

obscuration, as was predicted, the limb of the sun is cooler than its center, as we have abundant reason to suppose.

At the New York Meteorological Observatory, Central Park, New York City, where the eclipse was very nearly

total, the radiation at the time of maximum obscuration was almost negligible. It did not exceed 0.002 gram-calories per minute per square centimeter or about 1 per cent of the radiation intensity we would have expected had there been no eclipse.

SPECIAL AEROLOGICAL OBSERVATIONS DURING THE SOLAR ECLIPSE OF JANUARY 24, 1925

By L. T. SAMUELS

[Weather Bureau, Washington, D. C.]

Instructions were issued to the six aerological stations to begin their kite flights on this day in time for the kites to attain their greatest possible altitude from one-half to one hour before the eclipse began. This altitude was to be maintained as nearly constant as possible until an equal lapse of time after the eclipse had ended. In addition to the single Marvin meteorograph which is ordinarily placed in the first kite a second instrument of the same type was placed in the last kite in order to obtain a record of conditions nearer the ground as well.

The fact that this eclipse occurred so near the time of sunrise at these stations, however, rendered the observations far less satisfactory than if it had taken place several hours later in the day. Another unfortunate circumstance was the fact that none of the stations lay in the path of totality.

The records from Ellendale, N. Dak., and Groesbeck, Tex., are the only ones which contain any evidence of a probable positive nature. The table given contains data which were obtained by the instrument in the last kite or that nearest the ground at each of these stations.

The fall in temperature at Ellendale is rather striking, since it occurs with very little change in altitude and coincides with a retardation in the ordinary diurnal temperature rise at the surface. It seems significant

that, as indicated in the table, there was an almost complete recovery of temperature at this station within a short time following the eclipse. It is interesting also to note in this connection that the corresponding change in relative humidity is not as great as such a temperature change demands, providing the absolute humidity remains unchanged. In this case, however, the latter apparently decreased considerably.

	Time, a. m.	Altitude	Temperature	Relative humidity	Vapor pressure	Wind direction	Wind velocity
		m.	° C.	Per cent	mb.		m. p. h.
Ellendale, N. Dak.-----	8:02	495	-2.2	70	3.75	WNW--	11.3
	8:39	533	-7.0	72	2.45	WNW--	10.8
	9:14	557	-4.7	73	3.02	WNW--	11.3
Groesbeck, Tex.-----	7:46	683	8.5	33	3.66	W-----	10.8
	8:08	741	9.0	25	2.87	W-----	10.4
	8:48	752	8.1	28	3.02	W-----	10.4

At Groesbeck a fall in temperature is also noted, although of lesser magnitude. At this station, however, the surface temperature dropped about 1° F. during the maximum phase of the eclipse, shortly after it had started upward in its ordinary diurnal march.

The degrees of totality at Ellendale and Groesbeck were 95 per cent and 65 per cent, respectively.

METEOROLOGICAL CONDITIONS ON BAKER AND HOWLAND ISLANDS

[Extracted from a report by Walter G. Ramsay, Weather Bureau Office, Honolulu, Hawaii]

A scientific expedition under the auspices of the Bernice P. Bishop Museum of Honolulu, Hawaii, visited Baker and Howland Islands the latter part of September, 1924, for the purpose of collecting specimens of plant and animal life for study. These islands belong to the United States and are situated near the Equator in about 178° west longitude.

Mr. Walter G. Ramsay of the Honolulu office of the United States Weather Bureau, accompanied the expedition as meteorologist, detailed to make surface and upper-air observations. The expedition left Honolulu on board the U. S. S. *Whippoorwill* September 15 and returned October 7. One day was spent on Baker Island, and three days on Howland Island, the latter being the larger of the two.

The following excerpts (certain changes having been made in the sequence of the items), are taken from Mr. Ramsay's report to the Bishop Museum:

Observations of wind directions and velocities taken by ships in the vicinity of these islands during the past few years, and tabulated by the United States Weather Bureau, indicate that the two islands are practically between the northeast trades and southeast trades. During the months June to November, inclusive, when the northeast trades are farthest north, the islands are on the edge of the southeast trade winds; during December to May when the northeast trades are closest to the Equator, they are on the edge of the northeast trades. At no time of year are they in the so-called

doldrums, or belt of equatorial calms. In fact, the doldrums do not seem to exist as far west as these islands.

