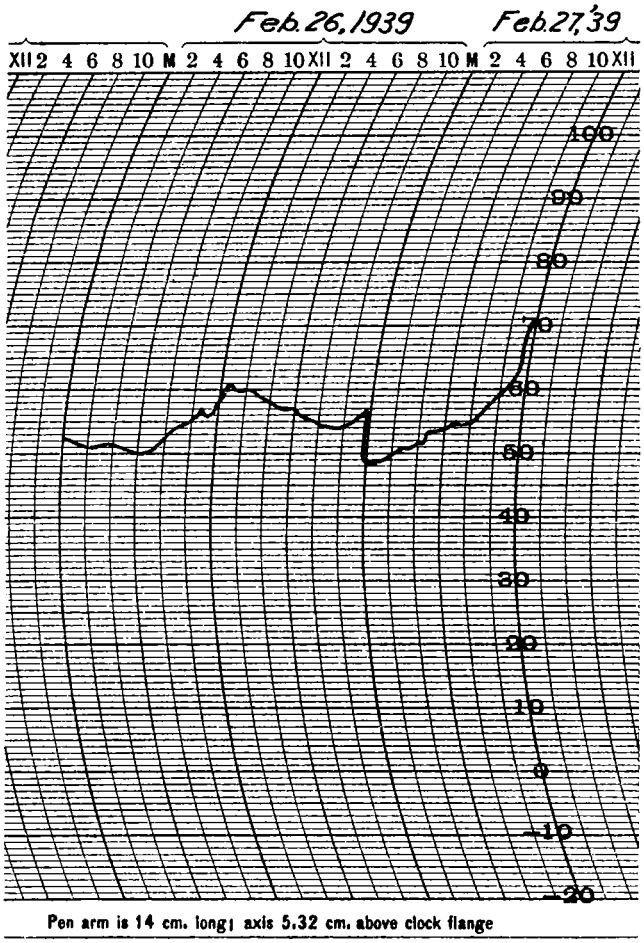

FIGURE 3.—Thermogram, New Orleans, La., February 26-27, 1939.

Maximum wind velocities varied considerably over the path of the storm and at most places were quite gusty, lasting only a very few minutes generally, and wind directions, for the most part, made very rapid shifts. However, little tornadic tendency was noted. The wind direction at the Weather Bureau, New Orleans, was easterly at the beginning of the hail, 11:30 p. m., but shifted to west and southwest at 11:39 and remained from that quadrant for 5 minutes, then shifted to easterly for 3 minutes, again to westerly for 4 minutes and at 11:52 returned to easterly.

The maximum 5-minute velocity recorded at New Orleans was 25 miles per hour from the southwest at 11:40 p. m., during which time an extreme velocity of 32 miles per hour occurred. Much higher extreme and maximum 5-minute velocities evidently occurred in some other sections of the storm area. A 90-mile gust (uncorrected) was recorded by the anemometer atop the Huey P. Long bridge across the Mississippi River, a short distance upstream from New Orleans, at an elevation of 265 feet above sea level.

Damage in the storm area, outside of the city of New Orleans, from both hail and wind, is estimated to be $50,000, consisting chiefly in loss of crops, buildings, and trees. In and around New Orleans it is estimated that the damage was at least $150,000; many buildings, trees, plate-glass windows, and signboards were either partially or totally destroyed. A 210-foot steel radio tower which was designed to withstand a 70- to 75-mile gale, was blown to the ground. Most damage was done by hail to flowers, shrubs, tender trees, truck crops, automobile tops, and house roofs. Some damage by rain and hail was also done to contents of buildings from which roofs had been totally or pratially removed by the wind.

The photograph, shown as figure 4, was taken at Prytania and Harmony Streets in New Orleans, near the end of the storm. (Photograph by the New Orleans States.)

THE MACGREGOR ARCTIC EXPEDITION TO ETAH, GREENLAND, JULY 1, 1937 TO OCTOBER 4, 1938

By CLIFFORD J. MACGREGOR

[Weather Bureau, Horseheads, N. Y., March 1939]

Plans were made during the Second International Polar Year to have the United States reoccupy Fort Conger, Ellesmere Island, Canada, for the purpose of meteorological, magnetic, and auroral observations. The United States was unable, however, to carry out the full program outlined by the Commission, and therefore no station was in operation in Ellesmereland or North Greenland, leaving a large blank area on the charts. During the writer's stay at Point Barrow, Alaska, for the Polar Year, he decided to reoccupy Fort Conger as soon as the necessary arrangements could be made; and in the fall of 1936 the organization of this trip became possible.

In the spring of 1937 a three-masted schooner, well constructed for use in the polar ice, was purchased in Newfoundland, and brought to Port Newark, N. J., where new motors were installed, and the ship reconditioned for the expedition, with new lines, rigging, sails, cabins, and internal bracing.

Leave of absence was obtained from the United States Weather Bureau for the purpose of leading the expedition. Personnel was secured for the special work to be done, such as magnetic and airplane surveying, making a total of 10 members.

The expedition had four main objectives:

1. To collect weather data from the Polar Basin, with especial reference to the effects of conditions in the polar regions to the formation of polar air masses and the weather of lower latitudes.
2. To make a magnetic survey for the Carnegie Institution of Washington.
3. To photograph the aurora borealis and study its effects upon radio transmission.
4. To explore the Polar Basin northwest of Ellesmereland, Canada, in order to clear up the question of Crocker Land which Peary placed on the maps more than 30 years ago and which we found to be nonexistent. At the same time a study was made of the customs and mode of life of the Polar Eskimo, and of the wildlife.

The United States Weather Bureau, the Julian P. Friez Co., and the Weston Electrical Co. supplied the necessary meteorological instruments, and the American Oxygen Co. of Harrison, N. J., provided the hydrogen for inflating the balloons. The Monroe Calculator Co. loaned an adding machine; and most of the records were compiled in the field. Electric current was supplied by Exide batteries, kept charged by small windchargers.

NARRATIVE

The expedition set sail from Port Newark, N. J., on July 1, 1937, for Lunenburg, Nova Scotia, where a week was spent in adjusting the radio and loading the balance of supplies and instruments. After leaving here a supply of fresh water and fruits was secured at Sydney, Nova Scotia, and the ship was headed for the Straits of Belle Isle, where a severe gale and fog were encountered. At midnight, the Battle Harbor light was cleared, the last light that would be seen for over a year, and the ship headed north-northeast for the coast of Greenland under full sail, dodging icebergs and floe ice. After arrival off Greenland 60 hours later, the wind died away, and the motors were used while heading north for Idglorsuit, Greenland, where dogs and fresh water were secured. After departure from Idglorsuit, on August 15, 1937, as many as 2,000 icebergs could be seen at one time; and from here on the ship encountered much ice in Baffin Bay.

At the lower end of Robertson Channel, in latitude 80°15′ N., we were stopped by a wall of ice 15 feet thick. Unable to proceed farther, we tried to seek shelter in Ellesmere Island only to find the whole coast blocked with ice. We therefore drifted south along the Greenland coast; it was necessary to get into winter quarters as soon as possible, because new ice was already forming, and there was danger of becoming frozen in. We arrived in Foulke Fiord, August 31, 1937. The charts showed 40 feet of water, and the ship drew only 12 feet, but much to our surprise we soon saw rock a few feet below the water, and the next thing we knew we were on the rock. The tide went out and left the ship high and dry, but by unloading part of our supplies we were able to refloat at the next high tide. However, a severe storm blew the ship out to sea, the anchors being unable to hold on the rocky bottom. After two days we were able to get back to Reindeer Point, Greenland, near Etah. One of the motors was damaged in the storm, putting such a load on the other motor that it exploded and set fire to the ship. Once back in the harbor, we found that most of the supplies were under water, as a 10-foot tide ebbed and flowed there.

The ship was unloaded, and work started on the building. Observations were begun September 8, 1937. The instrumental equipment included barometers, barograph, thermometers, thermograph, triple register, shelter-sling psychrometer, rain-gage, sunshine recorder, theodolite and balloon equipment, and also an aerometeorograph which, however, we were unable to use. All observations were made on 75th meridian time, to conform with observations made in the United States. Observations were made hourly; and coded reports transmitted daily to the United States by our own radio, and then sent by land line to the United States Weather Bureau at Washington. Pilot-balloon observations were made twice daily except during December and January. All observations were continued until the hour of sailing, July 7, 1938.

On the trip homeward, the Baffin Bay ice jam held the ship for 6 weeks; and it was not long before we discovered that the severe winter had crippled the vessel more than we had expected. Several seams had opened up, and constant pumping was required during the last 10 days before we reached St. John's, Newfoundland, where repairs were made. On the voyage to New York, we encountered the tropical hurricane that moved up the Atlantic coast in September, 1938, and lost the forecastle. We came into New York after being out 15 months and 4 days.

It is hoped that similar observations may be conducted in the near future at some point farther to the west, perhaps in northern Alaska or in Banks Land or Victoria Land, to obtain further data to aid in the study of the polar air masses that often pour down over the United States.

SUMMARY OF SURFACE METEOROLOGICAL DATA

Monthly meteorological summary, Etah, Greenland Station

[Latitude 78°20′ North, longitude 72°42′ West]

SEPTEMBER 1937

Date	Temperature, °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.[*]	Local noon	P. M.[*]	Total	Snowfall, p. m. to p. m.[*] (unmelted)		
							In.	*In.*		
9	32	20	26	81	70	68	0.00	0.0	--------	
10	26	20	23	88	82	93	.00	.0	N	
11	32	22	27	94	72	61	.00	.0	N	Clear.
12	32	21	26	82	76	81	.00	.0	NE	Cloudy.
13	33	20	26	75	78	76	T	T	E	Cloudy.
14	33	30	32	88	73	73	.00	.0	NESE	Cloudy.
15	30	25	28	76	88	74	.00	.0	E	Cloudy.
16	25	19	22	78	67	64	.00	.0	E	Clear.
17	27	19	23	72	75	72	T	T	E	Clear.
18	32	17	24	72	77	70	.00	.0	NE	Clear.
19	31	24	28	77	80	88	T	T	SW	Cloudy.
20	28	22	25	97	93	92	.01	.0	SW	Cloudy.
21	29	22	26	78	83	85	.01	.1	W	Cloudy.
22	34	21	28	67	58	49	.00	.0	N	Pt. cloudy.
23	34	25	30	43	46	58	.00	.0	SW	Clear.
24	34	27	30	56	60	58	.03	.3	SE	Cloudy.
25	29	26	28	75	94	89	.21	2.1	SE	Cloudy.
26	27	25	26	68	70	69	T	T	SE	Cloudy.
27	29	19	24	84	70	73	.03	.3	SE	Cloudy.
28	19	12	16	78	76	73	.01	.1	N	Cloudy.
29	18	10	14	69	63	86	.00	.0	NW	Cloudy.
30	32	15	24	48	54	73	.00	.0	NW	Pt. cloudy.
Mean	29.4	21.0	25.2	75	73	74	[b] .30	[b] 2.9	E	

[*] 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 29.91; highest, 30.34, Sept. 10; lowest, 29.57, Sept. 12.

Temperature.—Highest, 35, Sept. 24; lowest, 10, Sept. 29.

Precipitation.—Greatest amount in 24 hours, 0.21, Sept. 25. Snowfall, greatest 24-hour amount, 2.1, Sept. 25; snow on ground on 15th, 0.0; and at end of month, 2.3.

Wind.—Prevailing direction, E.; average hourly velocity, 9.6.

Weather.—Number of days clear, 5; partly cloudy, 2; cloudy 13; with measurable precipitation (0.01 inch, or more), 6.

Miscellaneous phenomena—Dates of.—Sleet, Sept. 20, 21.

Monthly meteorological summary, Etah, Greenland Station—Con.

