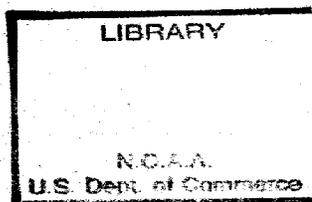


HYDROGRAPHIC OFFICE
DIV. OF NAUTIC SURVEILLANCE

BRITISH

RECORDS

No. 275.



QC
987
.J25
W34
1892/1901

TEMPERATURES

In Kingston, Jamaica, and the connection between the

SUN-SPOT FREQUENCY, THE MEAN MAX. TEMPERATURE AND THE
RAINFALL IN JAMAICA.



J A M A I C A :
GOVERNMENT PRINTING OFFICE, 79 DUKE STREET, KINGSTON.

1902.

National Oceanic and Atmospheric Administration

Climate Database Modernization Program

ERRATA NOTICE

One or more conditions of the original document may affect the quality of the image, such as:

Discolored pages
Faded or light ink
Binding intrudes into the text

This document has been imaged through the NOAA Climate Database Modernization Program. To view the original document, please contact the NOAA Central Library in Silver Spring, MD at (301) 713-2607 x124 or www.reference@nodc.noaa.gov.

LASON
Imaging Subcontractor
12200 Kiln Court
Beltsville, MD 20704-1387
March 28, 2002

TEMPERATURES

IN

KINGSTON JAMAICA

The mean temperature of a day at any place is the sum of the 24 corrected readings of the thermometer taken at each hour of the day and night divided by 24; the mean temperature of a month is the sum of the daily means divided by the number of days in the month; the mean temperature of a year is the sum of the monthly means divided by twelve; and the mean temperatures of, or at, the place, is the sum of the annual means divided by the number of years of observation.

Now it so happens that all over the world the mean temperature of a day does not greatly differ as a rule from half the sum of the maximum and minimum temperatures of the day; and as a consequence the mean temperature of a month does not greatly differ from half the sum of the mean maximum and minimum temperatures of the month.

Again it is found that the mean temperature of a day may be found with considerable accuracy by taking the mean of the temperatures at certain definite hours; but the hours differ at different places and in different latitudes, and care must be taken in the application of this method.

Now the uniformity of the climate in Jamaica assures us that if by careful study at one or two places these methods could be reduced to rules they would be found very useful for all other places in Jamaica.

As it was clearly impossible to attempt hourly readings at any station in Jamaica it occurred to me to ascertain the mean temperature at the Cinchona Plantation or Hill Gardens from the temperature six feet below the surface of the ground there. At that establishment they had a specially constructed thermometer six feet in length; and I asked the Hon. W. Fawcett, Director of Public Gardens and Plantations, to have the instrument put in the ground and carefully read. This was done for five complete years and more; and then the instrument was taken up and carefully compared with the standard thermometer in order to ascertain its error.

Mr. Fawcett made numerous comparisons on four days in April, 1897, with a general result that $0^{\circ} 4$ should be subtracted from the readings of the six-foot thermometer; but the comparisons were difficult to make as the difference between the six-foot and the standard varied slightly continually.

The following table shows the results of these investigations; the temperatures of the air were taken by thermometers in a Stevenson screen four feet above the lawn; and all the readings have been corrected for instrumental errors. It is to be remembered that we are chiefly interested in the last line only showing the means for the five years.

Temperatures at the Cinchona Plantation or Hill Gardens.
Means for the 5 years 1892-96 inclusive.

