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THE UNUSUAL WINDSTORM OF FEBRUARY 9, 1938, AT SAN FRANCISCO

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[Weather Bureau, San Francisco, Calif., March 1938]

From the 27th of January until the 14th of February 1938, northern California was visited by a series of rainstorms that followed one another in such rapid succession that there were scarcely any intermissions between them. In San Francisco precipitation of measurable amount (0.01 inch or more) fell on every day for 19 days—a new record for a continuous rainy period at that station. The previous longest period of consecutive rainy days was in February 1936, when rain of measurable amount fell on 15 consecutive days. Prior to that, the longest such period was 14 days, and occurred in the period January 25–February 7, 1884.

While nothing is known about the weather type associated with the rainy period of 1884, it is worth noting that the rains of February 1936 were associated with a weather type similar to that responsible for the rainy period of February 1938, when the all-time record for persistent rains in San Francisco was broken. It falls into Abercrombie's classification of Easterly Type Lows, referred to by the writer in his "Weather Types of the Northeast Pacific Ocean"¹ but may be epitomized more conventionally by saying that during the period mentioned the polar front was found persistently south of its normal latitudes, while the tropical high-pressure belt had disappeared. Incidental to this displacement was a remarkably persistent "leakage" of Pc air southward over middle latitudes of the northeast Pacific Ocean in the vicinity of the 150th meridian, thus transforming the latter region into one of cyclogenesis in which depressions formed in rapid succession and traveled eastward, bringing central California regularly into the path of their wettest sectors.

The most casual reference to the synoptic charts of the period will confirm the foregoing description, but in further elucidation thereof selected pressure and temperature graphs for the epoch are supplied in figures 1 and 2. It will be noted (fig. 1) that atmospheric pressure was continuously above normal at Dutch Harbor and St. Paul, Alaska, and also almost continuously above normal at Edmonton, Alberta, while at stations in lower latitudes, represented by the graphs for Midway Island, etc., the pressure was prevalingly below normal. The southward and southwestward movement of air from the Arctic, consonant with this pressure regime, is illustrated by the temperature graphs (fig. 2) which show persistently subnormal temperatures at Juneau, Alaska, and at Edmonton, Alberta. The abnormal drift of Arctic air might be further exemplified by the record of free-air wind observations at Juneau, but the data available to the writer are so sparse as to be unsuitable for publication. However, such reports as came to hand during the period under

review were consistent in showing a westward flow of air across the southeastern Alaska coast up to the highest altitudes reached by the balloons.

One of the depressions to form over lower latitudes at sea during this period is of especial interest because of the unusual strength of the winds which were associated with it at the time it moved onto the California coast. It was first indicated on the synoptic chart of February 6, near and northeast of Hawaii, but it exhibited no noteworthy features until the morning of the 8th when a well-developed vortex was apparent with center in approximately 31° N., and 130° W. Up to this time it had traveled almost due eastward, but in the next 24 hours its movement was toward the northeast, and its center appeared on the weather chart of the morning of February 9 near and southeast of the Farallon Islands, probably near the intersection of the 35th parallel and 135th meridian, at which time the central pressure was estimated to be 29.20 inches.

It was evident that the center would pass over central California during the day; whole gale warnings were displayed on the central California coast at 7 a. m. P. S. T., and special broadcasts of the approaching danger were issued to local radio stations and advices issued to the press. The center actually passed over or very near the San Francisco Bay region early in the afternoon. The behavior of the barometer during its passage is shown by the accompanying reproduction of the barograph trace (fig. 3) at the San Francisco station. Winds ranging in velocity from 38 miles per hour at San Francisco to 78 miles per hour at the Southeast Farallon were experienced. The wide range of velocities recorded at various points of observation within a relatively small area is worthy of note and is exhibited in the accompanying table.

Maximum wind velocities recorded in vicinity of San Francisco on Feb. 9, 1938

Station	Maximum velocity 5-minute period	Time	Extreme velocity (1 mile)	Time
Berkeley (Univ. of Calif.).....	40 SE.....	11:35 a. m.	58 SE.....	11:35 a. m.
Grizzly Peak.....	72.....	1:00 p. m.	113.....	12:53 p. m.
Hamilton Field (U. S. Army).....	36 SW.....	1:35 p. m.	45 SW.....	1:18 p. m.
Moffett Field (U. S. Army).....	61 SW.....	12:30 p. m.	68 SW.....	12:36 p. m.
Oakland Airport (Weather Bureau).....	35 SW.....	12:50 p. m.	67 SW.....	12:50 p. m.
Point Reyes (U. S. Lighthouse Bureau).....	56.....	3:20 p. m.	64.....	3:22 p. m.
San Francisco (Weather Bureau).....	38 SW.....	12:49 p. m.	47 SW.....	1:20 p. m.
San Francisco (Municipal Airport).....	57 WSW.....	12:38 p. m.	78 WSW.....	12:47 p. m.
SE Farallon* (U. S. Navy).....	78 W.....	(About noon)*
Selby Hill.....	60.....	1:50 p. m.	70.....	1:50 p. m.
Selby (Tunnel Hill).....	58.....	1:45 p. m.	61.....	1:49 p. m.