OCTOBER 1937

Date	Temperature °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	26	15	20	60	54	35	0.00	0.0	NW	Pt. cloudy.
2	27	20	24	55	69	70	.00	.0	NE	Pt. cloudy.
3	30	20	25	69	70	63	.00	.0	NW	Pt. cloudy.
4	24	15	20	80	78	70	T	T	NE	Cloudy.
5	15	9	12	73	56	53	T	T	NE	Cloudy.
6	22	7	14	57	74	75	T	T	NW	Pt. cloudy.
7	26	22	24	62	94	65	.00	.0	NE	Cloudy.
8	24	15	20	60	87	84	.02	.2	NW	Cloudy.
9	18	7	12	65	71	54	T	T	N	Pt. cloudy.
10	18	8	13	84	90	85	.10	1.0	NW	Cloudy.
11	20	10	15	76	89	45	T	T	NW	Pt. cloudy.
12	23	10	16	66	90	79	.01	.1	SE	Cloudy.
13	10	2	6	95	89	95	.07	.7	N	Cloudy.
14	4	−1	2	82	90	86	.01	.1	N	Pt. cloudy.
15	1	−6	−2	47	81	88	T	T	NW	Clear.
16	−4	−12	−8	69	90	71	T	T	NW	Pt. cloudy.
17	1	−11	−5	79	77	83	.00	.0	NW	Clear.
18	2	−3	0	65	53	75	.00	.0	NW	Pt. cloudy.
19	4	−3	0	72	38	60	.00	.0	NW	Pt. cloudy.
20	7	−1	3	58	60	78	.00	.0	W	Clear.
21	17	6	12	90	80	76	T	T	SE	Pt. cloudy.
22	22	15	18	80	64	86	T	T	SE	Cloudy.
23	22	17	20	87	93	84	.03	.3	S	Cloudy.
24	24	16	20	92	37	94	.03	.3	SE	Cloudy.
25	26	20	23	60	63	80	.00	.0	NE	Cloudy.
26	21	11	16	64	62	69	.00	.0	N	Pt. cloudy.
27	16	11	14	73	38	77	.00	.0	NW	Clear.
28	16	11	14	70	77	92	T	T	NW	Cloudy.
29	11	0	6	68	90	78	T	T	NW	Pt. cloudy.
30	3	−2	0	77	62	62	.00	.0	N	Clear.
31	3	−1	1	36	52	76	.00	.0	N	Clear.
Mean	15.5	7.3	11.4	70	72	74	[b] .27	[b] 2.7	NW	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 30.01; highest, 30.39, Oct. 24; lowest, 29.56, Oct. 20.
Temperature.—Highest, 30, Oct. 3; lowest, −12, Oct. 16.
Precipitation.—Greatest amount in 24 hours, 0.10, Oct. 10. Snowfall, greatest 24-hour amount, 1.0, Oct 10; snow on ground on 15th, 2.6; and at end of month, 2.3.
Wind.—Prevailing direction, NW.; average hourly velocity, 11.3.
Weather.—Number of days clear, 6; partly cloudy, 13; cloudy, 12; with measurable precipitation (0.01 inch, or more), 7.

Monthly meteorological summary, Etah, Greenland Station—Con.

NOVEMBER 1937

Date	Temperature °F.			Relative humidty (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	6	−1	2	59	63	95	0.00	0.0	N	Clear.
2	6	3	4	59	74	89	.00	.0	NW	Cloudy.
3	6	0	3	88	55	89	.00	.0	NW	Cloudy
4	10	−2	4	76	76	70	T	T	NW	Cloudy.
5	4	−2	1	83	87	87	T	T	N	Pt. cloudy.
6	6	0	3	70	73	73	T	T	NW	Cloudy.
7	10	4	7	84	86	80	.01	.1	NW	Cloudy.
8	12	5	8	76	90	81	.03	.3	N	Pt. cloudy.
9	11	3	7	73	67	63	T	T	NW	Cloudy.
10	14	7	10	91	83	91	.02	.2	NW	Cloudy.
11	11	2	6	91	66	86	.04	.4	W	Cloudy.
12	5	0	2	93	68	82	.00	.0	N	Clear.
13	3	−3	0	76	53	76	T	T	NW	Clear.
14	10	0	5	68	64	70	.01	.1	NW	Pt. cloudy.
15	12	−1	6	70	88	95	.00	.0	NW	Clear.
16	17	12	14	96	67	86	T	T	E	Cloudy.
17	16	7	12	86	87	91	.06	.6	NW	Cloudy.
18	8	0	4	95	82	76	.03	.3	NW	Cloudy.
19	12	1	6	84	84	72	.02	.2	NW	Cloudy.
20	13	4	8	83	84	89	.02	.2	NW	Cloudy.
21	11	5	8	95	95	96	.10	1.0	NW	Cloudy.
22	16	7	12	82	89	82	.06	.6	SW	Cloudy.
23	10	2	6	78	70	91	.02	.2	NW	Cloudy.
24	6	−3	2	77	84	88	T	T	NW	Pt. cloudy.
25	6	−5	0	72	71	73	T	T	NW	Pt. cloudy.
26	−3	−11	−7	70	44	70	.01	.1	NW	Pt. cloudy.
27	−2	−8	−5	68	49	83	.00	.0	NW	Pt. cloudy.
28	10	−7	2	66	61	90	T	T	NW	Cloudy
29	10	−1	4	79	75	78	.10	1.0	NW	Cloudy.
30	3	−5	−1	88	46	80	.00	.0	WNW	Clear.
Mean	8.6	.4	4.5	79	73	82	[b] .53	[b] 5.3	NW	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 29.94; highest, 30.62, Nov. 11; lowest, 29.48, Nov. 22.
Temperature.—Highest, 17, Nov. 16; lowest, −11, Nov. 26.
Precipitation.—Greatest amount in 24 hours, 0.10, Nov. 21. Snowfall, greatest 24-hour amount, 1.0, Nov. 21; snow on ground on 15th, 2.0; and at end of month, 5.0.
Wind.—Prevailing direction, NW; average hourly velocity, 10.8.
Weather.—Number of days clear, 5; partly cloudy, 7; cloudy, 18; with measurable precipitation (0.01 inch, or more), 14.

Monthly meteorological summary, Etah, Greenland Station—Con.

DECEMBER 1937

Date	Temperature °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day* [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	2	−10	−4	49	69	44	0.00	0.0	N	Pt. cloudy.
2	3	−5	−1	68	68	70	.04	.4	NW	Pt. cloudy.
3	8	−1	4	70	86	88	.00	.0	NW	Clear.
4	2	−6	−2	67	59	60	T	T	N	Clear.
5	10	−6	2	72	77	75	.04	.4	NW	Pt. cloudy.
6	7	0	4	56	85	93	T	T	NW	Clear.
7	6	−2	2	88	68	79	.02	.2	E	Pt. cloudy.
8	−1	−11	−6	64	28	51	T	T	NW	Clear.
9	−6	−13	−10	29	82	68	.00	.0	NW	Clear.
10	−10	−17	−14	45	31	31	.00	.0	NW	Clear.
11	−4	−15	−10	63	82	76	T	T	SE	Pt. cloudy.
12	−7	−12	−10	68	63	78	.01	.1	NW	Pt. cloudy.
13	4	−11	−4	71	80	85	.04	.4	NW	Cloudy.
14	−8	−15	−12	81	75	76	.03	.3	NW	Pt. cloudy.
15	−9	−15	−12	66	77	68	T	T	NW	Pt. cloudy.
16	−4	−10	−7	63	81	76	.02	.2	NW	Pt. cloudy.
17	−1	−12	−6	61	65	57	.01	.1	N	Pt. cloudy.
18	−9	−14	−12	57	44	88	.00	.0	N	Cloudy.
19	−14	−21	−18	45	84	82	.00	.0	NW	Clear.
20	−16	−22	−19	61	61	83	.00	.0	NW	Clear.
21	−14	−19	−16	56	19	53	.00	.0	NW	Clear.
22	−10	−15	−12	61	72	88	.00	.0	NW	Clear.
23	−8	−14	−11	52	68	59	T	T	NW	Pt. cloudy.
24	−5	−11	−8	72	73	79	T	T	NW	Pt. cloudy.
25	−7	−11	−9	55	50	78	.00	.0	N	Clear.
26	−7	−15	−11	61	27	78	.00	.0	NW	Clear.
27	2	−11	−4	76	51	73	.00	.0	NW	Pt. cloudy.
28	2	−11	−4	79	58	55	.04	.4	W	Pt. cloudy.
29	−4	−10	−7	56	54	73	T	T	N	Pt. cloudy.
30	−10	−15	−12	57	52	77	.00	.0	N	Clear.
31	−6	−14	−10	52	48	72	T	T	NW	Pt. cloudy.
Mean	−3.7	−11.7	−7.7	62	62	71	[b] 25	[b] 2.5	NW	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 30.07; highest, 30.84, Dec. 8; lowest, 29.48, Dec. 17.
Temperature.—Highest, 10, Dec. 5; lowest, −22, Dec. 20.
Precipitation.—Greatest amount in 24 hours, 0.07, Dec. 13–14. Snowfall, greatest 24-hour amount, 0.7, Dec. 13–14; snow on ground on 15th, 6.3; and at end of month, 6.3.
Wind.—Prevailing direction, NW.; average hourly velocity, 10.0.
Weather.—Number of days clear, 13; partly cloudy, 16; cloudy, 2; with measurable precipitation (0.01 inch, or more), 9.
Miscellaneous phenomena—Dates of.—Halos, lunar, Dec. 14, 16;

Monthly meteorological summary, Etah, Greenland Station—Con.

JANUARY 1938

Date	Temperature °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	−9	−16	−12	57	77	63	0.01	0.1	NNW	Pt. cloudy.
2	−6	−12	−9	57	51	73	.00	.0	NW	Pt. cloudy.
3	0	−12	−6	59	58	86	.01	.1	NW	Pt. cloudy.
4	−3	−11	−7	84	83	68	.00	.0	NW	Pt. cloudy.
5	−7	−13	−10	76	78	42	.00	.0	NW	Clear.
6	1	−11	−5	78	65	93	T	T	S	Cloudy.
7	−1	−13	−7	73	89	66	T	T	NNW	Clear.
8	−7	−14	−10	52	74	64	.00	.0	NW	Clear.
9	3	−8	−2	42	82	75	.02	.2	E	Cloudy.
10	2	−8	−3	56	92	72	.00	.0	NW	Pt. cloudy.
11	−5	−18	−12	50	76	87	.00	.0	NW	Cloudy.
12	−18	−25	−22	43	78	76	.00	.0	NW	Cloudy.
13	−22	−26	−24	76	76	24	.00	.0	NW	Cloudy.
14	−18	−24	−21	80	84	82	T	T	E	Cloudy.
15	−20	−22	−21	82	81	63	.00	.0	SE	Cloudy.
16	−19	−26	−22	59	29	76	.00	.0	NW	Clear.
17	−20	−25	−22	39	77	53	.00	.0	NW	Clear.
18	−21	−26	−24	53	77	78	.00	.0	NW	Clear.
19	−17	−24	−20	59	83	81	.00	.0	NW	Clear.
20	−13	−20	−16	82	59	56	.00	.0	NW	Clear.
21	−7	−12	−10	70	63	79	.01	.1	SE	Cloudy.
22	−10	−12	−11	78	89	89	T	T	SE	Cloudy.
23	−6	−10	−8	70	90	81	.03	.3	NW	Cloudy.
24	−8	−11	−10	70	90	59	.00	.0	NW	Cloudy.
25	−11	−17	−14	76	75	71	.00	.0	NW	Clear.
26	−9	−20	−14	70	63	87	.03	.3	E	Cloudy.
27	−20	−30	−25	28	72	72	.00	.0	N	Pt. cloudy.
28	−22	−29	−26	74	53	76	.00	.0	W	Clear.
29	−17	−23	−20	43	63	65	.00	.0	N	Clear.
30	−7	−19	−13	69	34	68	.00	.0	N	Clear.
31	−10	−16	−13	74	50	76	.00	.0	NW	Clear.
Mean	−10.5	−17.8	−14.2	64	71	71	[b] 1.1	[b] 1.1	NW	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 29.87; highest, 30.48, Jan. 5; lowest, 29.32, Jan. 20.
Temperature.—Highest, 3, Jan. 9; lowest, −30, Jan. 27.
Precipitation.—Greatest amount in 24 hours, 0.03, Jan. 23, 26. Snowfall, greatest 24-hour amount, 0.3, Jan. 23, 26; snow on ground on 15th, 6.6; and at end of month, 7.3.
Wind.—Prevailing direction, NW., average hourly velocity, 8.9.
Weather.—Number of days clear, 13; partly cloudy, 6; cloudy, 12; with measurable precipitation (0.01 inch, or more), 6.
Miscellaneous phenomena—Dates of.—Halos, lunar, Jan. 8, 13, 15. Fog, light, Jan. 26, 27.

Monthly meteorological summary, Etah, Greenland Station—Con.