Month.	Temps. of the air.				Temp 6 feet under ground.	Temp 1°		A + B. 2
	7 a.m.	3 p.m.	Max.	Min.		A. M + m	B. 7 a.m. + 3 p.m.	
January	54.5	61.5	65.8	53.4	60.8	58.6	58.0	58.3
February	54.6	61.8	65.6	52.5	60.1	58.0	58.2	58.1
March	55.9	62.3	66.4	53.8	59.8	59.1	59.1	59.1
April	58.9	62.6	66.1	54.9	59.7	59.5	60.8	60.2
May	61.9	63.9	67.5	57.2	59.3	61.4	62.9	62.2
June	62.4	66.2	69.8	58.2	60.5	63.0	64.3	63.6
July	62.3	66.7	71.2	58.8	61.8	64.0	64.5	64.2
August	62.8	67.3	71.8	59.0	62.8	64.4	65.0	64.7
September	62.6	65.9	70.1	58.9	62.9	63.5	64.2	63.8
October	61.5	64.5	68.4	58.2	62.4	62.3	63.0	62.6
November	59.6	63.9	67.8	56.9	62.1	61.4	61.7	61.6
December	56.8	62.0	65.5	54.2	61.7	58.8	59.4	59.1
Means	59.5	64.0	68.0	56.3	61.2	61.2	61.8	61.5

The column A. contains the mean monthly temperature computed from the formula

$$\frac{M + m}{2} - 1^{\circ}$$

where M is the mean monthly maximum and m is the mean monthly minimum.

The column B contains the mean of the monthly temperatures at 7 a.m. and at 3 p.m.

It will be noticed that the mean of the figures in A agrees exactly with the mean annual underground temperature, 61° 2; while the mean of the figures in B is a little larger. But we cannot yet decide which formula is the better of the two: and so we shall take the mean of A and B, given in the last column, as the mean monthly temperature of the air.

The mean monthly temperature of the air varies from 58° 1 in February to 64° 7 in August, with a range of 6° 6; while the mean monthly underground temperature varies from 59° 7 in April to 62° 9 in September, with a range 3° 2, or about one half that of the air.

The lag of two months between February and April, and of one month between August and September, is smaller than I had expected; and the range is somewhat larger; with the general result that greater care should have been taken to eliminate diurnal variation*, which may affect our final result of 61° 2 by a few tenths of a degree.

Now the Hill Gardens are 4,907 feet above the sea-level; and the question arises, does the same relation exist between the underground temperature and the different temperatures of the air at or near the sea-level? To answer this question it was decided to move the six foot thermometer from the Hill Gardens to the Parade Gardens in Kingston; but it was unfortunately broken on the way.

In July, 1898, the Weather Bureau at Washington established a Meteorological Observatory at Halfway Tree, Jamaica, with self recording instruments, so that the temperature of the air is recorded every hour, day and night; and the results are published in the U. S. *Monthly Weather Review*.

Now the temperature at Halfway Tree will not be quite the same as in Kingston: and the method of exposure may produce further difference: for while the thermometer screen is 4 feet above the ground at the Parade Gardens in Kingston and about 50 feet above sea level, it is above the roof of the buildings at Halfway Tree, 38 feet above the ground, and about 318 feet above sea-level.

But still we can ascertain the relations *inter se* of mean monthly temperatures, maxima, and minima.

The results for 1899, 1900 and 1901, are given in the following tables: they are highly satisfactory and the formula $\frac{A + B}{2}$ seems to give the mean monthly temperature with great accuracy.

The formula C, $\frac{7 \text{ a.m.} + 3 \text{ p.m.} + 11 \text{ p.m.}}{3}$, is not sufficiently accurate. It suits the barometer

exactly, that is to say to the nearest thousandth of an inch. (See W. R. No. 192, or rather, Table VIII. Errata, Vol. II); but it does not suit temperatures.

The formula D, has never been used by me: it has been adopted to a certain extent by the U. S. Weather Bureau.

* The instrument was read at 7 p.m. and 3 p.m. and the mean of the two readings was recorded for the day.

UNITED STATES STATION, HALFWAY TREE.

