Cyclones and gales.—No cyclones crossed the North Pacific high pressure region this month, and no gales were reported except from the American coastal region and the Far East. A fresh northwest gale was experienced at sea south of Eureka on the 5th; otherwise, all gales were of tropical character.

Closely following the disintegration of a West Indian hurricane that crossed the east Mexican coast on the 6th, moderate southerly gales occurred in the Pacific midway between Salina Cruz and Acapulco on the 7th, and fresh to strong southwesterly to rapidly shifting gales of cyclonic nature, with barometer depressed about 0.20 inch, were reported near Acapulco on the 8th.

On the 29th, in the same locality (16°35′ N., 100°52′ W.), the British steamship *Holystone* reported a disturbance of cyclonic characteristics, accompanied by much thunder and lightning, with a maximum velocity of force 12 from west-southwest in a gust at 4:20 p.m.

A violent gale (SE., force 12) of brief duration, accompanied by a pressure drop of 0.06 inch, was reported by the U.S.S. *Naches* on the 22d off the extreme southern coast of Costa Rica (7°55′ N., 83°57′ W.). The ship reported "passing through the inner circle of a tropical disturbance." Heavy rain and thunder squalls were noted by other ships in this neighborhood on the 20th to 22d.

Typhoon of the Far East.—There were some evidences of cyclonic activity on several occasions in the Far Eastern tropics during July, but so far as at present indicated only one of these disturbances developed any marked intensity. This was a typhoon which originated near Guam on the 24th. On the 31st, with greatly increased intensity, it was over the Nansei Islands, approaching Japan. The American steamship *Golden Star* encountered this typhoon on the 28th to 30th, with maximum wind velocity of force 10 from the east on the 29th, and lowest barometer 29.52, at 18°17′ N., 135°05′ E. The American steamship *Michigan* encountered full hurricane velocities from east and southeast on the night of the 30th–31st, near 20°30′ N., 132°12′ E., with uncorrected barometer down to 28.92 inches. The typhoon at that time was reported as developing and moving northeast with a speed of 30 kilometers per hour.

Fog.—Fog was most frequent off the coast of Lower California, where it was reported on 11 days. But about 10 days with fog were noted along the entire northward coast to the mouth of the Columbia River. Along the northern steamship routes some 20 to 30 percent, or more, of days had fog from 150° W. to 150° E.

TYPHOONS OF JUNE AND JULY 1933 IN EASTERN SEAS

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The following remarks regarding depressions of typhoon character that came in rapid succession beginning June 27, 1933, involve the use of ideas from the Norwegian system of frontal analysis. I find in them the key to the solution of Far Eastern weather problems; the only trouble is that very often, due to lack of observations from ships on the Pacific and from Central Asia, the key cannot be used with precision.

There were no typhoons until near the end of June, when a weak disturbance began the season. Thereafter followed four others. These are noted individually as follows, the dates being those on which the depressions could be first definitely identified:

(1) *June 27.*—This originated east of Hainan in the "intertropical front", i.e., the front between the trade wind and the so-called "southwest monsoon" (southern hemisphere air). The trade wind to the north was going from east to west, blocking the path of the southwest monsoon. The mountain ranges along the eastern coast of Indo-China helped to perpetuate the cyclonic motion once it started. This typhoon traveled slowly north and when it reached the interior of southern China on June 30 dissipated; at the same time a depression started west of Amoy, giving the false impression that the typhoon had quickly gone north to Shanghai and Korea.

(2) *July 16.*—This typhoon was first discovered near 17° N., 134° E., but it is probable that it started much farther east on the intertropical front, between Guam and the Bonins. It traveled westward along the front until the end of the 17th, when it turned northward around the trade-wind HIGH until it came to the Eastern Sea, during the 20th, about which time the storm had much occluded. There it broke connections with the intertropical and joined the polar front, continuing along the latter toward the Aleutian Islands until off our maps, on the 24th.

(3) *July 19.*—This typhoon was first observed when it came into the region of our maps around Guam, also on the intertropical front. Its later course was almost identical with the preceding typhoon, passing into the Eastern Sea on the 24th and thence northeastward beyond the range of the maps, on the 26th. Neither of these typhoons (2 and 3) was of more than moderate intensity.

(4) *July 27.*—Due to lack of observations this can at present be traced no farther eastward toward its origin than the 127th meridian at latitude 17° N. It undoubtedly started beyond that point on the intertropical front, which it followed until disappearance over northern Indo-China on the 31st. This front, after the preceding typhoon (3), settled down to the line between Formosa and North Luzon, over Hainan, from the direction of the Carolines. This depression was small when it reached the Philippines, but increased a bit in intensity as it got into the China Sea.

(5) *July 26 (Guam).*—This began about 400 miles east of Yap and about due south of Guam, on the same front, and followed the same track as typhoon (4) until near the Philippines. Here an interesting change of direction occurred. Although the intertropical front still went west to Hainan where the preceding depression was located, this typhoon went north after the 30th. Why? Most probably the *main* stream of the trade wind (in the upper air) went north and not west at the place of departure from the surface front. Typhoons seem to follow the direction of the air stream of the medium upper levels.

This typhoon slackened its pace and deepened very much as it reached the Loo-Choos on August 1. In the Eastern Sea it broke again with the southwest monsoon and entered the polar front circulation. There was much damage in Korea, over which the storm passed on August 4. Thereafter, in the Japan Sea, something peculiar seems to have happened, and it is possible that the typhoon split, one part going on northeastward, and the other re-forming to the east of central Japan and then going east. We must await further information on this situation.