FEBRUARY 1938

Date	Temperature °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	−10	−17	−14	63	63	74	0.00	0.0	NW	Clear.
2	−10	−19	−14	76	63	74	.00	.0	NW	Clear.
3	−9	−23	−16	24	68	76	.00	.0	NW	Clear.
4	−9	−15	−12	59	50	77	.00	.0	NW	Clear.
5	−10	−18	−14	23	63	88	.00	.0	NW	Clear.
6	−3	−14	−8	78	82	66	.00	.0	NW	Clear.
7	−8	−17	−12	75	42	57	.00	.0	NW	Clear.
8	−5	−12	−8	79	56	73	.00	.0	NW	Cloudy.
9	−5	−11	−8	73	79	68	.00	.0	NW	Pt. cloudy.
10	−12	−18	−15	87	85	87	.00	.0	NNW	Clear.
11	−11	−18	−14	58	66	52	.00	.0	N	Clear.
12	−10	−13	−12	68	77	52	.00	.0	NW	Clear.
13	−3	−16	−10	82	68	70	.00	.0	NW	Clear.
14	0	−17	−8	53	71	84	.03	.3	E	Cloudy.
15	−3	−8	−6	77	75	56	T	T	NW	Cloudy.
16	−4	−10	−7	82	76	82	T	T	W	Cloudy.
17	−2	−12	−7	78	66	69	.00	.0	W	Pt. cloudy.
18	3	−7	−2	88	78	75	.01	.1	W	Cloudy.
19	−6	−17	−12	81	89	69	T	T	E	Pt. cloudy.
20	−16	−22	−19	51	81	82	.00	.0	NW	Clear.
21	−15	−20	−18	53	84	69	.00	.0	N	Clear.
22	−13	−21	−17	63	83	69	.00	.0	N	Clear.
23	−9	−19	−14	77	58	72	T	T	NW	Pt. cloudy.
24	−14	−25	−20	78	81	81	.00	.0	NW	Clear.
25	−23	−26	−24	78	77	77	.00	.0	N	Clear.
26	−21	−26	−24	57	53	29	T	T	N	Pt. cloudy.
27	−11	−22	−16	63	84	52	.02	.2	N, NW, SE	Cloudy.
28	−8	−14	−11	76	36	90	T	T	E	Cloudy.
Mean	−8.8	−17.0	−12.9	68	70	70	[b].06	[b].6	NW	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 29.92; highest, 30.63, Feb. 19; lowest, 29.22, Feb. 27.
Temperature.—Highest, 3, Feb. 18; lowest, −26, Feb. 26.
Precipitation.—Greatest amount in 24 hours, 0.03, Feb. 14. Snowfall, greatest 24-hour amount, 0.3, Feb. 14; snow on ground on 15th, 7.4; and at end of month, 7.7.
Wind.—Prevailing direction, NW; average hourly velocity, 10.0.
Weather.—Number of days clear, 16; partly cloudy, 5; cloudy, 7; with measurable precipitation (0.01 inch, or more), 3.
Miscellaneous phenomena—Dates of.—Fog, light, Feb. 10, 14, 15, 19, 23, 26, 27, 28, fog, dense, Feb. 26, 27.

Monthly meteorological summary, Etah, Greenland Station—Con.

MARCH 1938

Date	Temperature °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	−8	−10	−9	70	90	79	0.02	0.2	SE	Cloudy.
2	−8	−17	−12	70	52	86	.00	.0	NW	Pt. cloudy.
3	−12	−19	−16	76	65	70	T	T	N	Pt. cloudy.
4	−8	−18	−13	70	86	72	T	T	N	Pt. cloudy.
5	−9	−17	−13	85	86	88	.00	.0	NW	Clear.
6	−5	−14	−10	63	68	79	.00	.0	N	Clear.
7	0	−12	−6	66	83	78	.01	.1	N	Cloudy.
8	3	−6	−2	76	85	82	.02	.2	NW	Cloudy.
9	5	−6	0	71	58	74	T	T	NW	Pt. cloudy.
10	−1	−8	−4	75	78	68	.00	.0	NW	Pt. cloudy.
11	−2	−8	−5	79	69	82	.00	.0	NW	Pt. cloudy.
12	6	−10	−2	78	51	84	T	T	N	Clear.
13	7	0	4	85	93	84	.03	.3	NW	Cloudy.
14	14	3	8	77	89	92	.12	1.2	NW	Cloudy.
15	7	3	5	92	87	89	.02	.2	NW	Cloudy.
16	3	−2	0	81	93	84	T	T	N	Cloudy.
17	0	−7	−4	82	82	84	.00	.0	NW	Cloudy.
18	−5	−17	−11	78	69	76	.00	.0	NW	Cloudy.
19	−13	−19	−16	67	63	64	.00	.0	N	Clear.
20	−16	−21	−18	63	85	83	.00	.0	N	Clear.
21	−10	−20	−15	65	62	62	.00	.0	N	Clear.
22	−10	−14	−12	82	67	61	.00	.0	E	Clear.
23	−9	−15	−12	75	59	64	.00	.0	E	Clear.
24	−6	−15	−10	74	91	60	.00	.0	NE	Pt. cloudy.
25	−8	−19	−14	72	46	49	.00	.0	NE	Clear.
26	−3	−14	−8	76	60	82	.00	.0	E	Clear.
27	−4	−17	−10	89	74	57	.00	.0	NE	Clear.
28	−1	−20	−10	85	63	82	.00	.0	DI[c]	Clear.
29	2	−6	−2	90	62	67	.00	.0	W	Cloudy.
30	4	−12	−4	89	82	54	.00	.0	NE	Clear.
31	−5	−11	−8	61	66	46	.00	.0	E	Clear.
Mean	−3.0	−11.9	−7.4	76	73	74	[b].22	[b]2.2	NW	

* 7 a. m. and p. m., 75th meridian time.
T Indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.
[c] Direction indeterminate.

SUMMARY

Barometric pressure.—Monthly mean, 29.91; highest, 30.48, Mar. 31; lowest, 28.92, Mar. 12.
Temperature.—Highest, 14, Mar. 14; lowest, −21, Mar. 20.
Precipitation.—Greatest amount in 24 hours, 0.14, Mar. 14, 15. Snowfall, greatest 24-hour amount, 1.4, Mar. 14, 15; snow on ground on 15th, 7.5, and at end of month, 6.5.
Wind.—Prevailing direction NW.; average hourly velocity, 10.6.
Weather.—Number of days clear, 14; partly cloudy, 7; cloudy, 10.
Miscellaneous phenomena—Dates of.—Fog, light, Mar. 1, 2, 16, 17, 18, 24, 30, 31.

Monthly meteorological summary, Etah, Greenland Station—Con.

APRIL 1938

Date	Temperature °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	2	−8	−3	61	75	17	0.00	0.0	E	Clear.
2	5	−5	0	61	62	66	.00	.0	NE	Clear.
3	13	−1	6	71	71	88	.00	.0	E	Pt. cloudy.
4	10	−15	−2	39	63	49	.00	.0	E	Cloudy.
5	−11	−21	−16	70	50	23	.00	.0	E	Pt. cloudy.
6	−13	−20	−16	55	59	69	.00	.0	E	Clear.
7	−9	−21	−15	62	36	48	.00	.0	E	Clear.
8	0	−16	−8	78	56	72	.04	.4	SW NE	Cloudy.
9	−3	−10	−6	69	69	12	.01	.1	E	Clear.
10	−3	−11	−7	85	56	33	.00	.0	E	Clear.
11	2	−14	−6	51	68	23	.00	.0	ENE	Clear.
12	−1	−7	−4	65	65	69	.05	.5	E	Cloudy.
13	12	−5	4	73	62	55	T	T	NE	Cloudy.
14	13	−4	4	88	73	72	.00	.0	E	Pt. cloudy.
15	8	−5	3	67	70	50	.00	.0	NE	Clear.
16	6	−2	2	62	42	48	.00	.0	E	Clear.
17	3	−6	−2	58	65	52	.00	.0	E	Clear.
18	9	−7	1	50	81	79	.02	.2	NE	Cloudy.
19	12	−4	4	91	78	75	.09	.9	W	Cloudy.
20	1	−7	−3	87	72	64	.00	.0	E	Clear.
21	14	−6	4	77	80	84	.03	.3	SW	Cloudy.
22	17	10	14	89	73	88	.05	.5	NE	Cloudy.
23	20	4	12	78	53	45	T	T	NE	Pt. cloudy.
24	10	0	5	73	72	71	.00	.0	E	Pt. cloudy.
25	13	3	8	73	65	69	T	T	SW	Cloudy.
26	12	0	6	56	70	49	.00	.0	E	Clear.
27	12	3	8	62	82	63	T	T	NE	Clear.
28	13	2	8	71	63	54	.00	.0	NE	Clear.
29	14	5	10	57	70	72	.01	.1	E	Clear.
30	24	8	16	73	92	55	.01	.1	E S	Pt. cloudy.
Mean	6.8	−5.3	.8	68	66	57	[b] .31	[b] 3.1	E	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 29.96; highest, 30.43, Apr. 23; lowest, 29.24, Apr. 12.
Temperature.—Highest, 24, Apr. 30; lowest, −21, Apr. 7.
Precipitation.—Greatest amount in 24 hours, 0.11, Apr. 18, 19. Snowfall, greatest 24-hour amount, 1.1 Apr. 18, 19; snow on ground on 15th, 6.0, and at end of month, 6.6.
Wind.—Prevailing direction, E.; average hourly velocity, 10.3.
Weather.—Number of days clear, 15; partly cloudy, 6; cloudy, 9; with measurable precipitation (0.01 inch, or more), 9.
Miscellaneous phenomena—Dates of.—Fog, light, 8, 9, 19. 20.

Monthly meteorological summary, Etah, Greenland Station—Con.

MAY 1938

Date	Temperature, °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	14	5	10	65	73	55	T	T	SE	Pt. Cloudy.
2	18	8	13	76	81	79	0.02	0.2	SW	Cloudy.
3	15	9	12	82	62	60	T	T	S	Cloudy.
4	14	10	12	86	84	79	.04	.4	SW	Cloudy.
5	12	9	10	73	90	65	.01	.1	SW	Cloudy.
6	18	8	13	85	57	67	.00	.0	SE	Cloudy.
7	26	11	18	85	78	80	T	T	DI [c]	Cloudy.
8	25	9	17	92	69	62	T	T	E	Clear.
9	13	3	8	82	66	74	.00	.0	E	Pt. cloudy.
10	7	1	4	55	74	68	.00	.0	E	Clear.
11	10	3	6	72	68	65	.00	.0	E	Clear.
12	25	6	16	83	71	81	.00	.0	DI [c]	Pt. cloudy.
13	27	14	20	84	86	74	.00	.0	W	Clear.
14	31	14	22	89	74	75	.00	.0	W	Pt. cloudy.
15	28	20	24	78	75	81	.00	.0	W	Pt. cloudy.
16	34	20	27	78	78	78	.00	.0	NE	Clear.
17	34	24	29	78	69	66	.00	.0	W	Cloudy.
18	34	23	28	72	58	88	.00	.0	E	Pt. cloudy.
19	29	21	25	68	64	51	.00	.0	E	Clear.
20	30	20	25	68	36	51	.00	.0	E	Clear.
21	33	22	28	63	56	41	.00	.0	E	Pt. cloudy.
22	38	25	32	63	54	54	.00	.0	E	Pt. cloudy.
23	36	26	31	51	44	45	.00	.0	E	Clear.
24	35	28	32	49	45	49	.00	.0	E	Clear.
25	40	30	35	47	59	50	.00	.0	NE	Clear.
26	43	31	37	56	44	50	.00	.0	E	Clear.
27	42	33	38	46	46	51	.00	.0	E	Clear.
28	39	30	34	44	73	72	.00	.0	SW	Clear.
29	36	27	32	80	81	80	.00	.0	SW	Pt. cloudy.
30	40	32	36	53	39	54	.00	.0	E	Clear.
31	31	25	28	60	95	74	.00	.0	E	Pt. cloudy.
Mean	27.6	17.6	22.6	70	66	65	[b] .07	[b] .7	E	

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.
[c] Direction indeterminate.

SUMMARY

Barometric pressure.—Monthly mean, 30.20; highest, 30.87, May 6; lowest, 29.57, May 31.
Temperature.—Highest, 43, May 26; lowest, 1, May 10.
Precipitation.—Greatest amount in 24 hours, 0.04, May 4. Snowfall, greatest 24-hour amount, 0.4, May 4; snow on ground on 15th, 5.7; and at end of month 0.8.
Wind.—Prevailing direction E, average hourly velocity, 8.1.
Weather.—Number of days clear, 14; partly cloudy, 10; cloudy, 7; with measurable precipitation (0.01 inch, or more), 3.
Miscellaneous phenomena—Dates of.—Halos, solar, 1, 7, 23, 30; fog, light, 2, 4, 5.