1900. Mean Temperature for each hour of seventy fifth meridian time.

Month.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Mid nt.	Means.												
* January	70.0	69.7	69.3	69.4	69.1	68.6	70.9	76.1	80.1	81.6	82.0	81.6	80.9	79.2	76.7	74.7	73.3	71.5	70.6	70.1	74.7				
February	69.9	69.8	69.2	69.1	68.6	68.6	68.5	71.6	76.8	79.8	81.4	82.7	83.3	83.0	81.8	80.5	78.6	76.4	74.5	73.0	71.2	70.1	75.1		
March	70.8	70.3	69.7	69.5	69.4	69.5	69.9	74.8	78.0	83.2	81.6	82.3	82.6	82.5	81.6	80.7	79.0	76.8	75.5	74.3	73.3	71.4	76.8		
April	72.1	71.5	71.2	70.9	70.8	70.4	71.6	77.3	80.2	82.0	83.1	83.5	83.5	82.5	82.3	81.2	79.9	77.7	76.2	74.9	74.0	73.2	72.6	76.9	
May	74.8	74.5	73.9	73.7	73.6	73.4	75.4	79.4	81.3	83.2	83.7	84.8	84.5	84.3	83.4	82.5	81.3	79.8	78.4	77.3	76.3	75.6	75.0	78.9	
June	74.2	73.9	73.8	73.7	73.5	72.9	75.1	80.0	83.1	85.2	85.9	86.4	85.4	84.3	83.5	82.1	80.8	79.9	78.4	77.2	76.2	75.6	74.9	79.1	
July	74.8	74.4	74.5	73.8	73.8	73.8	75.6	79.1	81.9	84.0	85.7	86.4	86.3	85.9	85.0	84.3	83.2	81.8	80.2	78.4	77.2	76.3	75.9	79.5	
August	74.8	74.2	73.9	73.7	73.2	73.0	75.3	79.8	83.7	86.4	87.3	87.6	87.3	85.8	85.4	84.2	82.5	80.5	79.0	77.5	76.4	75.9	75.0	79.9	
September	74.2	73.8	73.4	73.3	73.2	73.0	74.9	78.0	82.4	85.0	85.0	85.3	85.2	84.0	83.0	81.8	80.7	79.6	77.9	77.0	76.0	74.4	74.2	78.3	
October	73.0	72.7	72.6	72.0	71.9	71.8	73.9	77.5	82.1	84.4	85.2	85.4	84.6	82.6	81.6	80.7	78.8	77.2	76.5	75.6	74.7	74.1	73.6	77.6	
November	72.6	72.3	72.1	71.7	71.7	71.6	71.9	76.4	79.9	82.4	84.4	85.1	85.4	84.9	84.5	83.3	81.4	78.9	77.2	76.1	74.9	74.1	73.7	72.8	77.5
December	71.4	70.8	70.7	70.4	70.2	70.2	70.1	74.4	79.4	82.0	84.0	84.7	84.5	84.5	83.6	82.5	80.9	78.3	76.4	75.4	73.8	73.0	72.5	76.5	
Means	72.7	72.3	72.0	71.8	71.6	71.4	72.5	76.6	80.4	82.8	84.1	84.8	84.6	84.0	83.2	82.6	81.4	79.7	77.9	76.6	75.3	74.4	73.7	77.6	

Comparison of Formula.

Month.	Mean.	A.		B.		C.		D.		A + B.	
		M + m	1°	7am + 3pm	2	7 + 11	3	8am + 8pm	2	2	2
January	74.7	75.0	75.0	75.1	75.1	73.6	73.6	72.1	72.1	75.9	75.9
February	75.1	74.5	74.5	75.2	75.2	73.9	73.9	73.0	73.0	74.8	74.8
March	75.8	75.5	75.5	76.2	76.2	74.9	74.9	75.2	75.2	75.8	75.8
April	76.9	76.5	76.5	77.1	77.1	75.8	75.8	76.8	76.8	76.8	76.8
May	78.9	78.0	78.0	79.4	79.4	78.1	78.1	78.9	78.9	78.7	78.7
June	79.1	79.0	79.0	79.3	79.3	78.1	78.1	79.2	79.2	79.2	79.2
July	79.5	79.5	79.5	80.2	80.2	78.7	78.7	78.8	78.8	79.8	79.8
August	79.9	80.0	80.0	80.4	80.4	78.8	78.8	79.4	79.4	80.2	80.2
September	78.3	78.5	78.5	79.0	79.0	77.4	77.4	77.5	77.5	78.8	78.8
October	77.6	78.0	78.0	78.4	78.4	76.3	76.3	77.0	77.0	77.7	77.7
November	77.5	77.5	77.5	78.2	78.2	76.7	76.7	76.2	76.2	77.8	77.8
December	76.5	77.0	77.0	76.8	76.8	75.4	75.4	74.9	74.9	76.9	76.9
Means	77.5	77.4	77.4	77.9	77.9	76.6	76.6	76.6	76.6	77.6	77.6

* No returns for January, 1900. Mean for January 1899, taken.

