

RECENT OCEANOGRAPHIC CONDITIONS IN THE CENTRAL PACIFIC

PRESENTED BY GARTH I. MURPHY

(EDITORS' NOTE) : *Mr. Murphy in his presentation briefly reviewed material that he distributed to all members of the Symposium. It seemed best that rather than presenting the review by Mr. Murphy that the material distributed should be presented in total. The discussion has been included at the end.*

SURFACE TEMPERATURE ANOMALIES IN THE CENTRAL NORTH PACIFIC, JANUARY 1957-MAY 1958

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The surface-temperature monitoring program for the Northeastern Pacific utilizing ship's weather report data which was described at the EPOC meetings at Lake Arrowhead last fall was started in October 1957. Since that time we have prepared a complete series for the middle ten days of each month from January 1957 through May 1958. The final form consists of a series of four plots for each month, the actual temperature contours and the anomalies from the 30-year mean (H. O. 225), the tabulation of all temperature data available for the Pacific east of 180° and between 20°N and 30°S., and since January 1958 the anomaly of 1958 from 1957. The procedure used in constructing the temperature charts of the Northeastern Pacific was basically the same as that used by Dr. Takenouti's group at JMA for the Northwestern Pacific and which was verified by a check against research vessel temperature data by Franceschini of Texas A & M. This procedure is quite simple, the temperatures are decoded, averaged by one-degree square, and contoured assuming they represent the average for the center of the squares. The anomaly charts are drawn by overlaying the monthly and normal charts on a light table.

The anomaly charts appear to have the most promise for tracing major changes in temperature in spite of the fact that they contain many small cells which have no month-to-month continuity. Actually many of the small changes in the anomalies from the 30-year mean are the result of the difference in techniques used in their construction. The 30-year mean charts were interpolated from H. O. 225 and hence represent data that has had a maximum of smoothing while the monthly charts are drawn strictly on the distribution of temperature indicated by averages for the one-degree squares after the obviously bad values have been culled out.

Most of the large features in the 30-year anomaly charts persist from month to month but their change in size, shape, and geographical position is more

amoeboid in nature than can be accounted for by advection by the normal ocean currents. This leads to speculation as to the need for the computation of new mean-temperature charts. Examination of the major features of the area to the north and northeast of the Hawaiian Island chain will illustrate the manner in which these changes occur.

In January 1957 (Fig. 14) except for a few small cells the major portion of the area west of 145°W. longitude was 2°F. or greater, warmer than normal. By February (Fig. 15) in the area north of 35°N. the warming had persisted and the anomaly had increased in many places while to the south of 35°N. the positive anomaly had decreased in intensity. For March (Fig. 16) there were only minor changes in the distribution of positive and negative anomalies in the mid-ocean area but the amount of the positive anomaly had decreased. In April (Fig. 17) except for a few areas along 45°N., the return towards normal conditions had continued although most of the area was still slightly warmer than normal.

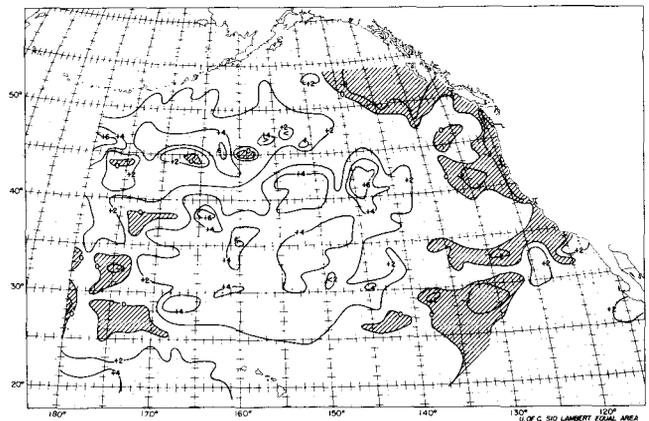


FIGURE 14. January 11-20, 1957. Anomaly of sea surface temperature (°F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

In May 1957 (Fig. 18) the dominant anomaly of the area was still 0 to 2°F. warmer than normal but there had been a slight increase in the areas of cold anomaly. This increase became pronounced in June (Fig. 19) and a tongue of cold water extended east between 35° and 60°N. latitude from 180° to 135°W. but outside this area the areas having positive anomalies of +2°F. or greater increased. This was the basic distribution throughout the summer with the tongue of cold water in the west or northwest merely changing shape and retreating or expanding (Figs. 20, 21).