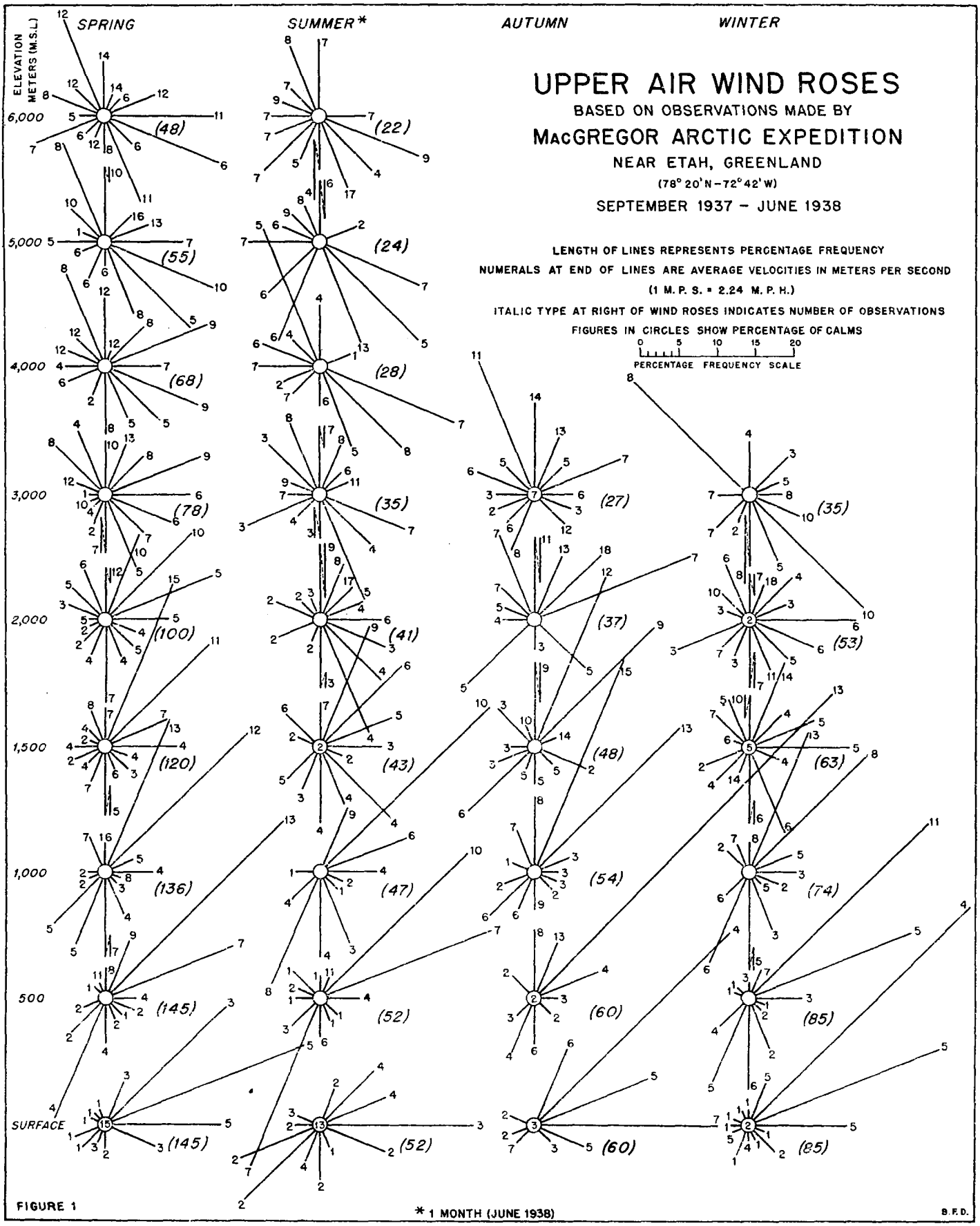
UPPER AIR WIND ROSES
BASED ON OBSERVATIONS MADE BY
MacGREGOR ARCTIC EXPEDITION
NEAR ETAH, GREENLAND
(78° 20' N – 72° 42' W)
SEPTEMBER 1937 – JUNE 1938
LENGTH OF LINES REPRESENTS PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES ARE AVERAGE VELOCITIES IN METERS PER SECOND
(1 M. P. S. = 2.24 M. P. H.)
ITALIC TYPE AT RIGHT OF WIND ROSES INDICATES NUMBER OF OBSERVATIONS
FIGURES IN CIRCLES SHOW PERCENTAGE OF CALMS
0 5 10 15 20
PERCENTAGE FREQUENCY SCALE
ELEVATION METERS (M.S.L.)
SPRING
SUMMER*
AUTUMN
WINTER
6,000
5,000
4,000
3,000
2,000
1,500
1,000
500
SURFACE
(48)
(22)
(55)
(24)
(68)
(28)
(78)
(35)
(27)
(35)
(100)
(41)
(37)
(53)
(120)
(43)
(48)
(63)
(136)
(47)
(54)
(74)
(145)
(52)
(60)
(85)
(145)
(52)
(60)
(85)
* 1 MONTH (JUNE 1938)
B.F.D.

FIGURE 1

Monthly meteorological summary, Etah, Greenland Station—Con.

JUNE 1938

Date	Temperature, °F.			Relative humidity (percentage)			Precipitation		Wind, prevailing direction	Weather, character of day [a]
	Maximum	Minimum	Mean	A. M.*	Local noon	P. M.*	Total	Snowfall p. m. to p. m.* (unmelted)		
							In.	*In.*		
1	34	25	30	59	49	49	T	T	E	Pt. cloudy.
2	36	26	31	53	48	60	0.09	0.0	E	Clear.
3	37	28	32	54	95	82	T	T	W	Pt. cloudy.
4	33	29	31	83	96	98	T	T	W	Cloudy.
5	32	29	30	92	95	91	.01	.1	SW	Cloudy.
6	34	28	31	77	90	74	.00	.0	W	Pt. cloudy.
7	37	30	34	52	62	70	.00	.0	SW	Pt. cloudy.
8	36	30	33	63	66	78	.00	.0	SW	Cloudy.
9	40	30	35	72	63	52	.00	.0	W	Pt. cloudy.
10	46	34	40	57	77	55	.00	.0	E	Clear.
11	46	35	40	58	51	48	.00	.0	NE	Pt. cloudy.
12	46	33	40	77	68	69	.00	.0	W	Cloudy.
13	47	36	42	68	63	72	.00	.0	W	Pt. cloudy.
14	49	37	43	49	52	50	.00	.0	E	Pt. cloudy.
15	40	33	36	75	65	81	T	T	W	Cloudy.
16	48	32	40	73	53	57	.00	.0	E	Clear.
17	40	32	36	74	82	74	.00	.0	W	Clear.
18	37	29	33	95	72	90	.00	.0	SW	Cloudy.
19	35	27	31	92	92	96	.00	.0	SW	Cloudy.
20	37	29	33	92	83	92	.00	.0	SW	Cloudy.
21	42	32	37	82	88	79	.00	.0	SW	Cloudy.
22	47	36	42	79	88	85	.00	.0	W	Cloudy.
23	57	40	48	56	69	60	.00	.0	E	Clear.
24	52	39	46	49	59	54	.00	.0	E	Pt. cloudy.
25	55	42	48	67	56	56	T	.0	E	Pt. cloudy.
26	50	39	44	56	50	50	.00	.0	SE	Clear.
27	56	43	50	54	48	46	.09	.0	E	Clear.
28	60	45	52	43	34	33	.00	.0	E	Clear.
29	59	40	50	55	53	57	.00	.0	SW	Pt. cloudy.
30	53	39	46	46	49	55	.00	.0	W	Clear.
Mean	44.0	33.6	38.8	67	67	67	[b] .01	[b] .1	E	

* 7 a. m. and p. m. 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

Barometric pressure.—Monthly mean, 30.02; highest, 30.40, June 6; lowest, 29.49, June 14.
Temperature.—Highest, 60, June 28; lowest, 25, June 1.
Precipitation.—Greatest amount in 24 hours, 0.01, June 5. Snowfall, greatest 24-hour amount, 0.1, June 5; snow on ground on 15th 0.2, and at end of month T.
Wind.—Prevailing direction, E; average hourly velocity, 7.0.
Weather.—Number of days clear, 9; partly cloudy, 11; cloudy, 10.
Miscellaneous phenomena—Dates of.—Halos, solar, June 7, 14, 29; fog, light, June 3, 4, 5, 15, 18, 19, 20; fog, dense, 18, 19, 20.

PILOT-BALLOON OBSERVATIONS

The expedition secured a total of 341 pilot-balloon observations during the period September 10, 1937, to June 30, 1938, inclusive. When weather permitted, these observations were made daily at 12 noon (75th meridian time) during the months of November, December, and January and at 6 a. m. and 6 p. m. during all other months. The wind data obtained by these observations are shown in detail for standard levels in tables 1 and 1A. Wind roses, prepared from these data for all levels having a total of 20 observations or more, are also shown by seasons (summer being represented by June 1938 only) in figures 1 and 2. Resultant winds for the same levels are shown in figure 3.

The heights of cloud bases were obtained by means of the pilot-balloon observations on 91 occasions. The average cloud heights, based on these data, are shown in table 2.