UNITED STATES STATION, HALFWAY TREE.

1901. Mean Temperature for each hour of seventy fifth meridian time.

Month.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Mid nt.	Means.	
January	69.2	68.6	68.5	68.2	67.7	67.7	67.4	71.3	76.9	79.8	81.8	82.1	82.6	81.8	81.4	80.4	80.4	78.8	76.3	73.8	72.7	76.6	71.7	70.5	69.5	74.2
February	70.0	69.6	69.3	69.2	69.1	68.8	68.9	73.1	78.3	80.5	82.0	82.6	82.9	82.1	82.2	81.6	81.6	80.4	78.5	75.9	74.4	72.6	71.7	71.0	70.4	75.2
March	71.0	70.2	69.8	69.7	69.7	69.7	70.3	77.2	79.3	82.1	83.2	83.0	83.0	82.2	82.3	81.5	81.5	80.4	79.0	76.8	75.4	74.0	73.6	73.0	71.8	76.0
April	72.6	71.9	71.5	71.0	70.6	70.4	73.3	77.8	81.1	82.9	83.5	83.6	83.3	82.8	82.6	82.6	82.6	81.0	79.6	77.9	76.9	75.7	74.8	74.0	73.2	77.3
May	74.1	73.4	73.3	72.7	72.8	72.5	76.2	80.7	83.3	84.8	85.5	85.0	85.0	84.5	83.4	82.5	82.5	81.6	80.5	78.9	78.2	77.3	76.3	75.7	74.6	78.9
June	74.3	73.9	73.6	73.7	73.5	73.3	76.0	79.8	82.2	84.1	85.0	84.7	84.3	84.0	82.4	82.1	81.4	80.6	79.0	77.7	76.4	75.7	75.0	75.4	74.8	78.8
July	74.2	74.0	73.7	73.4	73.4	73.1	75.2	79.9	82.1	84.6	84.7	85.1	84.8	83.6	83.1	82.7	82.7	81.2	80.2	78.9	78.3	76.8	75.9	75.4	74.8	78.8
August	74.3	73.7	73.6	73.4	73.4	73.3	75.3	78.6	82.6	84.9	86.0	86.4	85.5	84.5	83.1	82.0	81.5	80.2	78.9	77.9	76.7	75.7	75.1	74.5	78.8	
September	74.6	74.2	74.0	73.7	73.3	73.1	75.1	78.2	81.8	83.4	84.0	84.2	84.1	83.4	82.3	81.3	80.5	79.3	77.5	76.9	76.1	75.5	74.7	74.3	78.3	
October	73.8	73.3	73.0	72.7	72.7	72.5	74.2	78.2	82.0	84.5	85.0	85.0	83.6	83.0	82.4	80.9	79.4	77.1	75.4	75.0	74.1	73.6	73.0	72.7	76.5	
November	72.5	72.2	72.3	72.0	71.9	71.5	72.6	76.9	80.1	81.7	82.9	83.3	83.2	82.1	81.4	80.6	79.0	76.1	75.4	74.8	74.3	73.5	72.7	72.0	71.8	75.7
December	71.3	70.7	70.6	70.9	70.6	70.2	70.9	74.5	78.5	81.4	82.6	82.7	82.9	82.2	81.3	80.6	78.9	76.0	74.8	74.3	73.5	72.7	72.0	71.8	75.7	
Means	72.7	72.1	71.9	71.7	71.6	71.3	73.0	77.0	80.7	82.9	83.8	84.1	83.8	83.1	82.3	81.6	80.5	78.7	77.1	76.2	76.0	74.2	73.6	73.8	77.9	

Comparison of Formula.