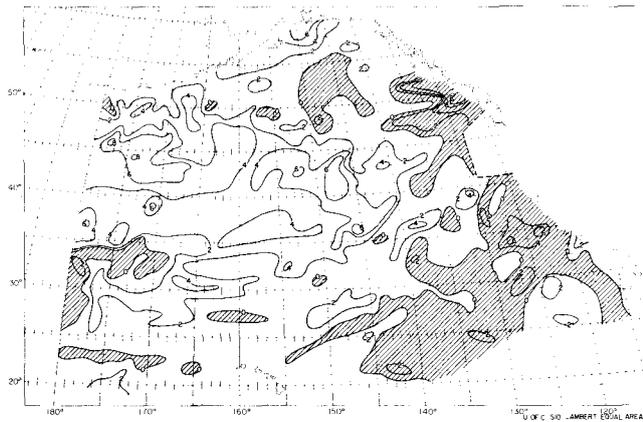


FIGURE 15. February 11-20, 1957. Anomaly of sea surface temperature (°F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

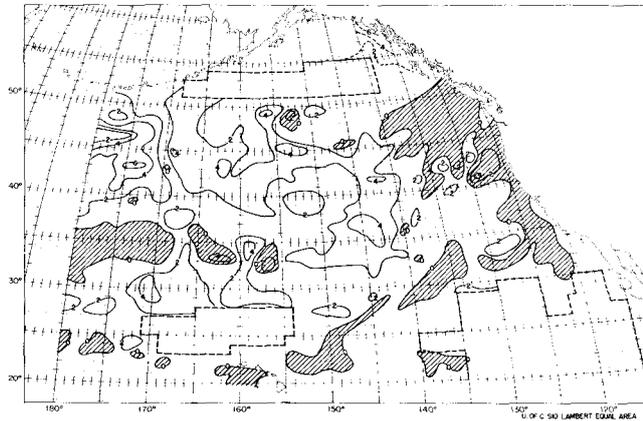


FIGURE 16. March 11-20, 1957. Anomaly of sea surface temperature (°F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

In the fall and early winter (Figs. 22-25) basically the same conditions existed; cold anomalies appear in the extreme west and positive anomalies reaching a maximum of greater than 6°F. dominate the eastern part of the charts.

In January 1958 (Fig. 26) the warm 0 to +2°F. anomaly was still dominant but there was really no

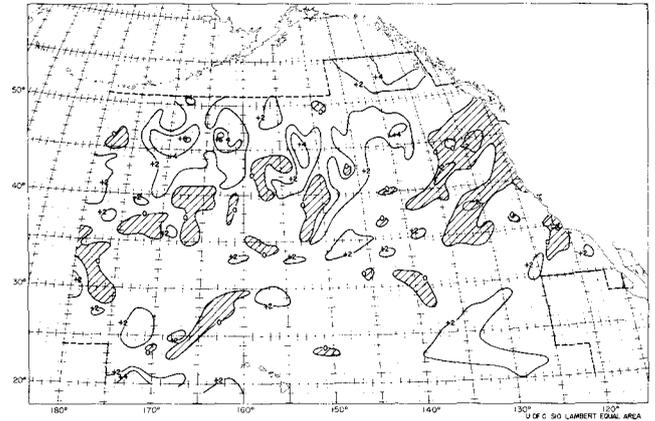


FIGURE 17. April 11-20, 1957. Anomaly of sea surface temperature (°F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

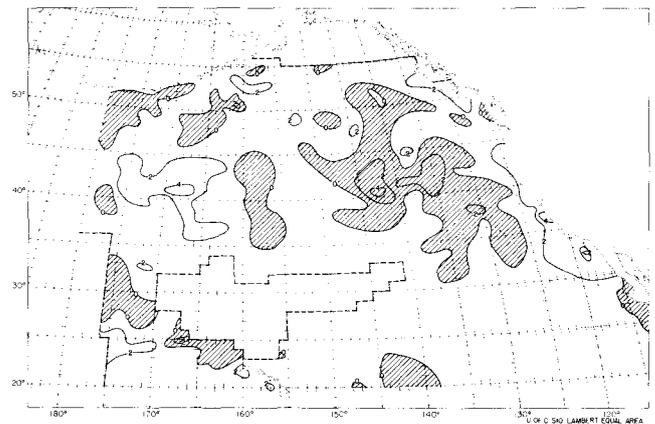


FIGURE 18. May 11-20, 1957. Anomaly of sea surface temperature (°F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

distinct pattern of cold (<0°F.) and warm (>+2°F.) areas.

