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# *Comparison of Norpac Temperature Sections with Average BT Sections along the same Tracks<sup>1</sup>*

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The NORPAC ATLAS (NORPAC Comm., 1960), now in press, contains horizontal and vertical charts of oceanographic data collected on the NORPAC Expedition, the first multi-nation synoptic survey of the North Pacific Ocean. Vertical BT temperature sections, included in the NORPAC ATLAS, were prepared by the author. At that time the synoptic BT temperature observations were compared with the average BT temperature observations previously published by Robinson (1951, 1957) and by Pattullo, *et al.* (1950). These comparisons show the relationship of the August 1955 temperature distributions to average August conditions, based on BT data collected between the years 1941 and 1952. Such comparisons were possible only in the eastern Pacific, where available BT data had already been analyzed. Now that the NORPAC ATLAS will soon be available to all oceanographers, these comparative temperature sections appear to be of general interest.

There are two longitude sections and two latitude sections whose locations are as follows: 140°W Long., 20° to 59°N Lat. (Fig. 1); 158°W Long., 22° to 56°N Lat. (Fig. 2); 42° to 44°N Lat., 125° to 165°W Long. (Fig. 3); and 52°N Lat., 130°W Long. to 165°E Long. (Fig. 4). In these figures the vertical lines indicate individual BT observations. To simplify comparisons, only every fifth isotherm is shown except where gradients are small, in which case additional isotherms have been added. The average isotherms are shown as dashed lines while those isotherms based on NORPAC BTs are solid lines.

Comparison of the average sections with the quasisynoptic NORPAC sections show the following similarities:

(1) The isotherms, from their intersections with the surface to their location at 400 feet, have the same general trend in the longitude sections. In the

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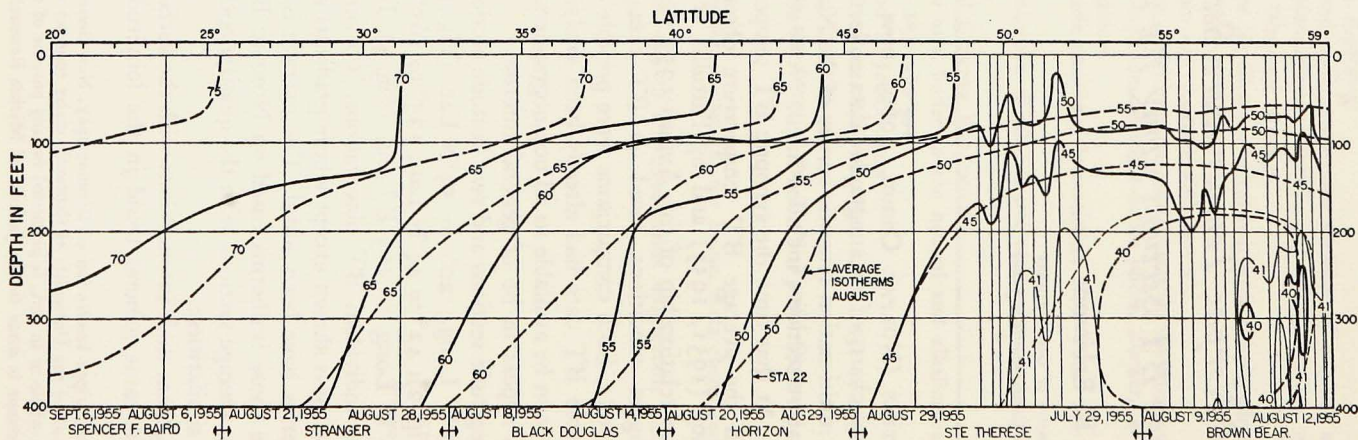


Figure 1. Comparison of vertical temperature sections at approximately  $140^{\circ}$  W Long. based on NORPAC BT observations with average BT temperature section along same track.