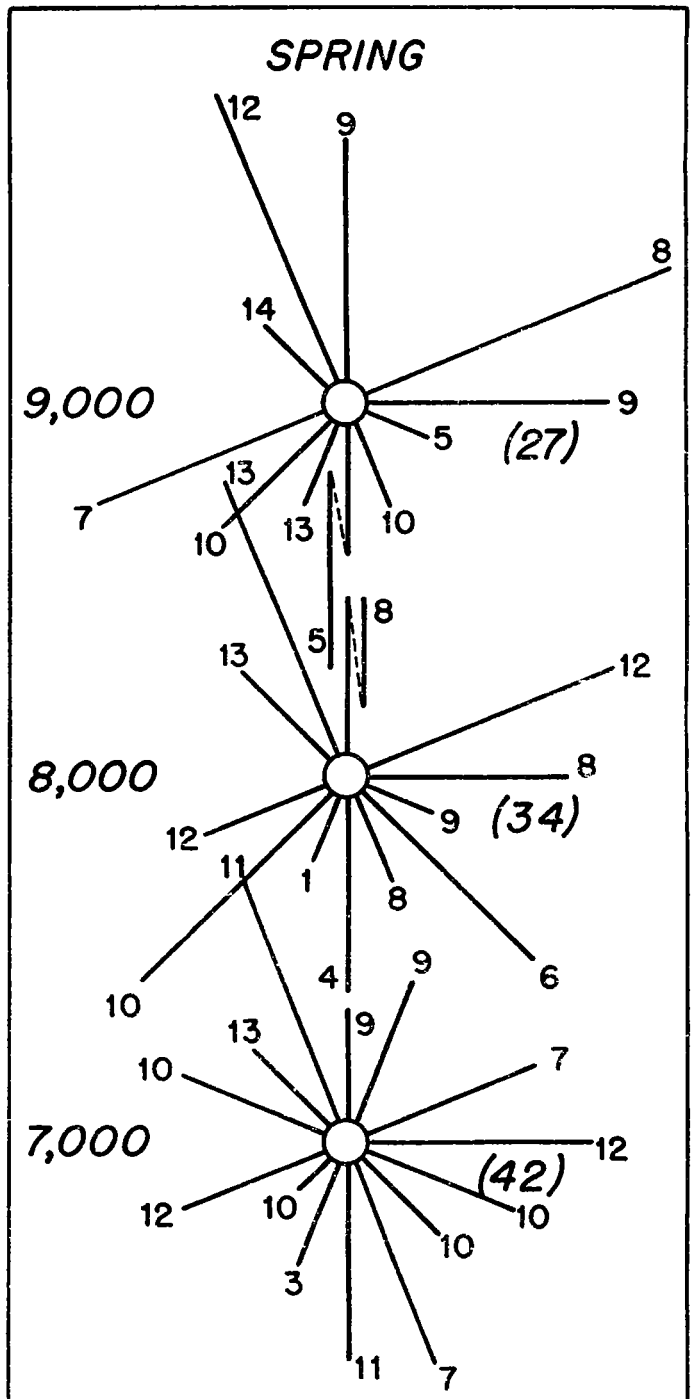

FIGURE 2
CONTINUATION OF WIND ROSES SHOWN IN FIGURE 1

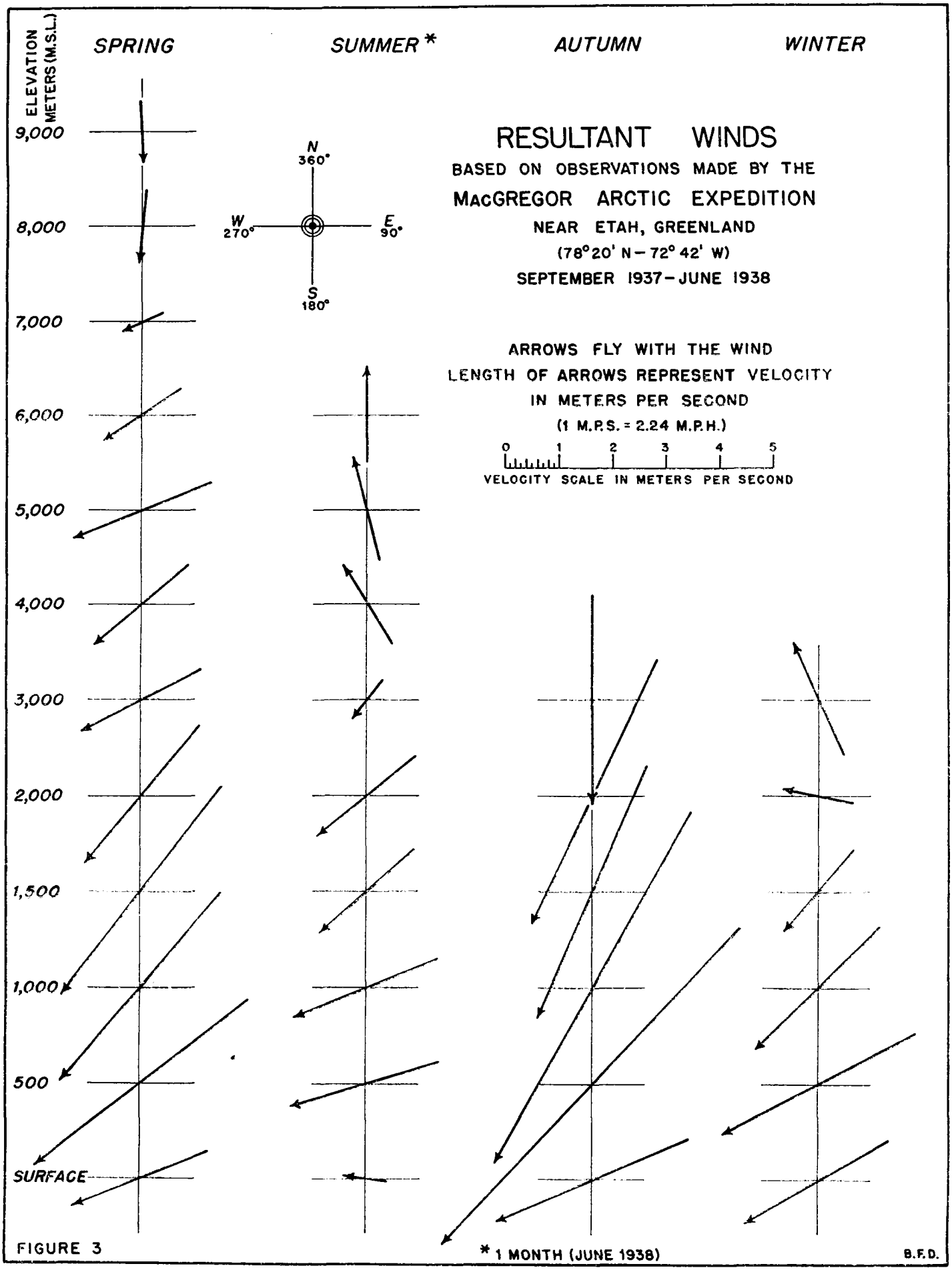
ELEVATION METERS (M.S.L.)
SPRING
SUMMER *
AUTUMN
WINTER
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,500
1,000
500
SURFACE
N 360°
W 270°
E 90°
S 180°
RESULTANT WINDS
BASED ON OBSERVATIONS MADE BY THE
MACGREGOR ARCTIC EXPEDITION
NEAR ETAH, GREENLAND
(78° 20' N – 72° 42' W)
SEPTEMBER 1937 – JUNE 1938
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENT VELOCITY
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H.)
0 1 2 3 4 5
VELOCITY SCALE IN METERS PER SECOND
* 1 MONTH (JUNE 1938)
B.F.D.

FIGURE 3

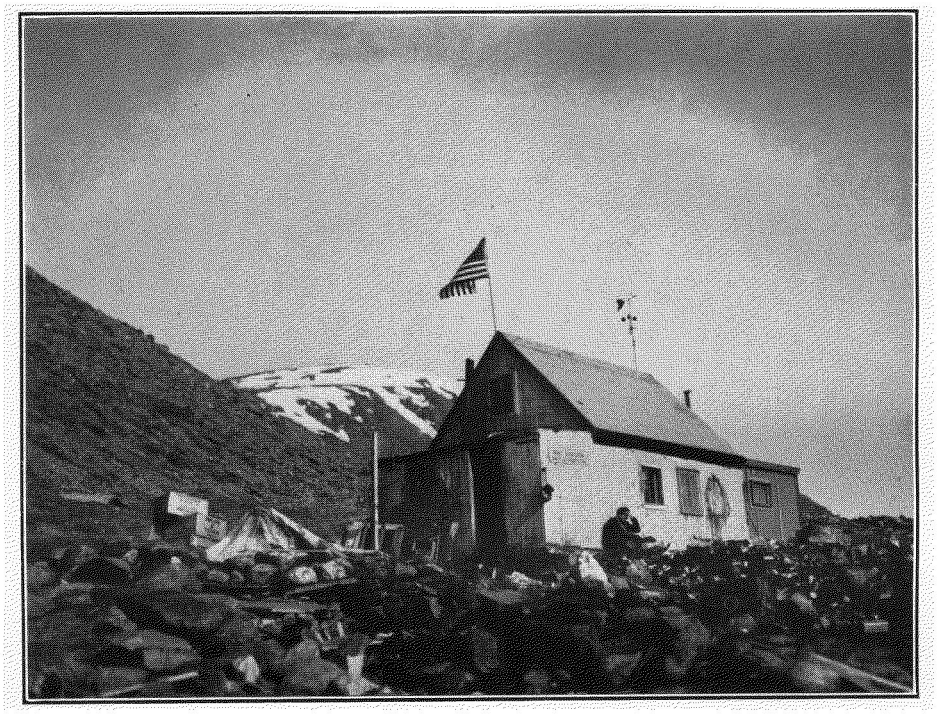

FIGURE 4.—The base camp of the MacGregor Arctic Expedition at Reindeer Point, Greenland (Etah). The mountains in the left background are north, to the rear is east. The Greenland Ice Cap about 8 miles away was visible from the east window.

FIGURE 5.—Rain and snow gage. Note the rocks used to secure gage.

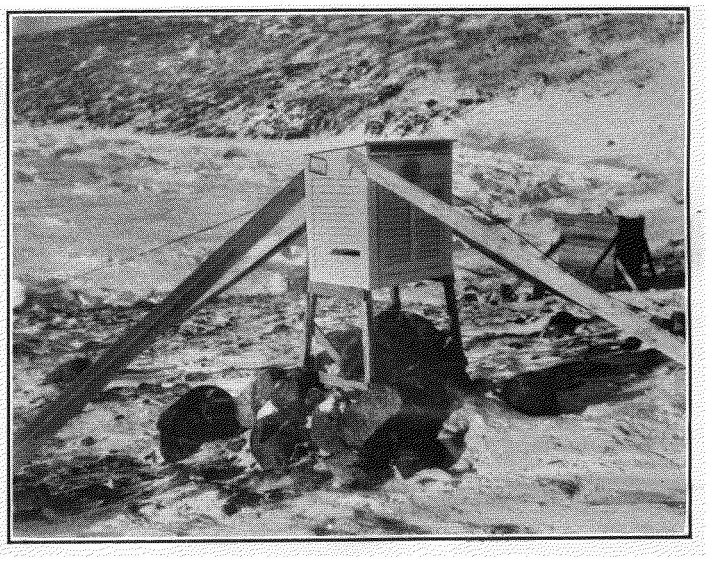

FIGURE 6.—Instrument and pilot-balloon observation shelters at the base camp. Note braces and rocks around both shelters to keep them from blowing away. Maximum wind recorded was about 80 miles per hour.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*

[All times are 75th meridian]

SEPTEMBER 1937—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
11	ne.	8	nw.	2	sw.	6	sw.	5	s.	3	ese.	3	sse.	8	sse.	7	s.	11	s.	13
12	Calm		nw.	2	sw.	2	wsw.	4												
13 [1]																				
14 [1]																				
15 [1]																				
16	e.	14	ne.	23	nne.	31														
17	nne.	8	ne.	22																
18	ne.	4	ssw.	2	ssw.	3	ese.	1	sw.	2	Calm		nne.	7	nne.	15	n.	17	nne.	19
19 [2]																				
20 [3]																				
21 [1]																				
22	ne.	2	ne.	5	n.	10	n.	10	n.	12	n.	9	n.	15						
23	ene.	4	n.	9	nnw.	8	n.	8	nw.	5	wnw.	8	wnw.	11	w.	12	w.	15	wnw.	13
24 [1]																				
25 [2]																				
26 [1]																				
27 [2]																				
28 [2]																				
29 [1]																				
30	ne.	4	ne.	12	nne.	12	nne.	19	n.	10	n.	14								

SEPTEMBER 1937—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
10	e.	4	ne.	14	ne.	22	ne.	15	ne.	15										
11	ene.	4	ne.	12	ne.	4	ne.	5	ene.	3	ene.	3	e.	7	ese.	11	se.	12	se.	10
12 [1]																				
13	e.	4	ne.	19	nne.	10	ne.	10	ene.	6	ene.	14	e.	8						
14 [1]																				
15 [1]																				
16	e.	12	nne.	21	nne.	28	nne.	26												
17	nne.	6	ne.	4	n.	2	ne.	3	ene.	3	ne.	5	ne.	4	ne.	11	n.	17		
18 [1]																				
19 [1]																				
20 [4]																				
21 [1]																				
22	ne.	7	n.	10	nnw.	12	nnw.	10	nnw.	10	nnw.	16	nnw.	14						
23 [1]																				
24 [2]																				
25 [2]																				
26	sw.	7	s.	7	s.	9														
27 [2]																				
28	ese.	6	ne.	17	nne.	22	nne.	15	ene.	13										
29	ne.	5	n.	12	nne.	8	nne.	13	nne.	10	nne.	16								
30	e.	4	nne.	14	n.	12	n.	12	n.	20	n.	18								

OCTOBER 1937—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	5	ne.	10	nne.	11	nne.	13	nne.	11										
2	se.	3	s.	8	sw.	12	sw.	15												
3	wsw.	2	ssw.	5	sw.	4	sw.	1												
4 [2]																				
5 [2]																				
6	ne.	3	ene.	3	nnw.	2	nw.	5	nnw.	10	nnw.	9	nnw.	18	nnw.	22	nnw.	23		
7 [1]																				
8 [2]																				
9	ene.	8	ne.	16	nne.	18	nne.	9	ne.	24										
10 [2]																				
11	ne.	3	ene.	3	ne.	1	ese.	1	se.	3	ssw.	5	sw.	5						
12 [1]																				
13	e.	3	ne.	15																
14 [2]																				
15	ene.	6	ne.	12	nne.	12	n.	13	nw.	9	nnw.	16								
16	e.	10	ne.	16	ne.	20														
17	ne.	5	ne.	13	ne.	10	ene.	14												
18	e.	7	ne.	16	ne.	27														
19	ese.	4	ne.	16	ne.	20	ne.	18	nne.	17	nne.	10								
20	nne.	5	ne.	10																
21	wnw.	2	ssw.	4																
22 [5]																				
23 [1]																				
24 [5]																				
25 [1]																				
26	ne.	5	ne.	3	ene.	2	wsw.	1	w.	4	nw.	5								
27	e.	3	e.	3	ene.	4	nne.	5	n.	3	Calm		nw.	6						
28 [1]																				
29 [5]																				
30	ene.	8	ne	8	nne.	6	ne.	1	n.	2	wnw.	4	w.	6	wsw.	9				
31	nne.	12	nne.	10																

[1] None. Low clouds.
[2] None. Snowing.
[3] None. Misting.
[4] None. Sleeting.
[5] None. Light snow.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

OCTOBER 1937—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	4	n.	6	n.	5	n.	4	nnw.	2	nnw.	7	nnw.	11						
2 [1]																				
3	ne.	2	Calm		e.	3	ese.	4	se.	4	w.	3	sw.	5	wsw.	6	wsw.	8		
4 [1]																				
5	e.	2	ne.	9	nne.	18	n.	13	n.	17										
6 [1]																				
7 [1]																				
8 [2]																				
9	e.	12	ne.	18	nne.	21	ne.	24	ne.	24										
10 [1]																				
11	ne.	3	n.	2	wsw.	2	s.	2												
12 [1]																				
13 [2]																				
14	ene.	7	ne.	19	nne.	21	nne.	19												
15 [2]																				
16 [6]																				
17	ese.	5	ne.	16	ne.	30	ne.	6	ene.	17										
18 [1]																				
19	e.	4	ne.	20	nne.	10	nne.	12	ne.	10										
20	ne.	1	se.	2	nne.	1	nw.	2	nnw.	5	nnw.	7	nw.	11						
21 [5]																				
22 [1]																				
23 [1]																				
24 [1]																				
25 [1]																				
26 [7]																				
27	ne.	5	ene.	3	nne.	10	nne.	1	sw.	1	wsw.	2								
28	nne.	2	sw.	3	ssw.	8	sw.	9												
29	ene.	5	nne.	8	ne.	2	sw.	1												
30 [7]																				
31 [7]																				

NOVEMBER 1937—12 NOON

1					none															
2	ese.	4	ne.	18	ne.	9	ne.	8	ene.	4	ene.	5								
3	e.	7	ne.	15																
4	ne.	2	ene.	5	ne.	4	n.	3	ene.	2	e.	6								
5	e.	7	ne.	20	ne.	4	nne.	3	ene.	6										
6 [2]																				
7 [2]																				
8 [2]																				
9	ne.	3	ne.	8	ne.	10	ne.	1												
10 [2]																				
11 [2]																				
12	ene.	3	ne.	17	ne.	16														
13	ene.	4	ene.	5	n.	10	w.	3	sw.	7	sw.	6	sw.	6						
14 [8]																				
15	Calm		ssw.	3	wnw.	1	nw.	3	wnw.	5										
16 [2]																				
17 [2]																				
18 [2]																				
19 [2]																				
20 [2]																				
21 [2]																				
22 [2]																				
23 [9]																				
24 [2]																				
25	ne.	2	ne.	2	ese.	3	se.	5	se.	9	se.	12								
26	ne.	2	ne.	4	se.	2	ssw.	5	sw.	10	ssw.	11								
27 [6]																				
28 [10]																				
29	ne.	2	s.	4	s.	9	s.	8												
30	nne.	3	ne.	1	wsw.	2														

[1] None. Low clouds.
[2] None. Snowing.
[5] None. Light snow.
[6] None. High surface winds.
[7] None. Strong surface winds.
[8] None.
[9] None. Cloudy.
[10] None. Cloudy with high surface winds.

