of Honshu. Winds were generally westerly.

20th, 10 p.m. The pressure varied from 776 mm over N.E. China to 760 mm off the Awa-Kazusa peninsula. Over Japan, the pressure was 767 mm in W. Kyushu and 760 mm in the vicinity of Tokyo. N.W. and W. winds prevailed.

TABLE X. AVERAGE VALUES OF THE MONTHLY METEOROLOGICAL ELEMENTS AT KAGOSHIMA, 1906—1910.

Month.	Barometric Pressure.* (Reduced to 0°C.)	Air Temperature.	Precipitation.	Number of Earthquakes.
I	755.7 mm	8.1 C	120.7 mm	5
II	754.2	6.4	101.4	2
III	753.9	10.3	150.8	5
IV	751.7	15.3	235.0	2
V	749.5	18.5	183.2	3
VI	747.1	21.9	454.7	2
VII	746.4	25.4	367.6	5
VIII	746.0	26.1	158.7	5
IX	748.8	24.1	257.6	2
X	752.4	19.2	147.9	2
XI	755.0	13.7	95.4	4
XII	756.4	8.6	61.2	3
Mean (or Sum).	751.4	16.5	2336.7 (Sum)	41 (Sum)

\* Reduction to mean sea level....+11.06 mm.

TABLE XI. MEAN MONTHLY METEOROLOGICAL ELEMENTS AT KAGOSHIMA, JAN. 1913 TO MARCH 1914.

Year.	Month.	Barometric Pressure.* (Reduced to 0°C.)	Air Temperature.	Precipitation.	Number of Earthquakes.
1913	I	757.14 mm	6.84 C.	67.8 mm	2
	II	755.36	7.19	57.4	1
	III	753.69	9.28	66.4	2
	IV	751.13	17.13	144.5	6
	V	748.93	18.50	168.6	2
	VI	746.30	21.39	476.2	19
	VII	747.11	25.08	129.3	14
	VIII	745.57	26.59	53.2	6
	IX	749.84	23.08	224.8	6
	X	751.51	19.09	37.7	7
	XI	756.56	14.09	67.8	15
	XII	756.76	8.45	110.0	11
	Mean (or Sum)	751.66	16.39	1603.7 (Sum)	91 (Sum)
1914	I	756.83	7.63	70.3	522
	II	754.74	8.85	145.3	24
	III	752.99	12.95	278.5	17

\* Reduction to mean sea-level....+11.06 mm.

TABLE XII. DAILY METEOROLOGICAL ELEMENTS IN  
JANUARY 1914, AT KAGOSHIMA.

Day.	Air Temperature.	Barometric Pressure.*	Relative Humidity.	Wind Velocity.	Precipitation.	Evaporation.	Number of hours with Sun Shine.
	°	mm		m/sec.	mm	mm	
1	7.64C	769.96	79.3	3.20	2.1	1.6	4.47
2	9.49	765.20	72.5	9.80	7.9	3.0	2.41
3	2.81	768.00	83.4	6.87	5.6	1.0	1.19
4	5.52	769.19	68.3	2.75	—	1.5	7.89
5	9.70	764.85	88.2	1.96	5.8	0.8	1.25
6	12.12	762.80	64.8	2.54	—	—	4.30
7	4.37	761.15	73.2	13.00	7.3	0.7	1.67
8	0.81	768.60	70.8	5.05	5.8	2.4	8.75
9	5.59	773.03	63.3	3.05	—	1.6	4.23
10	10.60	770.30	81.2	2.56	6.4	1.4	0.65
11	11.49	768.29	68.1	3.50	—	2.6	7.59
12	11.10	769.17	72.5	2.32	—	3.1	7.15
13	13.94	765.69	76.4	3.21	0.3	3.2	2.15
14	12.57	760.92	65.7	11.92	16.4	4.6	5.77
15	8.25	766.42	62.3	6.00	0.1	2.6	3.17
16	6.94	769.07	67.3	5.89	0.7	2.9	4.03
17	7.40	770.84	62.8	3.64	—	2.8	0.00
18	9.38	766.87	70.8	5.80	9.2	3.8	8.07
19	8.72	766.32	61.4	4.16	—	2.6	2.65
20	8.49	765.22	66.4	6.49	0.0	3.6	5.58
21	5.66	767.72	58.8	5.40	—	3.3	6.90
22	6.55	770.02	58.0	6.68	—	3.6	0.20
23	8.41	769.52	61.4	3.85	—	2.6	6.25
24	9.15	767.59	66.3	3.34	0.0	2.3	1.91
25	6.28	766.40	66.2	6.86	2.6	3.1	8.29
26	4.72	767.01	64.7	5.24	—	3.1	7.25
27	5.45	765.77	61.4	6.40	0.0	3.3	7.09
28	6.34	764.63	60.1	4.97	0.0	3.2	7.18
29	7.35	763.70	61.6	4.95	—	3.5	8.82
30	6.55	765.59	62.0	6.44	—	4.1	9.01
31	4.70	767.58	59.9	5.61	—	3.0	6.18

\* Reduced to mean sea-level and the standard gravity.

TABLE XIII. HOURLY METEOROLOGICAL ELEMENTS  
 AT KAGOSHIMA, JAN. 10TH TO 15TH, 1914:  
 WIND DIRECTION AND VELOCITY (m/sec.).