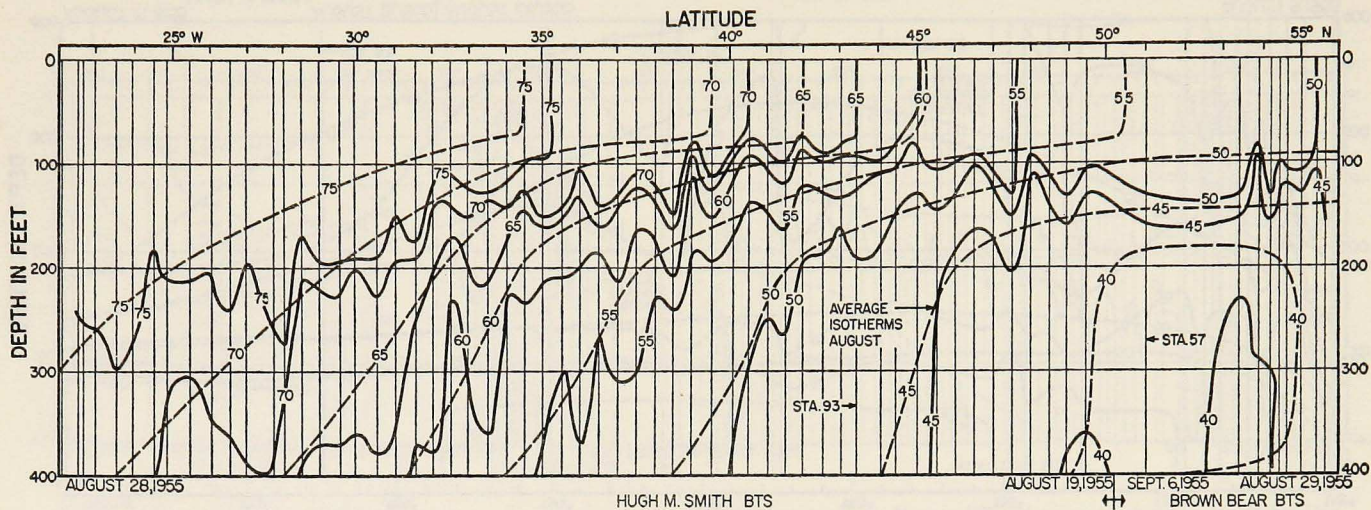


Figure 2. Comparison of vertical temperature section at 158°W Long. based on NORPAC BT observations with average BT temperature section along same track.

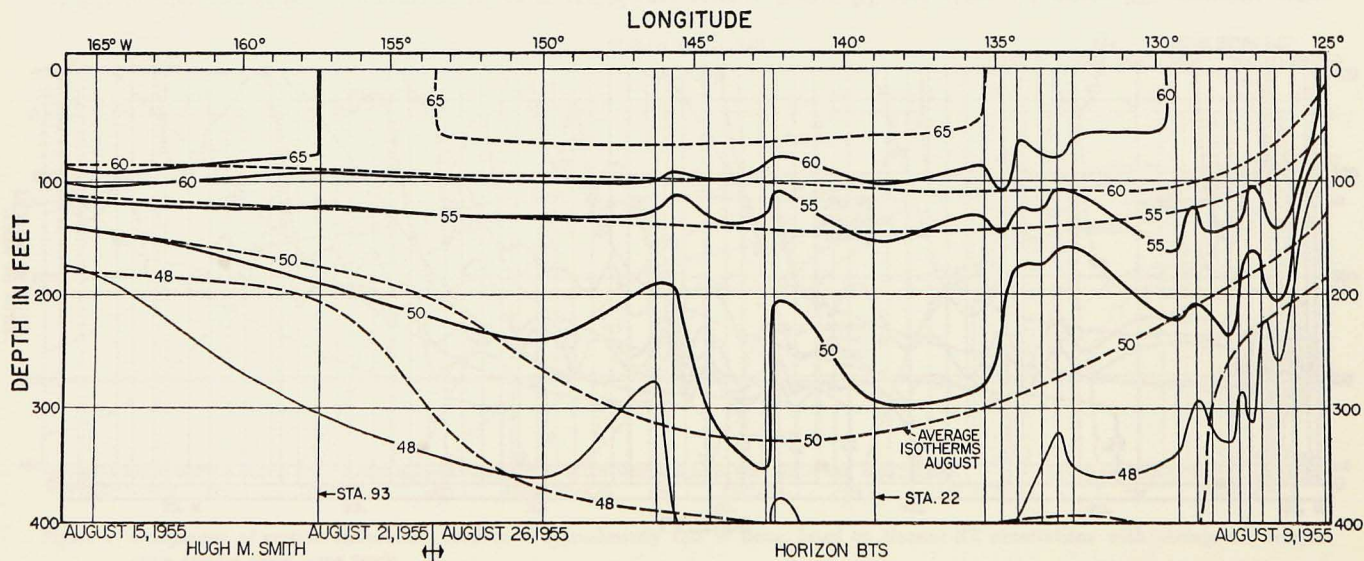


Figure 3. Comparison of vertical temperature section between  $42^{\circ}$  and  $44^{\circ}$ N Lat. based on NORFAC BT observations with average BT temperature section along same track.

