

OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received reports from the captains of 40 vessels navigating the Great Lakes. The following miscellaneous items are extracted from their reports:

Capt. W. S. Shay, steamship *Governor Smith*, 20th, 1 a. m., Lake Michigan, a violent north-northeast gale and very heavy sea.

Capt. J. W. Morgan, steamship *Australia*, on St. Marys River, Mich., 27th, reports snow squalls from 3 a. m. to noon.

Capt. S. Langell, steamship *Zealand*, 27th, Lake Superior, reports heavy snowstorm from 4.30 to 6.15 a. m., the snow falling so heavily unable to see consort at a distance of 600 feet; the wind was blowing very hard at the time with very heavy sea.

Capt. E. T. Rattray, steamship *Specular*, 16th, on St. Marys River, Mich., and 16th on Lake Michigan, heavy squalls with thunder, rain, and hail; the storm seemed to come from all points of the compass.

Capt. Edward Mooney, steamship *Wa-Wa-Tam*, 3d, Lake Erie, northern lights from 9.50 p. m. until midnight. 30th, Lake Michigan, northern lights from 9 to 9.20 p. m.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received monthly reports for the month of May from the keepers of 35 U. S. Life-Saving Stations on the Great Lakes.

SUNSHINE AND CLOUDINESS.

GENERAL REMARKS.

The quantity of sunshine, and therefore of heat, received by the atmosphere is a fundamental factor in the most important meteorological phenomena; the quantity received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends largely upon the distribution of cloudiness. The sunshine is now recorded automatically at about 38 regular stations of the Weather Bureau, either by its photographic or its thermal effects. The cloudiness is recorded by personal observations at all stations, and is given in the column of "average cloudiness" in Table I.

SUNSHINE.

During the month an instrumental record of sunshine has been kept at 17 stations by means of the photographic sunshine recorder and at 21 stations by means of the thermometric sunshine recorder; the results of these observations are given in Table IV, for each hour of local mean time (not seventy-fifth meridian time). The stations recording the largest percentage of sunshine between the hours of 11 a. m. and 1 p. m., were: Des Moines and Galveston, 95; Salt Lake City, 93.5; Tucson, 91. The stations having the least percentage between these hours were Eastport, 47.5; Portland, Oreg., 50; Cleveland, 54.5. The general average percentage for the whole month is given in the next to the last column of Table IV. The highest percentages were: Tucson, 89; and Galveston, 88. The lowest percentages were: Eastport, 40; Rochester, 44; Portland, Oreg., 45.

CLOUDINESS.

The average cloudiness between sunrise and sunset, as based on numerous personal observations, is given for each Weather Bureau station in Table I; the complement of this average cloudiness gives the observer's estimated percentage of clear

sky, and these latter numbers are given in the last column of Table IV.

COMPARISON OF SUNSHINE AND CLEAR SKY.

The sunshine registers give the duration of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of area of clear sky. It must not be assumed that these numbers should agree, and for comparative purposes they have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of duration of sunshine is almost always larger than the observer's personal estimate of percentages of area of clear sky; the average excess is 8 per cent for photographic records and 12 per cent for thermometric records:

Difference between instrumental and personal observations of sunshine.

Photographic stations.				Thermometric stations.			
	Instrumental.	Personal.	Difference.		Instrumental.	Personal.	Difference.
Tucson, Ariz.....	89	78	11	Des Moines, Iowa.....	78	69	9
Galveston, Tex.....	88	88	0	Key West, Fla.....	75	52	23
Santa Fe, N. Mex.....	77	63	14	New Orleans, La.....	72	72	0
Bismarck, N. Dak.....	72	68	4	Little Rock, Ark.....	69	41	28
Dodge City, Kans.....	71	63	8	Salt Lake City, Utah.....	69	57	12
Kansas City, Mo.....	71	56	15	St. Louis, Mo.....	66	56	10
Savannah, Ga.....	71	60	11	Baltimore, Md.....	65	52	13
Denver, Colo.....	63	46	17	Chicago, Ill.....	62	50	12
San Francisco, Cal.....	59	49	10	Colorado Springs, Colo..	62	41	21
Washington, D. C.....	59	51	8	Columbus, Ohio.....	61	40	21
Cincinnati, Ohio.....	56	47	9	New Haven, Conn.....	58	45	13
Cleveland, Ohio.....	54	40	14	Boston, Mass.....	57	46	11
San Diego, Cal.....	53	56	-3	Louisville, Ky.....	57	39	18
Portland, Oreg.....	45	45	0	Philadelphia, Pa.....	57	38	19
Eastport, Me.....	40	31	9	Wilmington, N. C.....	57	60	-3
Helena, Mont.....				Portland, Me.....	55	35	20
Memphis, Tenn.....		61		Detroit, Mich.....	53	42	11
				Buffalo, N. Y.....	52	46	6
				New York, N. Y.....	49	41	8
				Rochester, N. Y.....	43	35	8
				Vicksburg, Miss.....		70	

NOTES BY THE EDITOR.

REMARKABLE HAIL.

During a severe hailstorm at Vicksburg on the afternoon of Friday, May 11, a remarkably large hailstone was found to have a solid nucleus, consisting of a piece of alabaster from one-half to three-quarters of an inch. During the same storm at Bovina, 8 miles east of Vicksburg, a gopher turtle, 6 by 8 inches, and entirely encased in ice, fell with the hail.

An examination of the weather map shows that these hail storms occurred on the south side of a region of cold northerly winds, and were but a small portion of a series of similar

storms; apparently some special local whirls or gusts carried heavy objects from the earth's surface up to the cloud region, where they were encased by successive layers of snow and ice, until they fell as hailstones. The fact that hailstones, as well as drops of water and flakes of snow, often contain nuclei that must have been carried up from the earth's surface, is entirely in accord with the general principle that ascending currents precede the formation of cloud and rain, and that solid nuclei are needed to initiate the ordinary precipitation of moisture.