At all times of year, whether under the influence of the northeast or southeast trades, the prevailing direction of the wind in this vicinity is east, with a northerly tendency in the former case, and a southerly in the latter. The maximum velocity varies from 15 to 25 miles an hour, with comparatively few calms each year.

On the recent trip to these islands the wind was found to be comparatively steady both as to direction and force. The prevailing direction was slightly south of east during the daytime, and is believed to have veered somewhat at night, shifting to southwest for a short time. The highest velocity was attained during midafternoon, and was about 15 miles an hour. Shortly before sunset the wind died down, the velocity remaining low until shortly after sunrise, when it again increased to its usual velocity of 8 to 10 miles an hour.

As the accompanying tables of temperature readings show, there was quite a large daily range between maximum and minimum temperatures, on Howland Island. As no maximum or minimum thermometers were carried on the expedition, it is impossible to state exactly either the maximum or minimum temperatures. However, the observer feels positive that the maximum and minimum temperatures as estimated are conservative rather than extreme, and are not in error more than half a degree. From them the range is seen to be 16° or 17°. This is not what was expected. At Honolulu the range is seldom more than 9° or 10°, and as these islands are quite small it was not expected that there would be more than 6° or 8° difference in temperature between night and day readings. The temperature of the water, probably, does not vary more than 2° or 3°. It would seem that the coral sands of which the island is composed quickly absorb considerable heat during the day, raising the daytime temperature, and once the sun has set quickly radiate their heat, lowering the temperature during the late night.

TABLE 1.—Weather conditions, Howland Island, September 26–27, 1924

Time	Temperature	Humidity	Wind	Velocity	Clouds
Sept. 26 ¹ 6:00 a. m.	82	74	SE-----	mi. per hr. 10	4 Ci. SW., 2 Ci. St. SW., 1 Cu. E.
8:00 a. m.	86	64	E-----	8	7 Ci. SW., 1 Cu. E.
10:00 a. m.	90	56	E-----	8	8 Ci. St. SW., few Cu. E.
11:00 a. m.	92	57	E-----	10	7 Ci. St. SW., few Cu. E.
12:00 noon	90	56	E-----	8	3 Ci. St. SW., 1 Cu. E.
2:00 p. m.	92	55	E-----	10	1 Ci. St. SW., 1 Cu. E.
4:00 p. m.	86	66	ESE-----	10	3 Ci. S., 1 Cu. NE.
4:30 p. m.	84	69	ESE-----	10	4 Ci. S., 1 Cu. E.
5:00 p. m.	82	72	ESE-----	10	2 Ci. SW., 1 Cu. E.
6:00 p. m.	80	75	ESE-----	6	5 Ci. SE., 1 Cu. E.
Sept. 27 ² 6:00 a. m.	79	86	SE-----	2	6 Cu. SE.
6:30 a. m.	82	76	E-----	4	5 Cu. SE.
7:00 a. m.	82	78	E-----	4	2 Cu. E.
8:00 a. m.	86	75	E-----	6	2 Cu. E.
9:00 a. m.	88	77	E-----	6	2 Cu. E.
10:00 a. m.	90	78	E-----	6	1 Cu. E.
11:30 a. m.	94	61	E-----	6	3 Cu. E.
12:00 noon	94	66	E-----	8	4 Cu. E.
2:00 p. m.	88	72	E-----	8	2 Cu. E.
4:00 p. m.	86	70	E-----	8	1 Cu. E.

¹ Maximum temperature for the day, estimated, 93°; minimum, estimated, 78°. No rain fell on island, but several rain squalls occurred over the ocean in the near vicinity.

² Maximum temperature for day, estimated, 95°; minimum temperature, estimated, 78°. No rain fell on the island, but there were several rain squalls during the night over the surrounding ocean.

Cloudiness was greatest on the islands during the night, and least in the early afternoon or late morning. About 4 o'clock in the afternoon the clouds—huge, towering cumuli—began to form, and by sunset a considerable portion of the sky was covered with them. Shortly after sunrise they disappeared, somewhat, so that during the day what clouds there were were small. Considerable cirrus cloud was observed at times during the stay on the islands. The lack of cloudiness during the day was another point in which actual conditions showed themselves to be different from expected conditions.

Humidity variation was not very great, as the table shows, the highest reading, of course, being at night and the lowest during the early afternoon. Far lower humidity was found to prevail on the island than had been expected, however. During the stay on the islands no rain fell. From the appearance and scantiness of the vegetation it is doubtful if as much as 3 inches of rain falls on the islands in a year. However, this is nothing more than a guess, there being nothing tangible on which to base a conclusion.

