Notes on the climate of the Bonin islands.

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Ogasawarajima, called by foreigners the Bonin islands is a chain of small islands about twenty in number situated in the Pacific Ocean at a distance of about 250 km. from the south-east coast of Japan.

In the summer of 1901, a meteorological station belonging to the Central Meteorological Observatory, Tokyo was established in the Chichijima (Peel island), one of the largest islands of the group. The station is situated in $142^{\circ} 11'$ G.E., and $27^{\circ} 5'$ N. A psychrometer, a pair of maximum and minimum thermometers, and Richard's thermograph (middle size) are set in a thermometer screen which is established in the compound of the local administrating office. A self-registering ombrometer of the Hellmann pattern is also placed in the same place. Mercurial barometer (so-called station barometer) and Richard's barograph of middle size are set in a suitable room of the office. The height of the barometer and barograph above sea level is 4.0 m; that of the thermometers above ground is 1.3 m, and that of the raingange above ground is 2.3 m.

The systematic observations are made at 10 am and 2 pm. The air temperature, pressure and precipitation are continuously recorded by the selfregistering instruments. The termin observations and records of the automatic apparatus are reduced by the Central Meteorological Observatory, and the monthly summary of the observations is regularly published in the Monthly weather review of the observatory. The materials of the present notes are mostly taken from the publications from 1902 to 1904.

The mean of the barometric pressure and that of the air temperature given in the tables at the end of this note are calculated by the formula :— $(2a + 6a + 10a + 2p + 6p + 10p)/6$; and the mean of relative humidity by $(10a + 2p)/2$ which is however found to give somewhat lower values of humidity. By consulting the six-daily observations made at the Ishigaki-jima island which has close similarity in climatic conditions with the Bonin, I have found the correction to be applied to the hygrometric observations at the Bonins in order to obtain the true monthly means of humidity is +6%, and remains practically constant throughout the year.

In concluding the short introductory remarks I take the advantage to add a few words on the importance of meteorological observations of the Bonin islands. Besides furnishing the usual climatic data which are necessary for the practical life in the islands, the meteorological observations at these small patches of land isolated in the vast ocean give us two important materials; one of them is the data necessary in the climatological investigations of the eastern portion of North Pacific, and the other the material which is indispensable for the discussion of the formation and movement of rotatory storms near Japan, most of which pass near or over the islands.

The climate of the Bonin islands is sub-tropical rather than temperate. The mean annual temperature is 22.1° , the maximum monthly mean being 26.4° in August, and the minimum, 16.4° in January. The annual range of air temperature is 10° , and shows distinctly the subtropical nature of the climate. Analogously to this small difference in the temperatures of the coldest and warmest months, the diurnal range of temperature is found to be very small (about 6°), and to remain almost constant throughout the year.

The highest temperature recorded was 33.0° , on 21st September 1903, and the lowest, 7.5° on 17th February 1902, thus showing a range of temperature of 25.5° for the climate of the islands. The temperature thus remains above the freezing

point throughout the year, and no frost or snowfall has been experienced. Owing to the high air temperature and fertilizing summer rain, the vegetation is astonishingly luxuriant, palms, ferns and pineapples growing profusely. Banyan trees, cedar, iron-wood, orange, laurel, etc. also flourish there.

The Bonin islands lie within the sphere of influence of the east Asiatic monsoons. North-westerly winds blow almost constantly from the beginning of December to the end of February. The easterly monsoon sets in at the beginning of July and prevails until the end of October. During the north-west monsoon the sea is very rough and presents some inconvenience for the maritime communications to the islands, but it is calm and smooth from May to August. The annual variation of the barometric pressure also shows the Bonin islands lie in the district of the east Asiatic monsoons. The mean annual pressure reduced to sea level and standard gravity is 761.3 mm, and it rises to the maximum in February when the mean height is 764.4 mm, and falls to the minimum in September when the mean pressure is 757.5 mm. The range of annual variation is 7 mm !