In February 1958 (Fig. 27) the areas of cold anomaly began a distinct increase in size and the percentage of the areas having surface temperatures below normal continued to increase through May (Figs. 28-30). However, there appeared to be no definite pattern to their increase.

The yearly (1958-1957) charts (Figs. 31-35) appear to have the most persistent features and in most areas exhibit month-to-month changes that would be expected from the accepted circulation pattern in the Northeastern Pacific. For example the January-April 1958 charts show a steady encroachment of the area of negative anomaly from mid-ocean towards the coast. It reached the coast in March at 38° to 40°N. where the monthly temperature charts indicate the divergence in the currents occur and in April it continued to spread north and south.

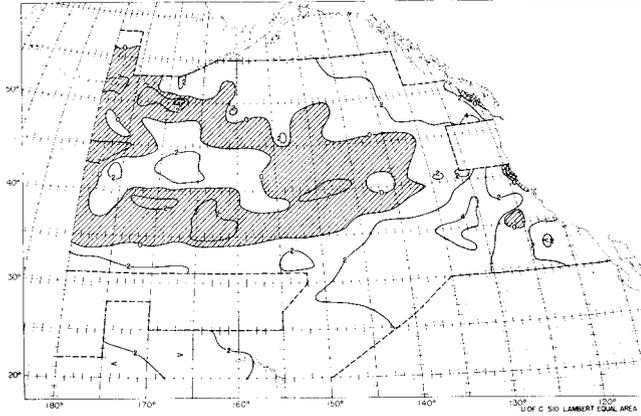