* Observation obtained by buzzer type anemometer; no automatic record available.

¹ Reed, T. R., Monthly Weather Review, Vol. 60, pp. 246-252, Dec. 1932.

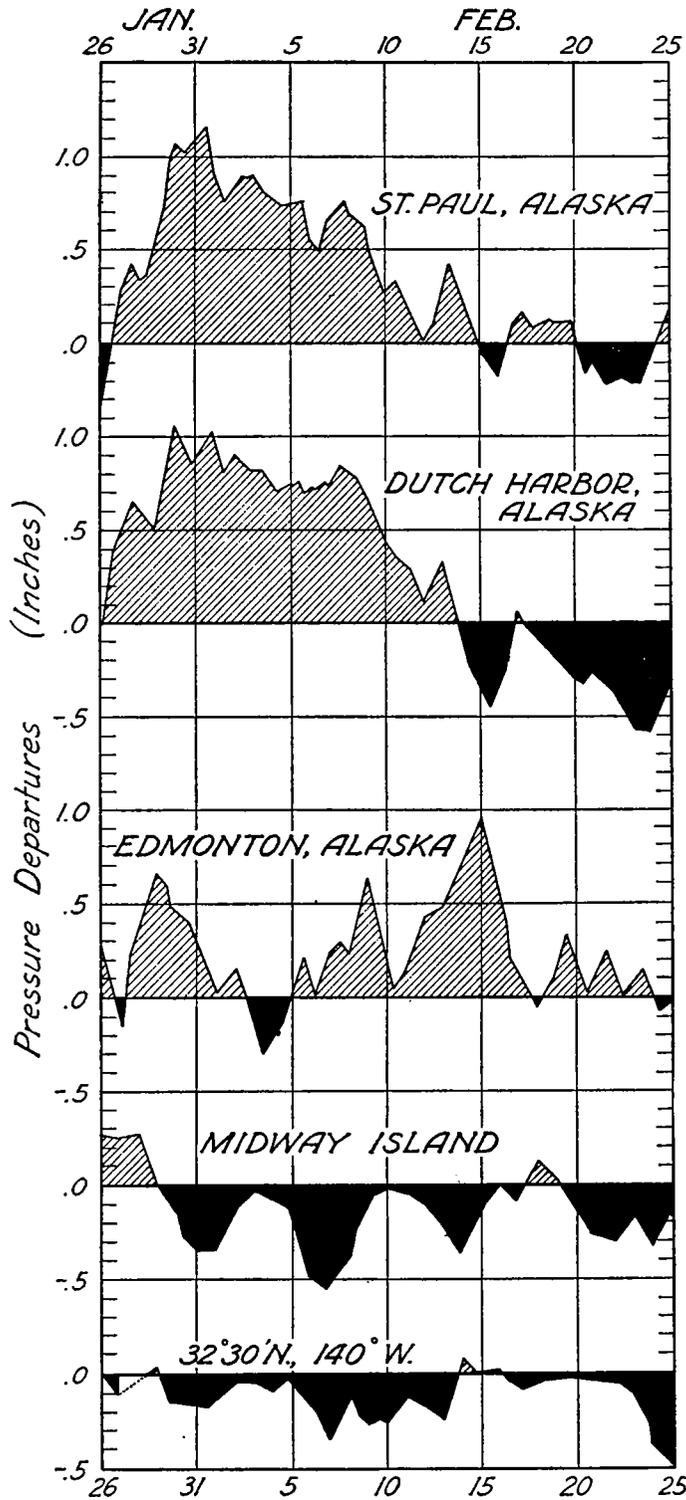


FIGURE 1.—Graphs showing departure from normal pressure during period of persistent rains in central California. Note the absence of the tropical high-pressure belt and of the low-pressure lane of northern latitudes.

In regard to the record at Oakland, J. A. Riley, official in charge, made the following comment:

The data were taken from the Dines anemograph. The Weather Bureau anemometer is also available but its record is not legible at time of highest wind. However, the buzzer attached to the anemometer was read several times during the storm and showed close agreement with the anemograph. Gusts on the anemograph occurred as follows: 12:50 p. m., 67 m. p. h.; 1:04 p. m., 64 m. p. h.; 1:20 p. m., 62 m. p. h.; all velocities uncorrected. The extreme velocity for 1 mile was 58 m. p. h., at 12:50 p. m.