Day. Hour.	10	11	12	13	14	15
1 a.m.	NNE 2.5	NNW 3.0	NE 1.9	SW 0.8	SW 6.2	NNW 8.5
2	NE 1.3	NNW 2.1	NNE 2.2	NE 0.6	SSE 7.3	NNW 7.6
3	E 2.2	N 3.4	NE 2.1	NNW 0.8	SW 8.3	NNW 6.3
4	ENE 2.4	N 4.2	SSW 0.9	N 2.3	WNW 8.2	NNW 6.5
5	NE 1.6	N 4.6	E 2.7	SW 0.7	WNW 14.5	NNW 5.9
6	E 2.2	N 4.7	ENE 3.9	SW 1.0	WNW 20.0	W 4.9
7	E 2.1	N 4.4	ENE 3.1	SE 1.2	WNW 16.1	NNW 2.0
8	E 2.4	NNW 3.4	E 3.8	SSE 1.8	W 10.4	N 3.4
9	ESE 3.1	N 1.6	ENE 3.3	NW 1.1	NNW 7.0	NNW 4.8
10	W 3.1	SE 2.9	E 3.5	SSW 0.9	W 6.8	NW 4.6
11	SSE 0.9	SW 1.4	SE 2.8	E 1.3	WNW 12.2	NW 5.5
12	SSE 2.1	NNW 2.0	SE 2.6	E 3.1	WNW 13.4	W 7.1
1 p.m.	S 2.1	NW 4.1	ESE 2.8	ESE 4.6	NNW 13.9	WNW 6.4
2	S 1.9	WNW 3.8	ESE 3.9	SSE 2.8	W 14.8	WNW 7.7
3	S 3.1	WNW 4.2	E 3.3	ESE 2.0	WNW 15.6	WNW 8.3
4	WSW 2.7	WNW 3.9	E 2.0	ESE 2.1	WNW 14.7	WNW 7.6
5	SW 3.2	WNW 3.9	E 0.5	SE 1.9	WNW 16.1	NW 5.9
6	SW 3.6	NW 4.4	ENE 0.5	S 2.2	W 15.1	NNW 4.1
7	WNW 5.8	NNW 5.1	SE 2.5	S 5.8	NNW 13.9	NNW 3.4
8	SW 3.1	N 6.6	NW 1.8	S 7.7	NW 11.8	WNW 4.0
9	SW 1.0	NE 2.5	SW 0.5	SSW 8.6	NW 10.3	NW 4.6
10	NW 1.9	ENE 1.9	SW 1.3	SSW 7.9	NW 10.9	NNW 5.3
11	NNW 3.6	E 2.8	W 2.0	SSW 8.6	NNW 9.5	NNW 4.3
12	NNW 3.6	ENE 3.1	N 1.8	SW 7.2	NNW 9.1	NNW 5.8

TABLE XIV. HOURLY METEOROLOGICAL ELEMENTS AT  
KAGOSHIMA, JAN. 10TH TO 14TH, 1914 :  
AIR TEMPERATURE AND BAROMETRIC PRESSURE.

Date. Hour.	Air Temperature.					Barometric Pressure. (Reduced to Mean Sea-level and Standard Gravity.) 700mm +				
	10	11	12	13	14	10	11	12	13	14
1 a.m.	5.9° C	11.6° C	8.1° C	10.7° C	15.1° C	72.5 <sup>mm</sup>	68.5 <sup>mm</sup>	69.0 <sup>mm</sup>	69.2 <sup>mm</sup>	60.1 <sup>mm</sup>
2	6.7	11.2	7.8	10.6	15.6	72.4	68.2	69.2	69.2	59.3
3	7.0	11.0	7.6	10.6	15.7	72.1	67.8	69.1	69.1	58.1
4	7.4	11.0	7.5	10.3	15.3	71.9	67.8	68.9	68.8	57.7
5	7.6	10.9	7.7	10.8	14.9	71.8	67.8	68.6	68.4	57.4
6	7.6	10.6	9.7	10.8	15.0	71.8	67.9	69.2	68.5	58.1
7	7.6	10.0	7.7	10.4	13.6	72.0	68.0	69.5	68.7	58.8
8	7.6	10.0	8.6	11.1	13.1	72.0	68.3	69.9	68.6	59.8
9	8.4	9.3	10.2	11.0	13.3	72.0	69.0	70.0	68.8	60.6
10	9.0	12.6	12.0	15.3	14.4	72.1	69.1	70.1	68.6	60.5
11	11.0	14.0	14.4	15.4	14.4	71.3	68.8	69.7	67.7	60.2
12	11.5	13.7	14.5	15.7	14.5	70.4	68.3	69.1	66.3	60.0
1 p.m.	12.3	14.4	15.3	15.4	14.2	69.6	67.9	68.3	65.3	59.6
2	13.9	15.4	15.0	16.3	14.3	69.1	67.4	68.1	65.1	59.7
3	15.0	15.0	14.6	15.7	13.7	68.7	67.3	68.2	64.7	60.3
4	15.7	14.7	13.8	16.0	12.0	68.4	67.4	68.4	64.4	61.1
5	14.4	13.3	13.8	15.6	11.7	68.7	67.8	68.8	63.8	61.8
6	14.0	11.2	12.8	15.4	10.8	68.6	68.4	69.1	63.5	62.6
7	11.5	10.0	12.2	16.1	8.0	68.8	68.6	69.5	63.1	63.5
8	11.5	9.6	11.5	16.1	8.8	69.0	68.7	69.0	62.4	63.9
9	12.2	9.4	11.6	16.3	8.7	68.8	68.9	69.6	61.3	64.2
10	12.3	9.2	11.2	16.2	8.6	68.6	69.1	69.4	60.3	64.6
11	12.5	8.8	10.3	16.7	8.1	68.4	68.9	69.7	60.3	65.0
12	11.8	8.8	10.4	16.1	7.9	68.3	69.1	69.8	60.4	65.2
Mean.	10.6	11.5	11.1	13.9	12.6	70.30	68.29	69.17	65.69	60.92