Table 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

DECEMBER 1937—12 NOON

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1 [11]																				
2 [12]																				
3	ne.	4	ene.	2	e.	1	wsw.	1	ssw.	1										
4	ne.	7	nne.	9	nne.	1	nw.	1	wsw.	6										
5	ese.	1	s.	12																
6	ne.	4	ne.	2	sse.	4														
7	ssw.	1	ssw.	5																
8	e.	1	ssw.	4	s.	4	s.	1	wsw.	2										
9	ene.	5	ene.	5	ne.	4	nnw.	5	nnw.	7	nnw.	9	nw.	8						
10	e.	5	ne.	14	n.	10	n.	16	n.	14										
11	ssw.	1	ssw.	8	ssw.	14	ssw.	14												
12	e.	1	s.	3	S.	9	s.	10												
13 [13]																				
14	se.	1	sse.	3	s.	8	s.	7	s.	7										
15 [2]																				
16	ene.	1	s.	3	s.	9														
17 [11]																				
18 [14]																				
19	ne.	4	ene.	1																
20	ene.	5	sse.	1	ssw.	5	sw.	2	s.	1	sse.	2	sse.	3						
21	ne.	2	sse.	1	s.	2	sse.	7	se.	4	se.	4	se.	4	ese.	1				
22	ne.	2	ene.	3	sse.	5	s.	5	s.	10	s.	8								
23	ne.	2	se.	2	s.	6	s.	5	s.	8	s.	8	s.	18						
24	e.	1	s.	5																
25 [15]																				
26	ne.	4	e.	2	ssw.	2														
27	ene. [6]	2	sw.	3	sw.	6	wnw.	6	nnw.	5	n.	4	s.	2	sse.	4				
28 [1]																				
29	ne.	1	ene.	9	nne.	10	n.	10												
30	ne.	2	ene.	8	nne.	12														
31 [2]																				

JANUARY 1938—12 NOON

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1 [12]																				
2	ne.	3	ne.	2	sse.	2	sse.	11	sse.	13	s.	18								
3	ene.	4	s.	4	s.	3														
4	nne.	1	ssw.	4	sw.	5	wsw.	2	wnw.	3	nw.	5	nnw.	9						
5	ne.	7	nne.	7	n.	5	nnw.	4	nnw.	5	nw.	6	nw.	9						
6	wsw.	5	s.	6																
7	ne.	1	ne.	12	nne.	13	n.	18												
8	ne.	3	ne.	1	nnw.	6	nw.	8	nw.	13	nw.	17								
9 [2]																				
10	w.	1	ssw.	4	nw.	4	nw.	11												
11	ne.	2	ne.	7	nne.	4	sse.	1	wsw.	2										
12 [2]																				
13	ne.	5	e.	2	ene.	6	ene.	7	e.	7										
14 [1]																				
15 [1]																				
16	ne.	1	s.	3	ssw.	5	sw.	4	wsw.	4	w.	7								
17	ene.	6	e.	4	nne.	7	nnw.	3	nnw.	6										
18	Calm		n.	3	nnw.	8	nnw.	9	nw.	8	nw.	11								
19	nne.	4	nw.	1	ese.	1	Calm		Calm											
20	ene.	2	ssw.	2	ssw.	4	sw.	6	sw.	11										
21 [2]																				
22	s.	4	s.	8																
23 [2]																				
24	ne.	4	sse.	2	sse.	3	ese.	3	ese.	4										
25	ene.	1	sse.	2	s.	6	s.	6	s.	12	sse.									
26 [2]																				
27 [2]																				
28	ne.	5	ene.	2	ene.	5	e.	5	e.	10										
29	ne.	6	ne.	11	nne.	13	nne.	15												
30	ene.	5	nw.	19	ne.	19														
31	e.	1	ssw.	5	ssw.	6	s.	7												

FEBRUARY 1938—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	3	ene.	5	ne.	6	ene.	6	se.	8	se.	12								
2	ene.	5	ne.	7	ne.	6	n.	2	n.	2	ne.	5	ne.	9						
3	se.	1	ene.	3	ne.	2	e.	3	ese.	4	se.	5	se.	8						
4	ne.	5	ne.	6	ne.	6	e.	3	ese.	7	ese.	11	se.	13						
5	ne.	3	ne.	7	ne.	2	e.	5	e.	5										
6	ne.	5	ne.	11	ne.	22	nne.	10	n.	8	nw.	4								
7	nne.	10	e.	4	ssw.	3	e.	7	e.	8	ese.	9								
8	wnw.	1	sw.	4																
9 [1]																				
10	ne.	5	ne.	8	nne.	7	ne.	2	ne.	3	ene.	5								
11 [6]																				
12	ne.	5	ene.	5	e.	1	ene.	2	se.	3	ssw.	2	s.	3						
13	e.	6	ne.	11	nne.	19	nne.	14	ene.	4	nw.	5	n.	14						
14 [2]																				
15 [2]																				
16	ne.	3	ne.	1	e.	7	ese.	4												
17	nnw.	1	ene.	3	ene.	4														
18 [2]																				
19 [2]																				
20	Calm		ssw.	7	ssw.	7	wsw.	2	ssw.	5	sw.	10								
21 [14]																				
22	ene.	7	ne.	13																
23	ne.	1	s.	7																
24	ne.	3	ene.	4	ne.	2	e.	2	e.	7	ne.	1								
25	ene.	7	ene.	7	ene.	6														
26	ene.	10	ne.	16	nne.	13	n.	15												
27 [2]																				
28 [2]																				

[1] Low clouds.
[2] None. Snowing.
[6] None. High surface winds.
[11] None. High wind.
[12] None. Blowing snow.
[13] None. Low clouds; snowing.
[14] None. High winds; blowing snow.
[15] None. Surface winds.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

FEBRUARY 1938—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	5	ene.	7	e.	2	e.	5	ese.	8	se.	10	ese.	15						
2	ene.	1	ne.	1	s.	5	s.	6	s.	4	s.	6	se.	7						
3	ne.	1	ene.	6	ne.	1	ene.	1	e.	2	se.	6	se.	14						
4	ne.	5	nne.	4	ne.	6	ne.	6	e.	6	e.	8	e.	7						
5	ne.	7	ene.	12	ne.	8	ene.	9												
6	e.	12	ne.	46																
7	nne.	4	ene.	1	s.	4	sse.	5	sse,	8	se.	13	se.	23						
8	n.	1	wnw.	1	ssw.	4														
9	sse.	1	sw.	4	s.	1	nne.	1	ne.	3										
10	ene.	10	ne.	20	nne.	20	nne.	20												
11	ene.	4	ene.	14	ne.	15	e.	7	ne.	3	s.	3								
12	e.	10	ne.	18	nne.	22	nne.	16	nne.	11										
13	ene.	5	ese.	1	nw.	1	n.	2	n.	3	n.	4	n.	6	nnw.	12				
14 [2]																				
15	ene.	5	ne.	1	sse.	3	sse.	6	s.	10										
16	ene.	3	e.	2	se.	5	sse.	8	sse.	13	se.	21								
17	ne.	5	ene.	6	ese.	3	Calm		sw.	2	sse.	2								
18 [2]																				
19	se.	3	ssw.	7																
20	ene.	2	ne.	4	ne.	1	Calm		wsw.	2	sw.	4								
21	e.	8	ne.	12	ne.	15	sse.	1	ene.	2	s.	2	s.	5						
22 [14]																				
23 [2]																				
24	e	5	ne.	15	ne.	20	ne.	5	ne.	5										
25	ene.	10	ne.	16	nne.	22	nne.	22	nne.	23										
26	ene.	7	ne.	17	nne.	22														
27 [2]																				
28 [2]																				

MARCH 1938—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1 [2]																				
2	wsw.	1	ssw.	7	ssw.	4	n.	4	nw.	6										
3	nne.	7	nne.	7	ne.	4														
4 [2]																				
5	ene.	7	ne.	19	ne.	6	ene.	16												
6	ne.	4	ne.	10	ne.	19	ne.	13	ne.	10										
7 [2]																				
8	ne.	4	ene.	4	ssw.	5	sw.	5												
9	e.	2	ssw.	5	sw.	6	s.	8	s.	4										
10	ene.	2	s.	2	s.	5														
11	ese.	2	ssw.	7	s.	11														
12	ene.	10	nne.	18	n.	31														
13 [2]																				
14 [2]																				
15	ese.	1	se.	1	sse.	8	s.	15												
16 [1]																				
17 [1]																				
18 [1]																				
19	ene.	5	ene.	8	ne.	8	nne.	12	n.	12										
20 [12]																				
21	ese.	5	ne.	20	nne.	26	nne.	26	nne.	28										
22	ene.	6	ne.	14	nne.	15	nne.	30	n.	31										
23	ene.	10	nne.	7	nne.	25	nne.	17												
24 [1]																				
25	Calm		ssw.	1	w.	2	n.	4	n.	5	n.	8	n.	10	n.	11	n.	13	n.	14
26	e.	1	ene.	8	nne.	1	Calm		s.	2	se.	2	nnw.	8	n.	12	nnw.	13	nw.	14
27	e.	1	ssw.	3	sw.	2	nne.	2	n.	4										
28	Calm		ssw.	1	ne.	1	nne.	6	nnw.	5	nnw.	5	nnw.	6	nnw.	5	n.	4	n.	4
29	wsw.	2	ssw.	7																
30	wnw.	1	sw.	5	nnw.	3	nw.	5	nw.	6	nw.	7	nw.	8	nw.	9	wnw.	12	wnw.	12
31	e.	3	ne.	15	nne.	14	nne.	30												

MARCH 1938—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1 [2]																				
2	ne.	1	e.	1	ssw.	3	w.	5												
3	e.	10	ne.	19																
4 [7]																				
5	ne.	3	ssw.	1																
6	e.	12	ne.	22	ne.	29														
7 [12]																				
8 [2]																				
9	ne.	2	sse.	1	s.	1	ssw.	7	s.	7	s.	4	s.	3	sse.	5				
10	ene.	2	ssw.	1	s.	4	s.	4	s.	6	s.	4	ene.	1	e.	1	e.	2	ne.	4
11	ne.	2	ene.	4	se.	3	s.	4	sse.	5	s.	10	s.	10	sse.	10	sse.	12		
12	ne.	2	sse.	2	e.	2	e.	4	s.	10	s.	14								
13 [1]																				
14 [2]																				
15 [1]																				
16	ne.	4	s.	4	ssw.	5														
17	ssw.	4	ssw.	8																
18 [1]																				
19	ne.	7	ne.	13	ne.	19	ne.	9												
20 [2]																				
21	e.	10	ene.	6																
22	e.	5	nne.	14	nne.	21	nne.	25	nne.	23	nne.	26								
23	ene.	3	ene.	4	nne.	12	nne.	11	n.	12	n.	15	n.	15						
24	ne.	2	ssw.	5	s.	11														
25	ene.	1	ne.	5	ne.	2	nne.	4	nne.	2	n.	4	nnw.	7	nnw.	10	nnw.	13	nnw.	15
26	ese.	1	ssw.	8	sw.	2	wnw.	2	wnw.	3	nnw.	8	nnw.	13	n.	20	n.	24		
27	ene.	1	ne.	2	sse.	1	Calm		nw.	3	nnw.	5	nnw.	6	nnw.	6	nnw.	8	nw.	12
28	Calm		ssw.	7	sw.	7	w.	4	nw.	4										
29	ssw.	2	ssw.	9	sw.	6	se.	1	w.	5	wsw.	10	wsw.	10						
30	nne.	1	n.	10	n.	12	nne.	12	n.	9										
31	ene.	6	ne.	15	ne.	17	nne.	20	nne.	18										

[1] None. Low clouds. [2] None. Snowing. [7] None. Strong surface winds. [12] None. Blowing snow. [14] None. High winds; blowing snow.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