From the 14 observations of upper-air wind directions and velocities very little could be learned. The balloons were carried away too quickly to be followed for any great length of time. In addition it is thought that water vapor in the lower air, caused by evaporation from the ocean's surface, caused a hazy condition which interfered materially with the observation of the balloons. The highest altitude reached with a balloon was 2,320 meters (7,612 feet), at which altitude the direction of the wind was 83°,

[north being 0°] compared with 85° at the surface; the velocity was 9.8 meters per second (22 miles an hour). The highest velocity encountered during any of the balloon observations was 17.6 meters per second (39 miles an hour). This was found at an altitude of 1,680 meters (5,512 feet).

TABLE 2.—Average velocity and direction of wind at various altitudes, Howland Island, September 26, 27, 1924

Minutes of observations	Altitude Meters	Velocity m. p. s.	Direction (north=0°)
0	0	3.7	90
1	192	9.6	100
2	368	9.2	101
3	544	9.3	101
4	712	9.8	99
5	880	10.4	98
6	1,040	9.7	96
7	1,200	10.9	93
8	1,360	10.6	100
9	1,520	10.8	98

Two facts of interest were gathered from the balloon observations: First, that the velocity of the balloon at the end of the first minute of observation, when about 190 meters (623 feet) above the surface was considerably greater than the velocity at the surface. An outstanding example of this was the first observation made, with a velocity at the surface of 3.6 meters per second (8 miles an hour) and a velocity at the end of the first minute of 14.0 meters per second (31 miles an hour). The average velocity of the wind at the surface for the 14 observations was 3.7 meters per second (8 miles an hour) and at the end of the first minute it was 9.6 meters per second (22 miles an hour). In most cases the velocity at the end of the second minute was somewhat less than at the end of the first. The second point in the balloon observations worthy of note was the steadiness of direction of the wind. At all times throughout the course of the balloons' flights the wind blew from a point within a few degrees of east. During the course of any one balloon flight the direction of the wind at various altitudes varied, on an average, only 7°. The greatest variation in any one run was 19°. Although no definite tendency of the wind in the course of the flights either to veer or to back can be claimed, the wind backed in more cases than it veered. That is (see table) starting with a surface wind from 90°, at the end of the first minute it had veered to 100°; at the end of the second it had veered to 101°; at the end of the third it was 101°; and then it commenced to back, first 99°, then 98°, next 96°, and so on.

Conditions as found on the islands might be summed up thus: Maximum temperature, about 94°, minimum about 78°; humidity comparatively low; wind, prevailing from the east, varying slightly during the daytime and backing to southwest for a short time at night; highest velocity about 15 miles an hour in early afternoon, falling to 3 or 4 miles an hour at night; sky partly cloudy to cloudy at night, and from 8 in the morning until 4 in the afternoon, clear, with only small clouds floating by; barometric pressure quite constant, varying only diurnally.

A 55-YEAR RECORD OF RAINFALL IN BERMUDA

Mr. William H. Potter, of Washington, D. C., has very kindly taken the trouble to compile and send to the REVIEW a valuable record of Bermuda rainfall, which we are glad of having the opportunity to make available in permanent form. The following explanatory notes are quoted from Mr. Potter's letter accompanying the record:

The records from 1870 to 1896 inclusive were copied from those published in the Bermuda Almanack of current dates and were taken by a Mr. Gosling. The records seem to have been carefully taken and show no great discrepancies. The amounts seem a little large in comparison with the later records, but I think they are fully as reliable as any old records taken by an amateur. The records from 1897 on were taken from those of the Prospect Ob-

servatory as published in the Colonial Blue Book, but supplemented in a large part by personal investigation of the original records. * * * No attempt has been made at the Observatory to make and keep a summarized record of the observations. * * *

There have been other records of rainfall in Bermuda, some taken by the Royal Engineers from 1855 to the eighties but not consecutively; another set, 1855 to 1862, by the Navy at the dockyard, but neither of these sets seems to me to be very reliable.

The importance of the records I am sending lies in the fact that they are taken in a spot on the globe where it is practically impossible to get records within about 700 miles in one direction and much farther in the others, and my object in sending them * * * is to have them placed on record permanently * * * for the sources from which I compiled them are scattered and difficult to get at.