

THE THERMAL STRUCTURE
OF THE INDIAN OCEAN

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ABSTRACT

The International Indian Ocean Expedition (1960-65) has for the first time provided a sufficiently complete data set to support an investigation of the oceanographic and climatic seasonal influence on Indian Ocean thermal structure in the upper 500 m and north of 40°S. Analysis of 23,847 bathythermograph and Nansen Cast measurements form the basis for a division of the Indian Ocean into 32 separate Areas with distinct thermal features. The basic thermal parameters considered in the analysis and depicted graphically in this paper include mixed-layer depth, maximum thermal gradient, five parameters of the permanent thermocline, and 2°C-interval isotherm depths to 500 m. The thermal structure within each oceanographic region is qualitatively evaluated in terms of the relative effects of net surface heat exchange, heat advection, and circulation dynamics. The analysis reveals that regions of the northern Indian Ocean exhibit unusual thermal characteristics due primarily to the influence of the shifting monsoon climates. The strong periodic upwelling and mid-summer surface layer cooling of the Arabian Sea are distinctive. The equatorial waters show only minor seasonal thermal variations, while the southern subtropical

region of the Indian Ocean experiences some summer thermocline development and winter mixed-layer deepening. A very thick permanent thermocline is characteristic of the Madagascar—West Australia zone.