APRIL 1938—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	4	ne.	12	ne.	14	ne.	19	nne.	2										5
2	ne.	1	n.	2	nnw.	7	n.	6	n.	7	n.	11	n.	9	n.	4	ne.	3	nne.	
3	ene	4	ne.	12	nne.	14	nne.	16	nne.	11	n.	10	n.	20	n.	4				
4	ene.	4	n.	11	n.	13	nnw.	13												
5 [12]																				
6	ne.	6	ne.	10	ne.	6	s.	1	ene.	2	ene.	10	ene.	13	ene.	21				
7	ene.	8	ene.	5	ene.	5	e.	6	se.	10	ese.	8	se.	10						
8	nne.	3	ene.	9	ne.	7	nne.	5	nne.	4	ene.	16								
9	ene.	3	nne.	3	ne.	4	e.	5	ene.	5	ene.	13	ene.	16	ne.	18				
10	ene.	3	ne.	14	ne.	11	ene.	9	ene.	3	e.	4	e.	7	ese.	9	e.	12	ese.	9
11	ene.	2	se.	1	sw.	1	nnw.	1	wnw.	1	ssw.	2	ssw.	2	se.	3	s.	4	s.	6
12	ene.	10	ne.	23	nne.	22	ne.	32												
13	nnw.	1	wsw.	3	ssw.	5														
14	s.	2	s.	6	s.	10	sse.	9	ene.	6	se.	12	ese.	13	ese.	19				
15	e.	1	sse.	2	sse.	6	se.	6	se.	6	e.	12	ese.	14	ese.	10				
16	e.	10	ene.	12	ne.	15	ne.	16	ne.	16										
17	ne.	5	ene.	6	s.	2	s.	3	s.	5	sse.	6	s.	7	se.	7	ese.	13	ese.	10
18	nne.	3	ese.	4	sw.	6														
19 [2]																				
20 [12]																				
21	ene.	1	ssw.	4	s.	5	s.	7	s.	9	s.	6	s.	10						
22 [2]																				
23 [1]																				
24	ne.	2	nne.	8	nne.	15	nne.	13												
25	s.	2	s.	9																
26	e.	5	ne.	19	ne.	17	ene.	6	e.	4										
27	nw.	1	sw.	3	sw.	7	ssw.	6												
28	e.	1	wsw.	2	ssw.	3	s.	2	se.	5	se.	4	ese.	6	ese.	8	ese.	8	ese.	12
29	ene.	5	ne.	8	e.	3	sse.	4	sse.	4	s.	5	s.	8	ssw.	11	s.	12	s.	9
30 [2]																				

APRIL 1938—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
1	ene.	5	e.	2	nne.	5	nnw.	3	nnw.	3	nnw.	5	nnw.	12	nnw.	9	nnw.	11	nnw.	10
2	ene.	4	ene.	11	nne.	6	nne.	19	nne.	10	nne.	18								
3	ne.	4	nnw.	11	nnw.	13	nnw.	11	nnw.	10	nw.	11	nw.	12						
4	e.	4	nne.	10	nne.	6	ne.	5												
5	ne.	5	ene.	14	ese.	8														
6	ene.	10	ne.	8	ne.	14														
7	ene.	10	ene.	5	ene.	14	e.	6	ese.	5										
8 [2]																				
9	ne.	3	e.	6	ene.	4	e.	3	ne.	4	ene.	7	ene.	9	ene.	12	ene.	17	ene.	18
10	e.	5	ne.	13	ne.	22	ne.	12												
11 [12]																				
12 [2]																				
13	Calm		ene.	1	wsw.	1	nw.	3	ne.	1	e.	5								
14	ne.	2	ene.	5	e.	5	ese.	6	e.	5	ese.	21	ese.	22	ese.	17	e.	20	e.	20
15	ese.	1	s.	4	s.	7	s.	8	s.	13	s.	7								
16	ene.	4	ne.	19	nne.	11	ne.	13												
17	e.	8	ne.	17	nne.	21	nne.	18												
18 [2]																				
19 [1]																				
20	ne.	5	e.	7	nne.	6	e.	1	e.	2	sse.	5	se.	6	sse.	11	sse.	16	s.	18
21 [2]																				
22 [2]																				
23	Calm		e.	3	se.	3	ese.	2	se.	8	ese.	4	se.	4	se.	3	ese.	6	ese.	7
24	e.	2	nne.	9	n.	9	n.	11	nnw.	7										
25 [2]																				
26	ese.	5	ne.	16	ne.	15	ene.	7	e.	6	se.	7								
27	ne.	1	ese.	1	sse.	4	ese.	5	ene.	6	e.	6	ene.	12	e.	9	e.	9	ene.	6
28	ne.	2	ne.	7	nne.	6	ne.	3	e.	4	ese.	5	e.	7	ese.	5	ese.	2	ene.	1
29	Calm		ssw.	4	s.	9	s.	7												
30	ene.	3	ene.	11	e.	3	sse.	4	s.	6	sse.	7	sse.	7	se.	9	sse.	9	se.	11

MAY 1938—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
1	e.	5	ene.	26	ne.	16	ne.	15	ne.	18										
2 [2]																				
3 [1]																				
4 [2]																				
5 [1]																				
6	Calm		sw.	1	wsw.	2														
7	Calm		wsw.	1	ssw.	4	w.	4	wnw.	4	wnw.	14								
8	ne.	1	n.	8	nnw.	11	nnw.	14	nw.	8	nw.	13	nw.	16	nw.	16	nw.	17		
9	nne.	4	nne.	7	nne.	14	nne.	8	nne.	3										
10	ene.	5	ne.	14	nne.	21	nne.	21												
11	e.	5	ne.	15	ne.	14														
12	Calm		sw.	2	ssw.	7	ssw.	5	ssw.	3	s.	6	sse.	7	sse.	10	sse.	10	sse.	14
13	Calm		sw.	1	nne.	3	ene.	4	ene.	5	ene.	4	se.	4	ese.	6	ese.	8	sse.	4
14	Calm		ssw.	4	s.	11	wsw.	2	sw.	2	nnw.	2	nnw.	6	nnw.	8	nnw.	11	nnw.	15
15	sw.	2	ssw.	4																
16	Calm		ssw.	2	s.	7	s.	5	s.	4	ssw.	2	wnw.	2	w.	3	w.	5	wnw.	8
17	sw.	1	sw.	3	s.	10	ssw.	7	ssw.	5	s.	9	wsw.	6						
18	sw.	1	ene.	2	ene.	1	e.	1												
19	ene.	5	ne.	16	nne.	14	ne.	11	nne.	3	w.	1	w.	5	w.	6	wsw.	10	wsw.	12
20	ene.	5	ne.	15	ne.	13	e.	6	se.	1	ese.	2	sse.	4	s.	6	ssw.	12	s.	11
21	ne.	4	ene.	2	ene.	2	e.	4	ese.	4	ese.	6	ese.	4	se.	4	se.	2	sse.	4
22	ne.	2	ne.	4	nne.	7	nne.	6	ne.	6										
23	ene.	3	ene.	3	ne.	6	ene.	5	ne.	10	e.	3	se.	1	sse.	2	sw.	6	sw.	10
24	ene.	5	ne.	18	nne.	20	ne.	18	ne.	19										
25	e.	3	ne.	3	sw.	4	wsw.	2	sw.	2	sse.	3	ese.	3	se.	3	sse.	6	sse.	6
26	ne.	7	ne.	14	ne.	8	nne.	14	ne.	8	ne.	8	ne.	7	ene.	6	ene.	9		
27	e.	3	ne.	12	ne.	9	ene.	3	e.	3	e.	6	e.	10	e.	9	e.	9	e.	7
28	Calm		s.	2	s.	2	ene.	3	ene.	5	ene.	5	ene.	8	e.	7	ene.	10	ene.	10
29	Calm		ssw.	4	w.	2	ne.	3	ene.	2										
30	nne.	2	ne.	8	ne.	12	ne.	11	ne.	8	ne.	13	ne.	12						
31	e.	3	ne.	13	nne.	15	nne.	20	n.	17	nne.	9								

[1] None. Low clouds. [2] None. Snowing. [12] None. Blowing snow.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

MAY 1938—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	4	ne.	9	sse.	2	s.	3	sse.	4	sse.	7	se.	10						
2 [2]																				
3	s.	1	ssw.	6	sw.	9														
4 [1]																				
5 [1]																				
6	wsw.	1	ssw.	2	s.	2														
7	Calm		sw.	1	ssw.	4	w.	2	wnw.	4	wnw.	9	wnw.	13						
8	ene.	2	ene.	7	nne.	9	n.	9	nnw.	7	nw.	14	wnw.	20						
9	ene.	4	ne.	14	ne.	18	nne.	16												
10	ese.	4	ne.	18	ne.	18	ne.	11	ne.	6	ne.	13	ne.	9	ne.	15	nne.	14		
11	ene.	5	ese.	1	sse.	4	s.	1	sse.	1	sse.	4	se.	7	se.	9	se.	11	se.	8
12	Calm		ssw.	3																
13	Calm		s.	1	s.	3	se.	2	ese.	2	ese.	1	ssw.	2	ssw.	1	wnw.	2	nnw.	4
14	sw.	1	s.	5	s.	12	sw.	2	wsw.	2	nw.	2	nnw.	6	nnw.	10	nnw.	13		
15	sw.	1	ese.	1	ssw.	7	sw.	5	ssw.	2	nne.	2	n.	6	nnw.	8	nnw.	10	nnw.	10
16	Calm		ssw.	5	ssw.	10	ssw.	12	ssw.	7	sw.	4	wsw.	2	nw.	5	wnw.	9	wnw.	9
17	wsw.	1	ssw.	2	s.	9	s.	8												
18	ne.	4	ene.	8	ne.	5	ne.	12	nne.	4	nnw.	2	w.	3	w.	6	wsw.	9	wsw.	11
19	ne.	5	ne.	15	ne.	11	ne.	5	nnw.	1	nw.	2	w.	4	wsw.	6	wsw.	9	wsw.	13
20	ene.	4	ne.	13	ne.	13	ne.	4	ene.	7										
21	ne.	4	ne.	5	ne.	1														
22	ese.	1	nne.	6	nne.	8	nne.	8	ne.	9	ne.	4	ese.	2	se.	2	ese.	3	e.	5
23	ene.	6	ne.	11	nne.	10	ne.	12	ene.	2	ne.	4	ne.	3	wnw.	1	wsw.	1	ssw.	2
24	ese.	3	ne.	17	ne.	11	ene.	8	ene.	7	ene.	11	e.	5						
25	nne.	1	nw.	1	sw.	5	wsw.	3	sw.	3	sse.	2	sse.	2	ese.	2	ese.	2	ssw.	4
26	ene.	5	ne.	17	nne.	13	ne.	13	ne.	7										
27	ne.	2	ese.	1	ssw.	5	ne.	1	ene.	5	ene.	7	ene.	9	e.	11	e.	13	e.	16
28	Calm		ene.	3	e.	3	ene.	4	ene.	3	e.	5	ene.	2						
29	Calm		ene.	1	nnw.	1	ne.	6	ene.	8	ene.	11	ene.	14						
30	ene.	3	ne.	13	ne.	9	nne.	7	ne.	8	nne.	8	nne.	12	n.	4				
31	ene.	5	ne.	13	nne.	19	nne.	22	ne.	22	e.	9								

JUNE 1938—6 A. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	5	ne.	11	ne.	5	ene.	1	se.	3										
2	e.	5	ne.	11	ene.	3	ene.	5	e.	2	ese.	5	se.	15						
3	e.	1	se.	1	s.	7	ssw.	2	s.	2	sse.	7	ese.	10	ese.	12	ese.	15	ese.	17
4 [1]																				
5 [2]																				
6	sw.	3	ssw.	8	ssw.	12														
7	sw.	2	ssw.	6	ssw.	6	sw.	3	wsw.	3										
8	s.	3	s.	6																
9	wsw.	3	ssw.	5	s.	7	sw.	7												
10	ne.	4	ene.	7	e.	7	e.	2	se.	1	sse.	4	sse.	4	ssw.	5	ssw.	5	sw.	9
11	ne.	4	e.	8	sw.	2	sse.	1	se.	5										
12	wsw.	1	sw.	4																
13	nne.	1	ene.	2	ese.	2	s.	2	sse.	5	ese.	7	ese.	6	ese.	5	e.	7	e.	5
14	e.	4	ne.	12	ne.	14	ne.	8	e.	7	se.	4	sse.	7	sse.	13	sse.	12		
15 [2]																				
16	Calm		ene.	8	ne.	10	nne.	8	nne.	8	nne.	7	n.	2	se.	1	se.	1	se.	2
17	wsw.	2	ssw.	7	sse.	4	e.	4	nnw.	3	nw.	4	wsw.	2	ssw.	7				
18	Calm		ene.	3	ene.	5	ene.	4	ene.	5	se.	2								
19 [1]																				
20 [16]																				
21	Calm		nw.	1	ssw.	5	s.	8	s.	6										
22	Calm		n.	1	e.	2														
23	ese.	2	ne.	9	ne.	11	nne.	11	nne.	10	w.	7	w.	11	w.	11	w.	13		
24	wnw.	3	ne.	11	nne.	10	n.	13	n.	13	nnw.	14								
25	ese.	3	ne.	6	nne.	7														
26	e.	6	ne.	11	ne.	17	ne.	13	ne.	18	ne.	6	ene.	1	ene.	2	s.	1	s.	2
27	ese.	3	ne.	11	ene.	9	n.	1	ssw.	2	wsw.	2	w.	3	w.	3	wsw.	7	sw.	7
28	ese.	2	ne.	8	ne.	7	ne.	6	n.	6	n.	4	nnw.	3						
29	e.	2	ene.	8	ene.	8	ne.	2	n.	4	nnw.	6	nnw.	3	n.	8	n.	6		
30	sw.	1	ssw.	7	sw.	6	s.	2	sse.	1	sse.	1	ese.	2	ese.	4	ese.	7	ene.	5

JUNE 1938—6 P. M.