The rainy seasons in the Bonin islands are June and September, and the driest seasons April and January. The total annual rainfall amounts to 1380 mm. Here rainfall is mostly showery, and long continued fall is extremely rare. The greatest falls that occurred on any day were 180.8 mm, on 4th October 1904; 126.0 mm on 6th September 1902; and 120.0 mm on 9th October 1903. The average number of rainy days in a year is 147, the maximum occurring in September and December, having the monthly mean of 17 days, and the minimum occurring in April, when the monthly number is 6 days.

RESULT OF THE METEOROLOGICAL OBSERVATIONS MADE AT THE BONIN ISLANDS.

$\lambda = 142^{\circ} 11' \text{ E.G.}$

$\phi = 27^{\circ} 5' \text{ N.}$

H=4m.

Month	Atmospheric Pressure				Prevailing Winds			Relative Humidity			
	1902	1903	1904	Mean	1902	1903	1904	1902	1903	1904	Mean
January	763.2	763.7	764.1	763.7	NW	W	W	85	66	59	70
February	65.5	64.4	63.2	64.4	NW	W	N	92	66	65	74
March	63.5	64.2	61.7	63.1	S	NE	S	87	80	70	79
April	62.7	63.1	62.7	62.8	SW	SSW	E	73	90	65	76
May	61.7	61.9	60.2	61.3	W	SSW	S	82	81	71	78
June	58.3	59.8	60.6	59.6	SW	SW	S	88	92	73	84
July	59.8	62.2	57.0	59.7	E	SE	E	79	82	76	79
August	57.8	60.9	56.6	58.3	E	E	E	84	74	72	77
September	55.8	59.6	57.2	57.5	E	E	E	81	71	74	75
October	59.9	59.3	59.6	59.6	E	NE	E	85	72	71	76
November	63.9	61.2	62.4	62.5	SE	W	W	82	71	59	71
December	61.7	62.7	63.1	62.5	W	N	W	70	65	63	66
Year	61.1	61.9	60.7	61.3				82	76	68	75

Air Temperature												
Month	Mean temperature				Mean max. temperature				Mean min. temperature			
	1902	1903	1904	Mean	1902	1903	1904	Mean	1902	1903	1904	Mean
January	16.3	17.7	16.4	16.8	20.0	21.0	19.8	20.3	13.3	14.7	13.0	13.7
February	16.2	16.4	16.7	16.4	19.9	20.1	20.7	20.2	13.5	13.5	13.6	13.5
March	18.0	18.9	19.0	18.6	22.0	22.1	22.8	22.3	15.2	16.2	16.8	16.1
April	19.9	20.5	20.2	20.3	24.0	24.0	24.1	24.0	17.1	18.0	17.2	17.4
May	23.3	21.9	23.2	22.8	27.0	25.2	27.1	26.4	21.7	19.5	20.5	20.6
June	24.7	24.9	25.7	25.1	28.1	—	29.4	28.7	23.1	23.1	23.3	23.2
July	26.5	26.8	25.9	26.4	30.5	30.7	28.4	30.0	24.2	24.3	24.0	24.2
August	26.6	26.4	26.4	26.5	30.2	30.6	30.0	30.3	24.7	23.7	24.1	24.2
September	25.9	27.0	26.2	26.4	29.2	30.2	29.7	29.7	24.1	24.8	23.8	24.2
October	25.6	24.7	24.5	24.9	27.6	28.3	28.2	28.0	21.8	22.5	22.1	22.1
November	22.5	19.5	20.9	21.0	25.8	24.8	24.5	25.0	20.5	19.4	17.8	19.2
December	21.9	18.5	19.5	20.0	22.4	21.2	22.7	22.1	17.1	16.2	16.5	16.6
Year	22.3	21.9	22.1	22.1	25.6	25.3	25.7	25.5	19.7	19.7	19.4	19.6

Air Temperature.