Month.	Mean.	A.		B.		C.		D.		A + B.	
		M + m	10	7 am + 3 pm.	2	7 + 3 + 11.	3	8 am + 8 p.m.	2	2	2
January	74.2	74.0	74.0	74.4	72.0	73.1	72.0	74.2	74.2	74.2	
February	73.2	74.7	75.6	74.0	73.8	74.0	73.8	75.2	75.2	75.2	
March	76.0	75.8	76.3	74.9	75.3	74.9	75.3	76.0	76.0	76.0	
April	77.3	76.9	78.0	76.7	77.4	76.7	77.4	77.4	77.4	77.4	
May	78.9	78.4	79.8	79.2	79.4	78.4	79.4	79.1	79.1	79.1	
June	78.6	78.8	79.2	79.2	78.8	77.8	78.8	79.0	79.0	79.0	
July	78.8	78.6	79.2	79.2	78.6	77.8	78.6	78.9	78.9	78.9	
August	78.3	77.8	78.7	78.7	77.8	77.8	77.8	78.2	78.2	78.2	
September	77.7	77.9	78.3	78.1	77.1	77.5	77.5	78.4	78.4	78.4	
October	76.5	76.6	77.0	77.0	76.0	75.7	76.0	76.8	76.8	76.8	
November	75.7	75.7	76.1	76.1	74.4	73.7	74.4	74.4	74.4	74.4	
December	77.2	77.2	77.6	77.6	76.2	76.2	76.6	76.6	76.6	76.6	
Means	77.2	77.2	77.6	77.6	76.2	76.2	76.6	76.6	76.6	76.6	

The results for 1900 and 1901 given in the above tables confirm those for 1899, and leave little to be desired. The formula $\frac{A+B}{2}$ gives the mean monthly temperature with an average error of $0^{\circ}2$ only, while the greatest error in any month during the two years is only $0^{\circ}5$.

We clearly cannot do better than adopt $\frac{A+B}{2}$ for any place in Jamaica; but A may be used alone, or B may be used alone, in case any instrument at any station was out of order for a short time. The rule is therefore:—add together the 7 a.m., 3 p.m., Max., and Min. temperatures; subtract 2° from their sum; and divide the remainder by four to get the mean temperature of the day. And by employing monthly means, we similarly get the mean temperature of the month.

As already stated it was at one time assumed that the mean temperature of the day would be given by $\frac{7 \text{ a.m.} + 3 \text{ p.m.} + 11 \text{ p.m.}}{3}$ and certain results were deduced and published in W. R. No. 123. We now propose to revise those results for Kingston and to extend them to the whole time the Weather Service existed, or rather to the complete years 1881 to 1898 inclusive.

Summary of Kingston Temperatures for each Year.

Year.	Mean.	7 a.m.	3 p.m.	Max	Min.	Highest Max. and date.		Lowest Min. and date.	
						°	°	°	°
1881	79.0	75.7	84.0	87.2	71.2	93.8	July 7	60.3	Jan. 13
1882	78.8	75.6	84.0	86.4	71.2	92.2	Aug. 27	61.5	Feb. 6
1883	79.0	75.6	84.1	86.8	71.5	93.3	July 28	63.6	Dec. 10
1884	78.5	75.3	83.8	86.3	70.7	92.7	Sep. 18	62.3	Feb. 7
1885	79.4	75.6	84.3	86.9	71.6	95.2	Nov. 6	58.2	Dec. 29
1886	79.5	75.6	84.5	89.0	70.9	96.4	Oct. 1	62.2	Jan. 26
1887	78.4	74.6	83.4	88.3	69.3	93.3	July 21	56.7	Dec. 4
1888	79.4	75.2	85.1	88.9	70.1	91.6	July 28	59.6	Jan. 5
1889	79.7	75.0	85.5	89.5	70.9	94.3	July 28	60.0	March 2
1890	78.2	73.1	84.1	87.9	69.8	94.4	July 31	60.2	Feb. 4
1891	79.0	74.1	84.7	87.5	71.5	96.7	Aug. 20	61.5	Jan. 27
1892	78.1	73.6	83.4	86.7	70.7	94.8	July 11	63.0	Feb. 2
1893	77.9	73.3	83.2	86.5	70.6	92.9	July 4	63.8	Mar. 17*
1894	78.0	73.7	83.3	86.7	70.3	92.9	June 22†	61.2	March 9
1895	78.6	73.7	84.3	87.5	71.0	94.6	Aug. 17	62.8	Dec. 21
1896	79.2	74.2	84.7	87.8	71.9	93.9	July 13	62.7	Jan. 15
1897	79.1	74.2	84.7	87.8	71.7	94.0	Aug. 9	62.0	Jan. 12
1898	78.2	73.3	83.8	86.9	70.7	93.5	Jan. 13	62.6	Nov. 12
Means	78.8	74.6	84.2	87.5	70.8	94.1	...	61.3	...