FIGURE 19. June 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

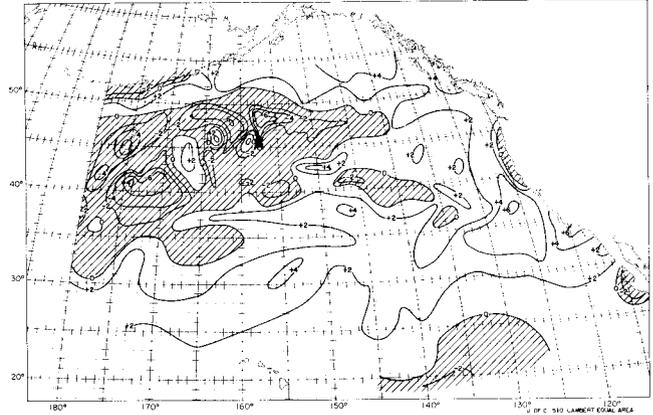


FIGURE 22. Sept. 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

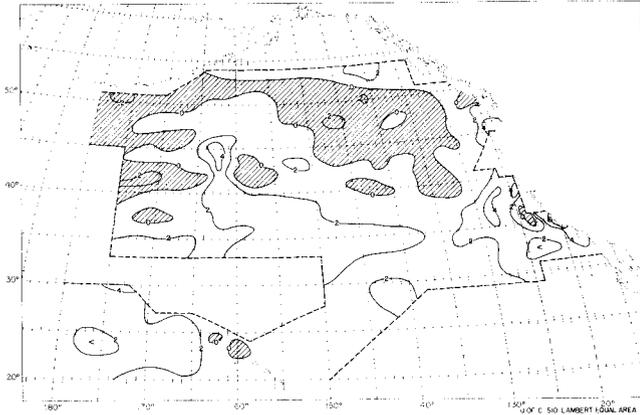


FIGURE 20. July 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

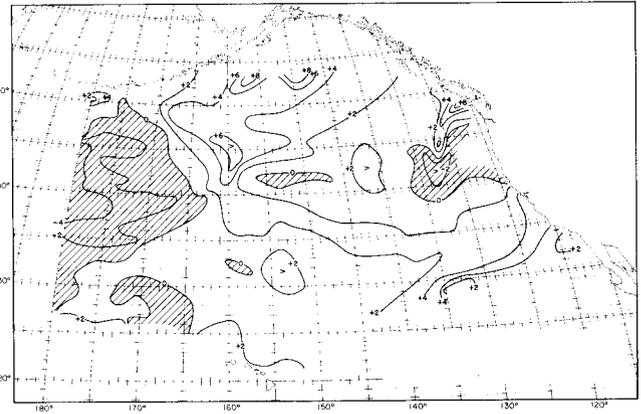


FIGURE 23. October 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

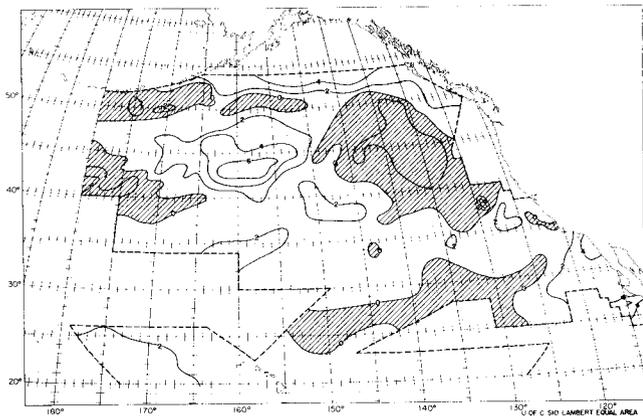


FIGURE 21. August 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

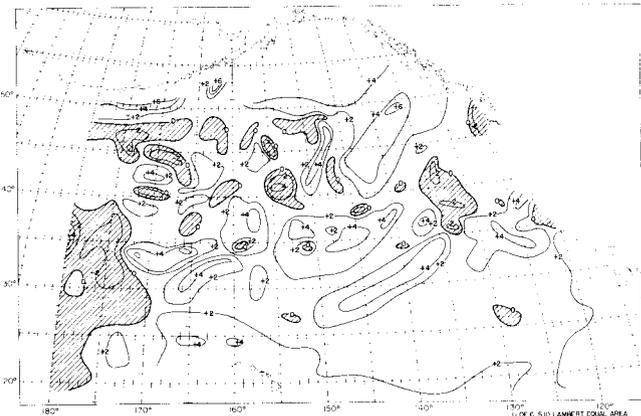


FIGURE 24. Nov. 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

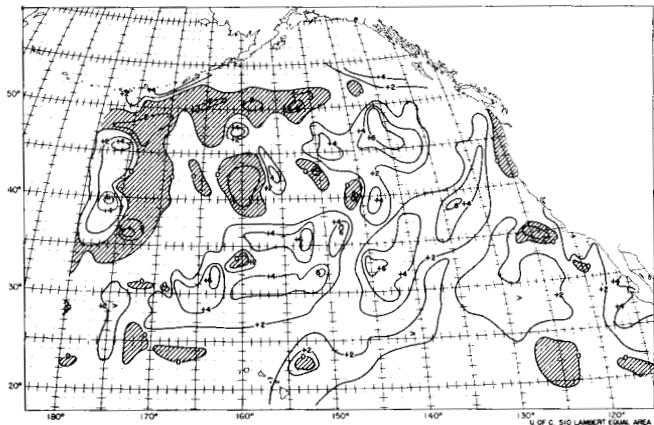


FIGURE 25. Dec. 11-20, 1957. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

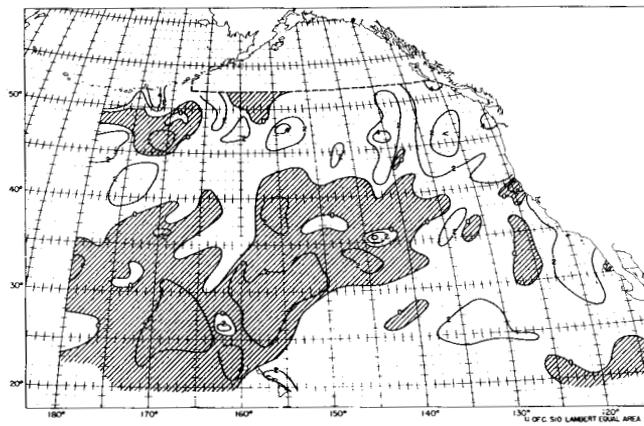


FIGURE 28. Mar. 11-20, 1958. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

