	Monthly precipitation in centimeters.	Number of days without rain.	Average daily evaporation in centimeters.	Amount of wind in kilometers. Daily average.	Extreme wind velocity in meters per second.	Average humidities by months.	Maximum temperature in each month. Degrees C.	Minimum temperature in each month. Degrees C.
1919.								
January	1.46	22	0.22	474	19.7	82	27.9	3.8
February	10.22	9	.18	506	21.5	83	23.2	1.4
March	5.22	17	.23	449	16.1	88	29.0	11.0
April	22.16	12	.36	484	32.2	86	32.1	12.1
May	10.58	17	.45	423	22.3	82	32.2	16.3
June	29.70	8	.55	397	29.5	86	33.2	23.0
July	21.01	19	.63	438	24.1	84	34.3	25.0
August	23.20	18	.58	484	29.5	79	35.4	23.4
September	3.84	22	.50	364	24.1	76	32.8	20.5
October	7.54	23	.47	401	18.8	81	31.8	12.4
November	7.12	23	.40	439	15.7	71	29.4	5.4
December	4.11	27	.33	529	25.0	71	22.4	4.9
Totals and averages	146.16	217	.41	451	.....	80.7	35.4	1.4
1920.								
January	0	31	.30	484	24.1	65.0	23.5	2.1
February	26.50	12	.16	555	21.5	86.0	26.3	6.3
March	10.28	13	.22	417	21.5	86.0	28.4	8.0
April	34.96	10	.30	384	27.3	86.0	28.7	14.4
May	37.76	14	.40	414	32.2	86.0	32.0	20.0
June	24.80	12	.53	385	26.8	85.3	33.2	21.6
July	50.32	11	.60	525	24.6	83.5	35.7	24.2
August	54.65	11	.47	364	24.6	91.0	33.5	23.1
September	12.66	14	.51	346	24.1	80.0	33.7	22.5
October	3.48	23	.35	389	17.9	70.0	33.0	16.3
November	11.66	20	.36	392	18.8	76.0	29.6	12.4
December	5.73	20	.21	462	23.2	79.0	29.5	7.6
Totals and averages	272.80	191	.37	426	.....	81.1	.....	.....

For many of the items two years' observations do not seem to be sufficient upon which to base a description of the climate, but many interesting points may be noted. The rainfall for 1920 was almost twice as great as for 1919, and this seems to be due to a larger precipitation in almost every month, to longer rains, and more rain per day. We have no way to ascertain which is nearer the average for Canton. January of the second year had absolutely no rainfall, and of the first year had 1.46 cm., distributed over nine days. There seems to be a definite seasonal distribution of the rainfall. October, November, December, and January had a total of 95 days of no rain in 1919 and of 94 days in 1920, while the four months April, May, June, July had 56 and 47 days with no rain in their respective years.

While many days had only a small fraction of a centimeter of rainfall, several days had a very heavy fall. In 1919, 11 days had over 2.5 cm. and 1920 had 34 similarly rainy days. These days are scattered all through the year from February to November in each case. December and January are the dry months, also the months with no heavy rain. The heaviest one-day precipitation fell on July 19 in the second year, when 26 cm., or over 10 inches, was recorded. No other day in the whole period attained quite half this record. While the more rainy months and all the heavier rains come during the season of the southeast monsoon, yet the rainest day came when the wind was from the west. Of the eight heaviest rainy days, four had east winds, one north wind, two south winds. These heavy rainy days are frequently preceded and followed, within a day or two, by wind from the same direction with no rainfall.

Although there is a rather distinct rainy and dry season, the sunshine recorder, which operated about 16 months out of the two years, never showed a full day of sunshine. Eleven hours was occasionally exceeded, but usually only a few days in the month had sunshine more than six hours. The summer and early fall seem to be the sunniest times. One September had 22 days in which the sun shone over six hours. The Octobers had 14 and 16 such days, the Novembers had 8 and 7 such days, and the Decembers, 13 and none. In 1920, February had 24 days with no sunshine, March 20 days and April 10, while July had 23 days with over six hours sunshine and still had over 50 cm. of rainfall. Mornings and evenings banks of stratus clouds are common, and through all the warmer weather the cumulus cloud is very common.

The humidity figures given in the table indicate the subtropical monsoon conditions, and the average relative humidities for the two years are only 0.4 per cent apart, in spite of the fact the more humid year had twice as much rainfall. Only twice in the two years did the humidity for a day fall below 50 per cent. Those were days in December and January. This humidity is determined by averaging three readings, taken at 7, 1, and 6 o'clock. Ten months out of the 24 had at least one day with an average humidity between 50 per cent and 60 per cent, and these are scattered well through the years—January, 2; May, 1; September, 1; October, 2; November, 2; December, 2. Several days carried an average humidity for the day of over 96 per cent. The mean daily evaporations for the two years are 0.41 cm. and 0.37 cm., respectively, although the daily average for February fell to 0.18 and 0.16 cm., respectively, and in July it rose to 0.63 and 0.60 cm., respectively. There is here a reflection of the temperature, but not of the humidity or monsoon wind effect.

The wind direction is apparently the normal monsoon. In October, November, December, January, and February it is very constantly from the north, while in April, May, June, July, and August it is pretty steadily between south and east. While the direction is fairly constant, the velocity varies greatly. The maximum velocities observed run from 15 or 16 meters per second in October and November to 32.2 meters per second in April and May. The instruments have recorded the amount of wind in kilometers per day. Eleven days in the two years have to their credit over 1,000 km. of wind, and one of these exceeded 1,400 km. These days of heavy wind fell two in January, one in February, two in July, three in August, and three in December. The lowest amount of wind recorded was 117 km. on June 28, 1920. On November 9 of the same year none was recorded at all, and the maximum velocity that day was 2.2 m. per second. Such a day in November would be very comfortable, but the one in June must have been as sticky as a glue pot.