* And December 7.

† And July 17 and September 21.

Summary of the Kingston Monthly Temperatures.

Month.	Mean.	7 a.m.	3 p.m.	Max.	Min.	Average	Average
						Highest	Lowest
						Max.	Min.
January	75.8	68.9	83.1	86.1	67.0	90.1	62.8
February	75.7	69.4	82.7	85.6	67.0	89.3	63.2
March	76.4	71.3	82.8	85.6	67.8	89.3	63.9
April	78.2	74.9	83.3	86.3	70.0	90.1	66.6
May	79.9	78.1	83.7	87.0	72.5	90.2	68.9
June	81.1	79.1	85.2	88.2	73.7	91.8	70.4
July	81.6	79.7	86.4	89.5	73.4	93.4	70.4
August	81.0	77.6	85.7	89.5	73.4	92.6	70.2
September	80.7	76.9	85.2	89.2	73.5	92.3	70.7
October	79.3	75.6	84.5	88.0	72.4	91.8	68.8
November	78.6	73.4	84.3	87.9	70.7	91.1	66.6
December	76.9	70.7	83.3	86.7	68.4	90.5	63.7
Means	78.8	74.6	84.2	87.5	70.8	91.0	67.2

The first thing which attracts our attention is the break in the 7 a.m. readings in the first table; from 1881 to 1889 the mean is 75.75; from 1890 to 1898 the mean is 73.7. During the first nine years the screen was as well exposed as possible; during the last nine years the screen was moved to the Parade Gardens, which had been recently planted with ornamental shrubs of all kinds. Of late years these shrubs have grown into trees, and gave anxiety as to the exposure of the screen; but it appears that the exposure was bad at first, and has not become worse with the growth of the trees.

But it is to be noticed that the daily Maximum temperatures, which occur shortly after noon, are in no way affected by the ornamental shrubs or trees: the sun is then vertical or nearly so, and of course the screen is exposed to its full blaze; the same applies to the 3 p.m. readings; and again the Minimum readings have not been affected.

It is therefore to be hoped that the Mean temperatures are not greatly affected as computed by the formula $\frac{A + B}{2}$.

But when we look down the Maximum column we are surprised to find that the two lowest results occur in 1884 and 1893, near the times of the Sun-spot Maxima, and that the highest result occurs in 1889 at the time of the Sun-spot Minimum. These effects are reproduced in the mean temperature column; but without doubt we ought to look to the mean of the daily Maxima throughout the year to show any variation in the intensity of Solar radiation.

Now the connection between the Sun-spot period and the Rainfall in Jamaica* was shown by reducing the irregularities by taking the mean of any three years as the mean of the middle year; and applying this process to the mean Maximum temperatures we get the following table:—