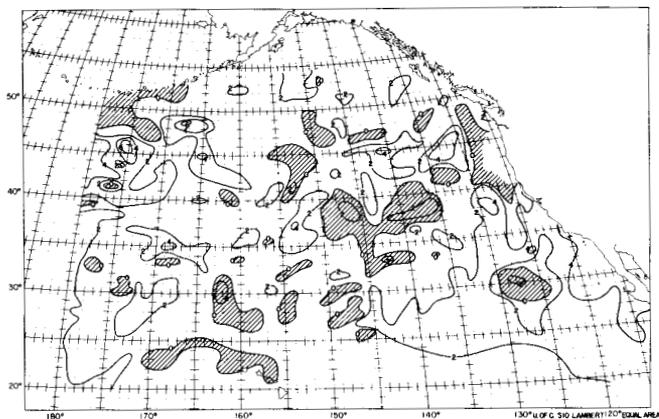


FIGURE 26. Jan. 11-20, 1958. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

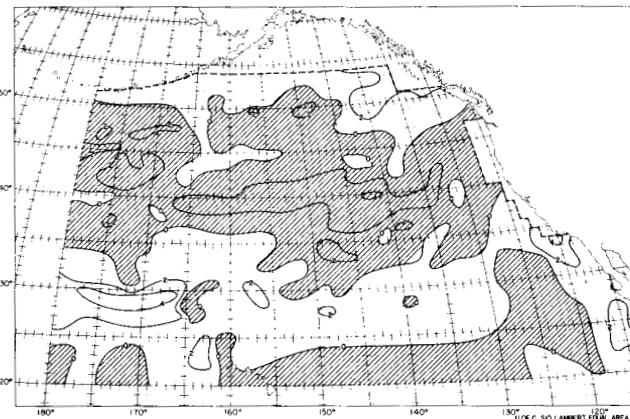


FIGURE 29. Apr. 11-20, 1958. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

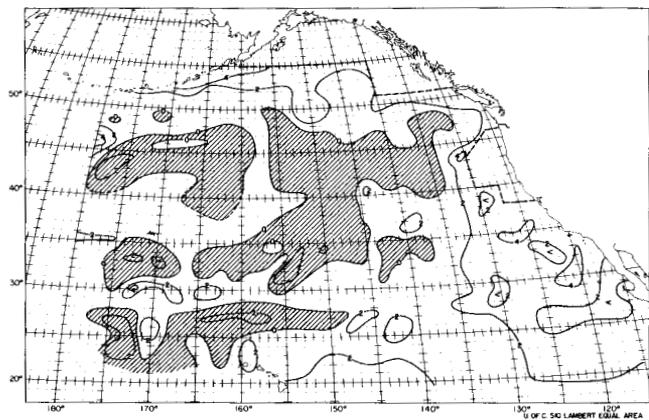


FIGURE 27. Feb. 11-20, 1958. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

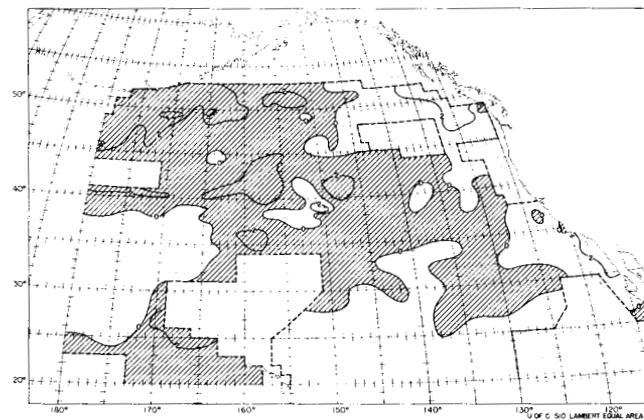


FIGURE 30. May 11-20, 1958. Anomaly of sea surface temperature ($^{\circ}$ F) from 30-year mean charts of H.O. 225. Hatched areas colder than average.

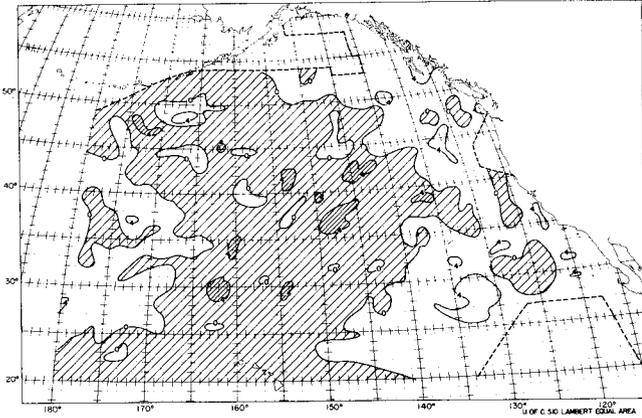


FIGURE 31. Jan. 11-20; 1958 minus 1957. Surface temperature change. Hatching indicates areas colder in 1958 than 1957.