Date	Surface		500 m.		1,000 m.		1,500 m.		2,000 m.		3,000 m.		4,000 m.		5,000 m.		6,000 m.		7,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
1	ne.	4	ene.	7	e.	4	se.	2	ese.	4	sse.	7	se.	5	se.	8	se.	7		
2	ne.	5	ne.	12	ne.	3	ne.	1	ese.	2	ese.	7	se.	13	sse.	20	sse.	22		
3	sw.	2	ssw.	9																
4 [2]																				
5 [1]																				
6	wsw.	3	ssw.	4	ssw.	7	wnw.	2	nw.	2	wsw.	2	nnw.	4	n.	4	nnw.	4	nnw.	7
7	ssw.	3	ssw.	9	ssw.	10														
8	ssw.	4	s.	6																
9	sw.	1	ne.	5	ne.	2	se.	3	s.	3	sw.	4	sw.	7	sw.	8	sw.	9	sw.	9
10	ene.	4	ene.	3	se.	1	se.	4	ese.	3	ese.	8	ese.	8	se.	7				
11	nne.	2	e.	1	w.	1	ssw.	3	sse.	5	s.	5	s.	6	se.	5	ese.	5	ese.	9
12	sw.	1	sse.	1	sse.	5	sse.	8												
13	wsw.	2	ssw.	5	ssw.	5	se.	8	se.	7										
14	e.	5	ne.	10	ne.	16	ene.	11	ne.	15	ene.	11	ese.	8						
15	sw.	4	ssw.	15																
16	ene.	3	ene.	9	ne.	13	nne.	9	nne.	7	n.	7	nnw.	9	sw.	3	sw.	5	ssw.	8
17	w.	2	ssw.	6	s.	3	e.	2	ene.	2	nnw.	3	se.	1	ssw.	5	s.	7	s.	9
18	s.	1	sw.	2	sse.	2	sse.	3	sse.	4	sse.	6								
19 [16]																				
20	Calm.		w.	1	s.	3	s.	5	sse.	7	se.	5								
21	Calm.		nw.	1	sse.	1	se.	3	sse.	6	s.	2								
22	s.	1	ene.	7	ene.	5	ne.	3	wnw.	2	wsw.	6								
23	e.	3	nne.	11	nne.	16	nne.	13	n.	12	n.	9	nnw.	4	nw.	9	wnw.	9	wsw.	11
24	ene.	3	ene.	10	ne.	11	nw.	11	n.	13	wnw.	9	wnw.	8						
25	e.	2	ne.	11	ne.	9	nne.	7	n.	8	n.	7								
26	ene.	4	ene.	15	ne.	12	nne.	11	e.	8										
27	e.	3	ene.	7	ne.	3	nw.	1	wsw.	1	nw.	2	wnw.	4	wnw.	6	nw.	7	nw.	8
28	sse.	1	ne.	5	nne.	3	nne.	7	n.	7	nne.	9	n.	7	nnw.	8	nnw.	12	nnw.	16
29	Calm.		wnw.	2	s.	1	ese.	2	wnw.	3	nw.	4	nw.	4	n.	5	n.	7	n.	8
30	e.	1	ssw.	5	ssw.	8	Calm.		s.	2	s.	2	sse.	4	sse.	6	s.	4	se.	2

[1] None. Low clouds. [2] None. Snowing. [16] None. Foggy.

TABLE 1A.—*Continuation of wind data in preceding table 1 showing wind data for levels of 8,000 meters and above*

[Months or days with no data for these levels are omitted]

Date	8,000 m.		9,000 m.		10,000 m.		11,000 m.		12,000 m.		13,000 m.		14,000 m.		15,000 m.		16,000 m.		17,000 m.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
SEPTEMBER 1937—6 A. M.																				
11	sse.	13	sse.	12																
18	n.	21																		
23	wnw.	18	wnw.	20	wnw.	22	wnw.	15												
MARCH 1938—6 A. M.																				
24 [1]																				
25	n.	14	nnw.	10	nw.	11														
26	nnw.	16																		
28	n.	5	n.	10	nw.	10	nnw.	11	nnw.	8										
MARCH 1938—6 P. M.																				
10	e.	3	ene.	6																
25	nnw.	16	nnw.	10																
27	nnw.	9	nnw.	18	nnw.	27	nnw.	34												
APRIL 1938—6 A. M.																				
2	n.	5	n.	11																
10	ese.	9	e.	7																
11	sse.	8	sse.	10	sse.	22														
28	e.	9	ene.	7																
APRIL 1938—6 P. M.																				
1	nnw.	9																		
9	ene.	20																		
14	e.	13	e.	11	e.	11														
23	se.	9																		
27	ene.	10	e.	10	e.	9														
28	se.	4	ese.	5																
30	se.	9																		
MAY 1938—6 A. M.																				
13	ssw.	1	s.	6	nw.	2	n.	2	nne.	1	ene.	4	ene.	12						
14	nnw.	14	nnw.	11	nnw.	9	n.	7												
16	nw.	13																		
19	wsw.	12	wsw.	8	sw.	9														
20	s.	6	s.	4	s.	2														
21	s.	1																		
23	sw.	12	sw.	13	sw.	7	ssw.	5	ssw.	4	sw.	4	ssw.	8	sw.	10	sw.	10	sw.	15
25	sw.	7	ssw.	13	s.	4	e.	2												
27	ene.	6	ene.	10	ene.	7														
28	ene.	11	ene.	11																
MAY 1938—6 P. M.																				
13	n.	7	n.	5	nnw.	5	nnw.	6	n.	5										
15	nw.	13	nw.	14																
18	wsw.	13	wsw.	8																
19	sw.	14	sw.	8	ssw.	6														
22	se.	4	s.	6																
23	s.	6	s.	3	ese.	5														
25	sw.	5	wsw.	6	s.	2														
JUNE 1938—6 A. M.																				
3	se.	18																		
10	sw.	12	sw.	12																
13	ene.	8	ene.	7																
16	ese.	5	ese.	6																
26	sse.	3	se.	4	ese.	2														
27	sw.	10	sw.	9	wsw.	5	w.	3	wnw.	3										
30	ene.	7	e.	11	e.	18	ene.	6												
JUNE 1938—6 P. M.																				
6	n.	8																		
9	ssw.	10	sw.	9																
11	ese.	12																		
16	s.	11	ssw.	15																
17	s.	10	sse.	11	s.	6														
23	wsw.	18	wsw.	22																
27	nw.	8	nw.	6	wnw.	5	wnw.	2												
28	n.	18																		
29	nnw.	11	n.	10	n.	13	n.	9												
30	e.	4	se.	10	se.	12	ese.	8												

[1] None. Low clouds.

TABLE 2.—*Average height of clouds as determined by pilot-balloon observations, September 1937 to June 1938, inclusive*

Cloud Type	Spring		Summer[1]		Autumn		Winter		Annual	
	Average height	Number observations	Average height	Number observations	Average height	Number observations	Average height	Number observations	Average height	Number observations
Ci			5,677	1	5,227	2			5,377	3
Cs	4,095	9	5,317	2	3,877	1			4,282	12
As	2,435	4	3,187	6	3,157	2	2,257	4	2,763	16
Ac	2,437	1			2,317	3			2,347	4
Sc	1,311	13	1,165	9	1,065	5	1,054	3	1,201	30
St	1,115	9	804	2	1,378	4	1,033	11	1,097	26

[1] Month of June 1938, only.

TROPICAL DISTURBANCES OF OCTOBER 1939

By WILLIS E. HURD

[Weather Bureau, Washington, November 1939]

Hurricane of October 12–18, 1939.—The fourth tropical disturbance of 1939, that of October 12–18, unlike its predecessors of June, August, and September, which were of light to moderate character, was a hurricane of fully developed intensity. It originated to the eastward of the Antilles, and its preliminary signs were evidenced by unsettled weather and somewhat depressed barometer, with light winds, over the Leeward Islands during the afternoon of the 9th. From the 9th to the 12th there was but little change in the situation, except for a slight fall in barometer over the Leewards. By the morning of the 13th, cyclonic circulation appeared to be developing northeast of Puerto Rico, with winds of force 5–6 reported by ships south and west of the center which, at 7 a. m. (E. S. T.) was in approximately 21° N., 66° W. The lowest known barometer at the time was 1,005 millibars (29.68 inches), wind west, force 5, reported by a ship near 19° N., 65° W. Thereafter development of the disturbance was much more rapid, and it moved, first in a north-northwesterly direction, then north-northeast past Bermuda on the 16th, until its identity was lost on the 18th east of northern Newfoundland.

By 7 a. m. (E. S. T.) of the 14th, although there were no ships' observations to the near eastward of the center, winds in other quadrants of the disturbance denoted the establishment of a cyclonic circulation. The American steamer *Argentina*, near 25° N., 68° W., at that time, gave a barometer of 1,001 millibars (29.56 inches), wind east-northeast, force 6. At local noon of the 14th the Panaman motorship *Permian*, in 22°43′ N., 69°33′ W., reported the earliest known gale, a northwest wind of force 7, barometer 1,001.7 millibars (29.58 inches), observed in connection with the cyclone. Squally weather continued over a wide area throughout the day, with highest winds reported as of force 7, lowest barometers about 999 millibars (29.50 inches).

During the night of the 14th–15th, or very early on the 15th, rapid intensification set in. A report received by mail from the American steamship *F. W. Abrams* shows that at 1:50 a. m., local time of the 15th, the barometer on ship had fallen to 988.5 millibars (29.19 inches) in 26°54′ N., 66°18′ W., with wind east, force 8. At 7:50 a. m., local time, in 26°36′ N., 66°48′ W., the wind was a hurricane from the east, with barometer down to 941.4 millibars (27.80 inches), the lowest pressure observed during the course of the storm. The center at 7 a. m. (E. S. T.) of that date was close to 27° N., 67° W. High winds covered a wide extent of the sea during the local forenoon hours of the 15th. At 2 a. m. the southbound American steamship *Borinquen* in 28°00′ N., 65°30′ W., had a barometer of 969.5 millibars (28.63 inches), with northwest winds, force 10. Between about 10 a. m. and 2 p. m. the ship encountered southwesterly gales of hurricane force, with rising barometer. Considerably to the northwestward, the Dutch steamship *Telamon*, near 29° N., 69° W., had a northeasterly gale of force 10 during the midday hours, and at local noon the American steamship *Ponce* had a force-8 gale in 32°30′ N., 71°45′ W. During the afternoon the Dutch southbound steamship *Bacchus* experienced gales of force 10 to 12 from north to northeast, lowest barometer 993.9 millibars (29.35 inches) at 5 p. m. near 30° N., 68° W. In the same position, during the early morning hours of the 16th until about 6 a. m., the winds at the ship continued at force 11 from north-northeast. The cyclone center at that time was a short distance south of Bermuda.

From early morning on the 14th, the hurricane, which until then had been pursuing a generally north-northwesterly course, began curving into a north-northeasterly direction, under the influence of a strong anticyclone that was pressing seaward with crest over the Middle Atlantic States. It was during this recurve that the storm rapidly entered its hurricane stage.

For the 16th ship reports are lacking from near the center of the hurricane and, except for the force-11 gale experienced in the early morning by the *Bacchus*, no other vessel reported a wind higher than force 9. This was in 36°22′ N., 66°55′ W., lowest barometer 1,003 millibars (29.62 inches), read on the Dutch steamer *Hermes*. At greater distances north and west of the storm center, there were moderate to fresh gales.

Press reports from Bermuda show the islands to have been swept by hurricane winds for several hours during the afternoon of the 16th, with a maximum velocity of 131 miles an hour from the north at 6:40 p. m., as the center of the hurricane passed close to the eastward. Here considerable damage was done to trees, boats, houses, and public utilities.

During the greater part of the 17th the hurricane continued on a north-northeasterly course, with the center