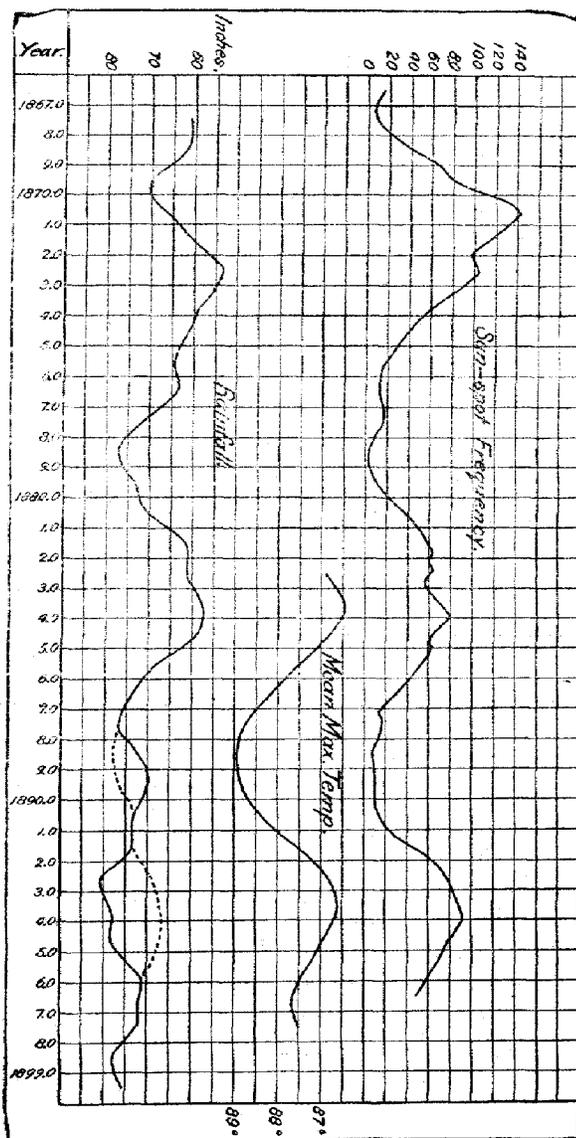
Mean Max. (smoothed) for middle of each year.

1882	...	...	86.8
1883	...	...	86.5
1884	...	...	86.7
1885	...	...	87.4
1886	...	...	88.1
1887	...	...	88.7
1888	...	...	88.9
1889	...	...	88.8
1890	...	...	88.3
1891	...	...	87.4
1892	...	...	86.9
1893	...	...	86.6
1894	...	...	86.9
1885	...	...	87.3
1896	...	...	87.7
1897	...	...	87.5

* *Nature*. Vol. 49, p. 399

The following diagram gives the curves of Sun-spot frequency according to Wolf (*Nature*, Vol. 58, p. 80), of Mean Max. temperatures in Jamaica, and of the Jamaica Rainfall.

It will be noticed that the agreement between the first and second curves is remarkably close, and that there are about 2° in mean Max. temperature between the Solar Max and Min.



In the Rainfall curve irregularities will be noticed near the dotted curves; from the middle of 1887 to the middle of 1890 the rainfall was less than it should have been; and from the middle of 1891 to the end of 1892 it was greater than it should have been.

Attention is strongly called to these irregularities because in 1892 it was assumed that the curve would recover its position, and a smaller rainfall for the next few years was predicted; but 1893 proved unusually wet, giving the smoothed max for the middle of 1892.

The following table gives the Rainfall in Jamaica from about 90 Stations :—

Year.	Rainfall In.	Smoothed. In.	Year.	Rainfall. In.	Smoothed. In.
1866	53.65		1884	56.90	58.67
1867	64.47	61.95	1885	59.86	69.12
1868	67.74	62.53	1886	90.61	73.71
1869	55.37	70.85	1887	70.66	77.79
1870	89.43	64.96	1888	72.11	72.31
1871	50.04	61.57	1889	74.15	70.23
1872	45.18	52.78	1890	64.42	74.42
1873	63.06	59.06	1891	84.70	74.03
1874	66.94	61.47	1892	72.98	81.39
1875	52.42	64.24	1893	86.49	78.29
1876	71.25	64.06	1894	75.39	77.83
1877	63.40	72.06	1895	71.62	71.87
1878	76.42	77.89	1896	68.61	72.61
1879	88.84	73.57	1897	77.59	73.35
1880	55.44	70.96	1898	73.84	79.08
1881	63.60	60.64	1899	85.82	76.44
1882	57.87	61.91	1900	69.65	
1883	59.26	58.01	1901		

Montego Bay,
Jan. 17th, 1902.

MAXWELL HALL.