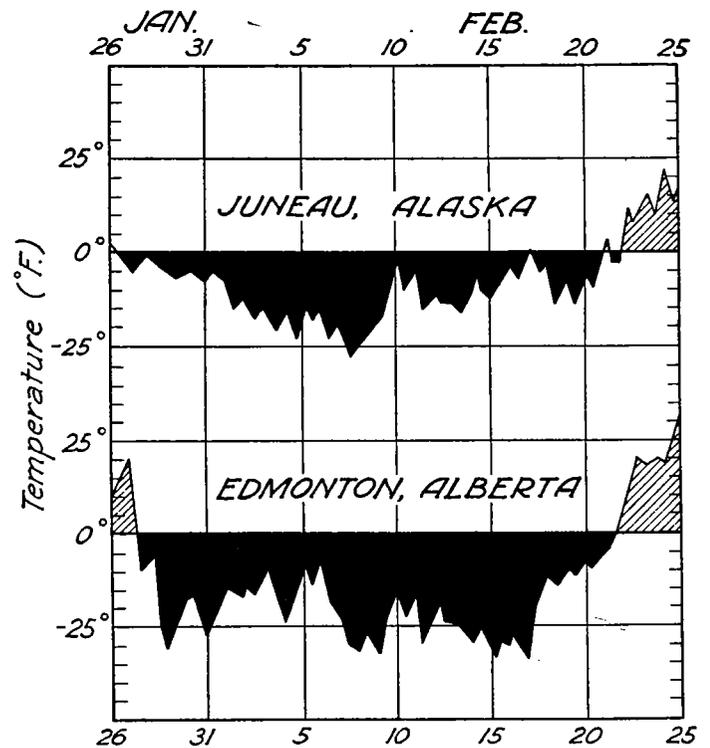


FIGURE 2.—Graphs showing departure from normal temperature during period of persistent rains in central California. Note the persistence of Pc air south of its normal latitudes.

E. P. Sullivan, meteorologist at the San Francisco Municipal Airport, made the following comment:

The highest gust recorded and the estimated average velocity for the highest 5-minute period (chosen after careful observation of the chart) are substituted for the extreme and maximum velocities usually cited, due to the fact that our anemograph is a Selsynmotored pressure type instrument which records instantaneous velocities.

‡ A shift in wind direction from SE to SSW occurred at about 11:50 a. m., at which time the velocity began climbing from an average of about 25 m. p. h. The first gust of 70 m. p. h. occurred at 12:30 p. m. Gusts over 70 m. p. h. continued through 1:10 p. m., after which the velocity decreased somewhat, but remained gusty with occasional peaks of 60 m. p. h. until around 4:30 p. m.

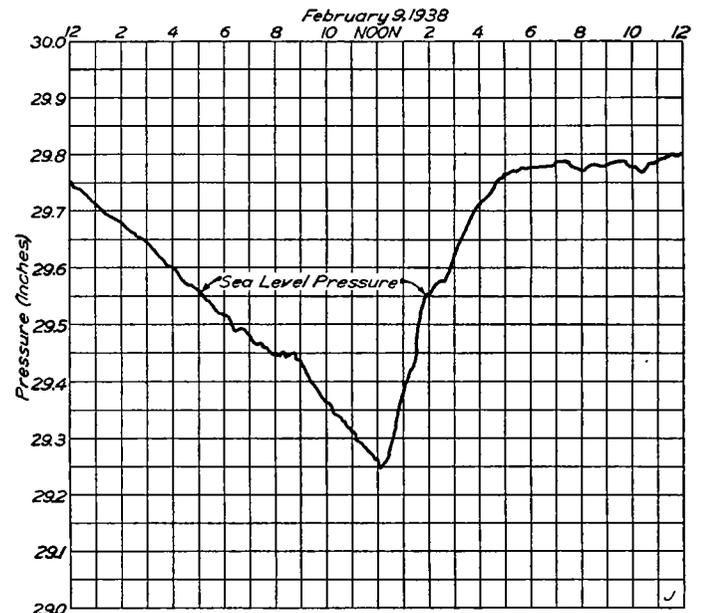


FIGURE 3.—Copy of barograph trace at San Francisco, Calif., February 9, 1938.