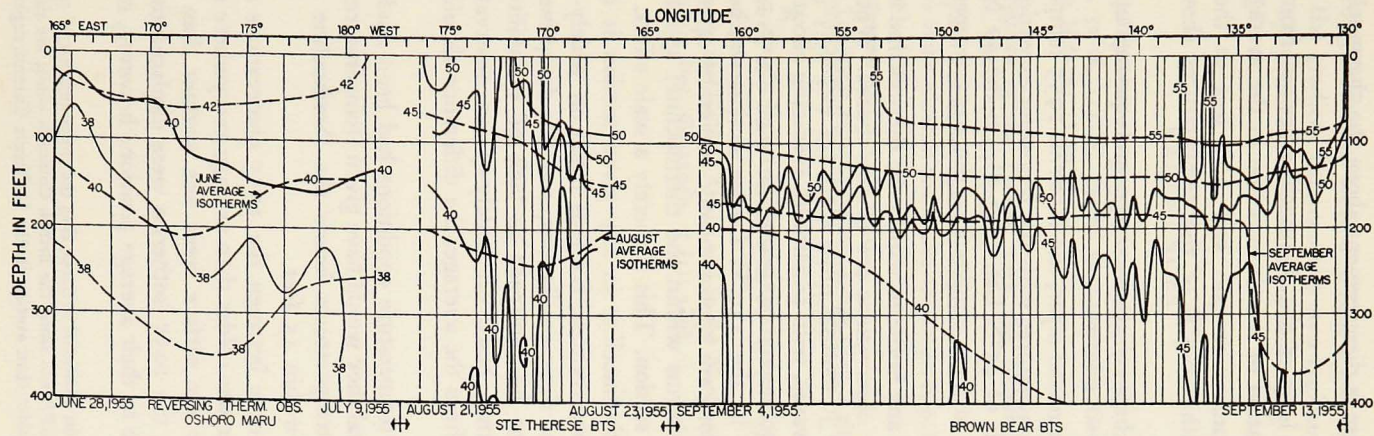


Figure 4. Comparison of vertical temperature section between  $51^{\circ}$  and  $52^{\circ}$ N Lat. based on NORPAC BT and reversing thermometer observations with average BT temperature section along same track.



latitude sections there is disagreement above the thermocline but good agreement at depth.

(2) The average level of the thermocline derived from the NORPAC BTs agrees with the location of the thermocline in the average sections.

(3) The temperatures at 300 and 400 feet in the NORPAC sections are, in general, within  $0.3^{\circ}\text{F}$  of the temperatures shown by the average sections.

The differences between the average and quasisynoptic sections are as follows:

(1) In the surface mixed layer, the NORPAC 1955 temperatures were lower than the average temperatures with the following exceptions<sup>2</sup>: on the  $158^{\circ}\text{W}$  Long. section, south of  $45^{\circ}\text{N}$  Lat. (Fig. 2); on the  $42^{\circ}\text{N}$  Lat. section, west of  $155^{\circ}\text{W}$  (Fig. 3); in these two sections the 1955 temperatures were higher than average.

(2) The depth of any isotherm within the thermocline is extremely variable wherever the 1955 observations are closely spaced. Where observations are approximately 20 to 30 nautical miles apart, the displacements of the isotherms appear as irregular waves, with amplitudes averaging about 30 feet. The mean depth of the thermocline and isotherms, as noted above, agrees well with the average. However, in the  $140^{\circ}\text{W}$  Long. section south of  $50^{\circ}\text{N}$  (Fig. 1), where the observations are approximately 200 miles apart, the depth of the thermocline (or isotherms within the thermocline) appears as uniform as it does in the average section. This is merely a scale effect. The appearance of oscillations in the thermocline in any given section is a function of space and time between observations. Sections based on widely-spaced observations simply cannot reveal these oscillations, and the deceptive smoothness of the isotherms should not be construed as lack of variability. For this reason, if depths of isotherms, based on widely-spaced observations, differ by no more than 15 feet from the average, the difference should not be considered significant.

If predictions of temperature conditions had been made from the average charts, then in general they would have given: temperatures above the thermocline within  $2^{\circ}\text{F}$ ; temperatures below the thermocline within  $0.3^{\circ}\text{F}$ ; and thermocline depths within 15 feet.

The major difference between the 1955 observations and the averages is that the surface layer was colder than average everywhere except in the southwest quarter, where the surface layer was warmer than usual. In the cold surface mixed layer, the 1955 isotherms were displaced to the south from 60 to 360 miles relative to their average position; however, south of  $45^{\circ}\text{N}$  along

<sup>2</sup> See Hollister (1956) for additional evidence that the entire summer of 1955 was colder than average at Weather Station PAPA and along the British Columbia coast; see also Reid, *et al.* (1958) who showed that it was also colder than average in the California Current region in 1955.

158°W Long. the 1955 isotherms were displaced approximately 100 miles to the north. That is, the gradient between the two regimes was steepened. At 158°W Long. (Fig. 2), predicted temperatures and 1955 temperatures would have agreed at 45°N.

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