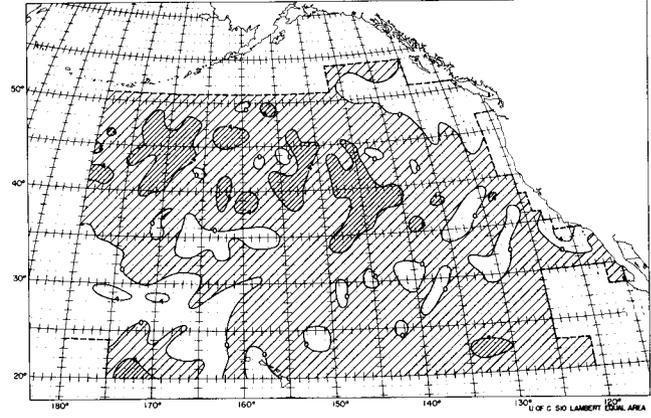


FIGURE 34. April 11-20; 1958 minus 1957. Surface temperature change. Hatching indicates areas colder in 1958 than 1957.

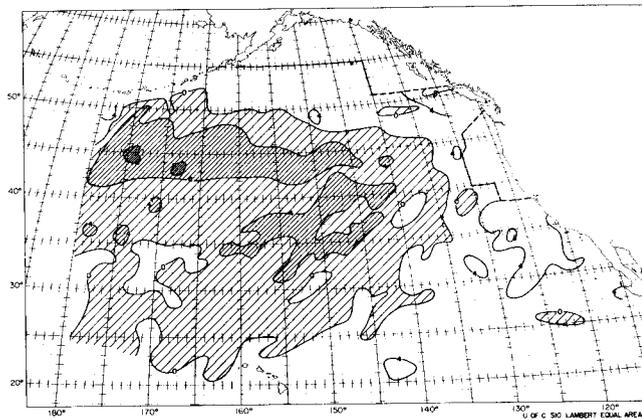


FIGURE 32. Feb. 11-20; 1958 minus 1957. Surface temperature change. Hatching indicates areas colder in 1958 than 1957.

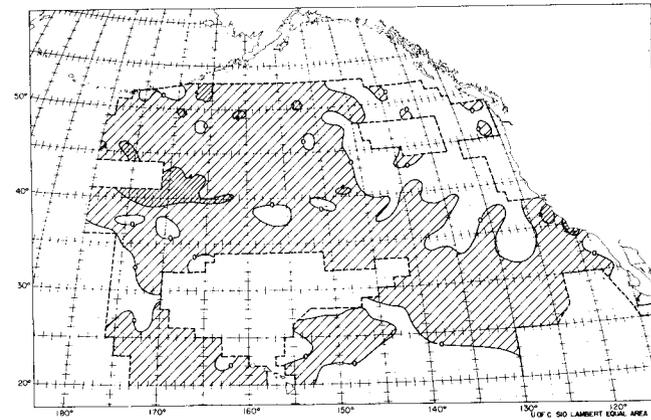


FIGURE 35. May 11-20; 1958 minus 1957. Surface temperature change. Hatching indicates areas colder in 1958 than 1957.

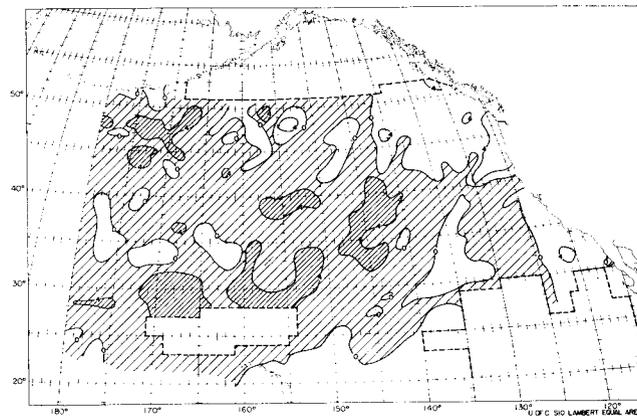


FIGURE 33. March 11-20; 1958 minus 1957. Surface temperature change. Hatching indicates areas colder in 1958 than 1957.