The maximum, minimum, and range of temperatures as shown in the above tables are about what would be expected in a subtropical climate. It is earnestly hoped that this excellent piece of work carried on by the college will be continued for many years to come and that the results will have a wide circulation for the observatory is very completely equipped and the observers are careful and competent.

CLIMATIC FEATURES OF SANTOS, BRAZIL.

[Abstracted from report furnished by U. S. Vice Consul Herndon W. Goforth, Santos, Brazil, Jan. 20, 1922.]

Inasmuch as Santos is the greatest coffee port in the world, Brazil's leading export center, and a popular place of residence (population over 100,000), the following notes on the climatic features may be of some interest:

Santos is on the island of São Vicente, immediately off the coast of Brazil, 200 miles southwest of Rio de Janeiro. The chief part of the city is but 7 feet above mean sea level.

"The entrance to São Vicente for vessels from the open sea is through a strait, perhaps 5 miles in width, formed by the headlands, several hundred feet high, of two adjacent islands which extend several miles farther seaward than does São Vicente. Behind the city on the north, and also on the east and west sides, at a distance of less than 10 miles, is the Serra, a chain of mountains about 3,000 feet in altitude. * * * Santos is therefore entirely surrounded by mountains except for the 5-mile strait to the south."

"The climate [weather] of Santos is largely a matter of how the wind blows. In general, if the wind is overland from the northwest, the temperature steadily rises until it occasionally reaches or even exceeds 100° F. This 'norwester' sometimes continues for several days, but more often a single day or a few hours is sufficient to raise the temperature in the basin, or low-lying portion of the island, to a height sufficient to cause the cool air from the sea to rush in through the strait with hurricane force, drive the heated air upward and over the mountains, lower the temperature in the city, and bring a deluge of rain in its wake. It is not a rare occurrence to have several storms of this kind within 24 hours, although during the cool season they are not so frequent and two or three weeks of rainless weather may intervene."

The subjoined tables of temperature and precipitation need little explanation. It will be noted that the hot season extends from December to February, inclusive, and the cold season from June to August, inclusive. The mean temperature of the coldest month (July) is only about 15° F. lower than the mean of the warmest month (January or February). In general, temperature conditions are not very sharply defined by months. The extremes of temperature so far recorded are 38° and 105° F., respectively.

Rainfall seems to be even more variable, the annual amounts ranging between 50 and 110 inches, with a mean of about 77 inches.

The author further remarks: "Since the climate of Santos is extremely damp, there being occasional periods of as long as 10 days without sunshine, shoes and other articles of clothing mold badly unless frequently aired and sunned. The prevention of rust on all articles of metal is extremely difficult. Nickeled ware usually does not withstand the humidity, as the nickel almost always peels. Complaint on the part of local merchants is frequently heard to the effect that the tin containers used for packing certain goods imported from the United States, such as fruits and fish, become so rusty as to greatly injure the sale of the article. American chocolates are not carried in stock at Santos, since it has been found that they do not withstand the climate long enough to permit of being sold. Special packing, and in some cases a difference in the preparation of the article itself, is therefore a requisite to success in establishing the sale of certain kinds of American goods."

TABLE 1.—*Mean annual temperature and rainfall at Santos, Brazil, for the 10-year period 1911–1920.*

Year.	Temperature.	Rainfall.	Year.	Temperature.	Rainfall.
	°F.	Inches.		°F.	Inches.
1911	69.4	109.8	1917	66.0	88.4
1912	69.6	85.9	1918	69.3	75.6
1913	70.7	80.0	1919	69.6	78.6
1914	70.5	51.3	1920	69.6	84.0
1915	70.3	65.6			
1916	68.9	55.7	Mean	69.4	77.5

TABLE 2.—*Average monthly temperature and rainfall at Santos, Brazil, during 1916 and 1918.*

	Temperature.		Rainfall.	
	1916	1918	1916	1918
	°F.	°F.	Inches.	Inches.
Summer:				
December	76.5	76.3	9.2	6.0
January	76.3	76.8	4.1	5.8
February	75.9	77.2	5.5	4.8
Mean	76.2	76.8	6.3	5.5
Fall:				
March	75.0	77.0	11.9	9.9
April	72.1	74.7	7.8	6.6
May	69.4	70.7	5.7	11.6
Mean	72.2	74.1	8.5	9.4
Winter:				
June	68.9	65.7	3.7	5.0
July	65.3	61.7	1.5	5.4
August	63.9	62.6	1.7	2.9
Mean	66.0	63.3	2.3	4.4
Spring:				
September	69.1	66.4	2.4	3.0
October	68.9	67.7	9.9	6.5
November	74.3	73.4	4.7	9.6
Mean	70.8	69.2	5.7	6.4
Year	71.3	70.9	68.1	77.1

TABLE 3.—*Monthly rainfall at Santos, Brazil, July 1, 1920–June 30, 1921.*

Month.	Inches.	Month.	Inches.
1920.		1921.	
July	3.45	January	10.61
August	3.23	February	22.92
September	6.52	March	7.27
October	4.88	April	8.75
November	8.55	May	1.19
December	4.50	June	2.86

Total for 12 months=84.73 inches. The annual average is 96.34 inches.