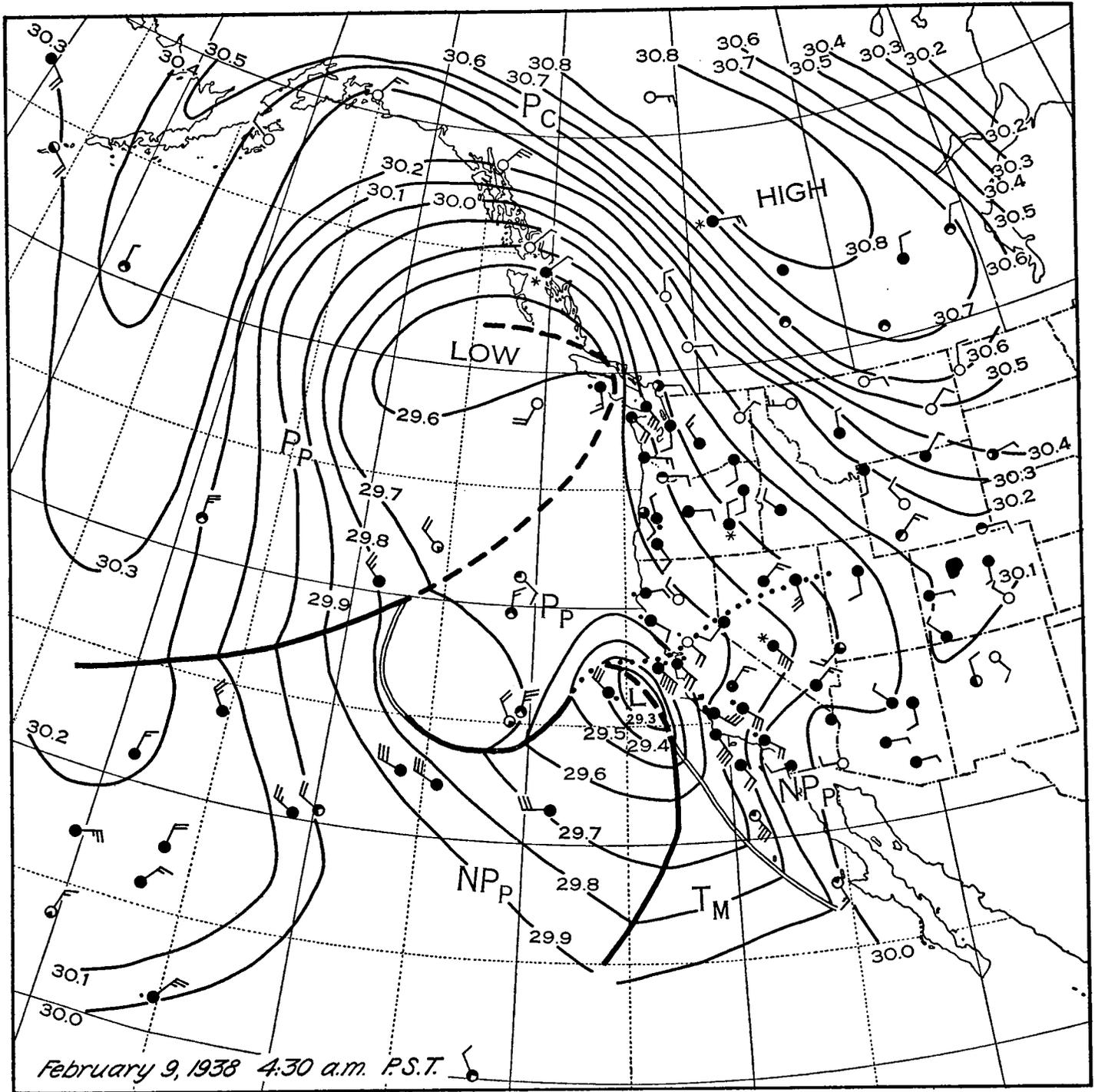


FIGURE 4.—Synoptic weather map for the morning of February 9, 1938. Analysis made by E. M. Vernon.

It might be mentioned that brief periods of power failure varying from a few seconds to about 1½ minutes occurred during the period of highest wind. The 1½ minute failure occurred just a few seconds after the 78 m. p. h. gust. During such periods the wind recorder is inoperative.

The most distant station in the above table is Point Reyes, situated on a coastal promontory 36 miles north-west of San Francisco. The station recording the highest extreme velocity, Grizzly Peak, is situated in the Berkeley

Hills, 12 miles east-northeast of San Francisco, and at an elevation of 1,760 feet above sea level. The directions and distances of other observation points from the San Francisco city station are as follows: Berkeley, 11 miles ENE.; Hamilton Field, 20 miles N.; Moffett Field, 32 miles SE.; Oakland Airport, 11 miles E.; San Francisco Airport, 10 miles S.; Southeast Farallon, 31 miles WSW.; Selby, 21 miles NNE.