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A Large-Scale Longitudinal Variation in Surface Temperature in the North Pacific

Kern E. Kenyon

Scipps Institution of Oceanography, University of California, San Diego 92093

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ABSTRACT

A large-scale longitudinal variation in surface temperature in the North Pacific is described by an analysis of some existing data and some newer data. When monthly mean surface temperatures are plotted against longitude at mid-latitudes there is nearly always a temperature maximum in the eastern Pacific and a minimum in the central Pacific. Long-term averages of monthly mean temperature data, as well as independent surface temperature data from individual cruises, show a similar maximum and minimum. At 35°N and 40°N the mean positions of the maximum and minimum are further west in summer than in winter, and for a given month are further west at 35°N than at 40°N. The east-west scale of the temperature feature is defined to be the longitudinal distance between the positions of the adjacent temperature extremes and is shown to have an average value of about 2000 km nearly independent of season and latitude. The temperature scale is defined to be the difference between the maximum and minimum temperatures and is shown to have an average value of about 2°C at 40°N and 35°N and 1°C at 30°N. Based on these scales and the mean north-south temperature gradient, two separate north-south scales of the surface temperature feature are defined which are of order 100 and 1000 km. The data suggest a direct relationship between variations in the temperature scale and the east-west scales, with large (small) temperature scales often corresponding to large (small) east-west scale. The effect of the longitudinal temperature variation on the, seasonal range of surface temperature, as well as its connection with surface temperature anomalies, is discussed. It is suggested that the longitudinal temperature variation may be an indicator of a large-scale mechanism of poleward heat transport in the ocean.

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Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
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