Month	Daily range				Absolute max. temperature			Absolute min. temperature		
	1902	1903	1904	Mean	1902	1903	1904	1902	1903	1904
January	6.7	6.3	6.8	6.6	21.9 (31)	24.9 (27)	22.6 (14)	8.7 (21)	11.6 (9) (25)	8.1 (10)
February	6.4	6.6	7.1	6.7	22.4 (26)	23.3 (1)	22.9 (16) (29)	7.5 (17)	8.0 (21)	10.3 (20)
March	6.8	5.9	6.0	6.2	25.6 (24)	25.6 (15)	25.5 (6)	10.0 (8)	10.9 (11)	9.3 (24)
April	6.9	6.0	6.9	6.6	27.2 (29)	26.8 (29)	27.3 (27)	10.7 (8)	13.2 (7)	11.2 (8)
May	5.3	5.7	6.6	5.8	30.5 (28)	28.0 (20)	29.9 (31)	15.5 (14)	13.1 (7)	14.3 (10)
June	5.0	—	6.1	5.5	31.2 (29)	30.0 (30)	30.8 (22)	19.3 (4)	17.9 (6)	19.5 (14)
July	6.3	6.4	4.4	5.8	31.9 (25)	32.0 (25)	30.5 (5)	21.8 (12)	22.3 (18)	21.2 (17)
August	5.5	6.9	5.9	6.1	32.3 (3)	31.8 (14)	31.6 (28)	22.7 (1)	21.4 (17)	21.0 (17)
September	5.1	5.4	5.9	5.5	31.3 (22)	33.0 (21)	31.4 (11)	19.4 (16)	23.0 (2)	21.0 (29)
October	5.8	5.8	6.1	5.9	30.7 (13)	31.4 (3)	29.5 (1) (18)	20.4 (20)	17.5 (27)	17.5 (14)
November	5.3	5.4	6.7	5.8	28.2 (1)	28.7 (1)	28.7 (1)	16.9 (17)	14.5 (17)	14.5 (17)
December	5.3	5.0	6.1	6.5	24.9 (14)	25.5 (1)	25.5 (1)	13.2 (20) (21)	10.2 (27)	16.7 (22)
Year	5.9	5.6	6.3	5.9						

Month	Rainfall				Greatest daily rainfall			No. of rainy days			
	1902	1903	1904	Mean	1902	1903	1904	1902	1903	1904	Mean
January	75.7	41.5	74.7	64.0	40.0 (31)	21.4 (17)	25.5 (29)	13	9	11	11
February	29.3	53.9	177.2	80.8	15.4 (1)	8.9 (14)	37.5 (8)	9	13	17	13
March	52.1	68.0	201.2	107.1	25.6 (14)	21.1 (22)	70.3 (6)	9	10	13	11
April	11.6	52.0	32.3	32.0	6.0 (25)	10.8 (13)	19.8 (2)	5	8	6	6
May	134.6	48.2	81.6	88.1	39.2 (11)	13.6 (26)	40.5 (8)	11	9	10	10
June	268.7	211.0	99.3	193.0	52.5 (22)	8.5 (22)	31.0 (20)	16	11	15	14
July	59.2	61.7	226.1	115.7	39.5 (4)	35.5 (31)	66.6 (25)	8	6	14	9
August	196.1	41.0	48.6	95.2	43.2 (10)	14.3 (2)	21.2 (24)	14	14	13	14
September	274.4	125.3	151.4	183.7	126.0 (6)	63.5 (1)	46.1 (26)	11	21	19	7
October	104.2	176.9	234.1	171.7	34.3 (18)	120.0 (9)	180.8 (4)	16	15	17	13
November	27.3	311.1	61.2	133.2	6.4 (12)	85.2 (3)	39.3 (6)	11	17	10	13
December	163.0	91.9	90.3	115.1	40.9 (9)	32.7 (29)	19.9 (2)	21	15	50	17
Year	1396.2	1265.5	1478.0	1379.9				144	148	141	147