Abstract View

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A Heat Balance for the Bering Sea Ice Edge

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ABSTRACT

Detailed oceanographic, meteorological and sea ice observations were obtained from the Bering Sea marginal ice zone (MIZ) during the February–March 1983 Marginal Ice Zone Experiment (MIZEX West). These data have been used in estimating a mean midwinter upper layer heat balance for the MIZ. During a period when the ice edge was stationary the dominant source term in the heat budget was the advective input from northward flow of relatively warm water beneath the ice edge. The associated mean heat flux per unit length of ice edge was about 22 MW m^{-1}, approximately equal to the heat required to melt the southward-moving ice. Heat was also input by upward diffusion from the warm deeper-water layer that underlay the MIZ. This upward flux was driven primarily by double-diffusive convection and was about 8 MW m^{-1}. Heat loss resulted from sea-air flux, primarily through open leads, of about 13 MW m^{-1}. Estimated errors in the individually computed flux terms varied from 10 to 70 percent; within these limits, the terms represent a reasonably good estimate of the heat balance for the Bering Sea MIZ. This balance is clearly dominated by those terms resulting from northward water flow into the region and southward ice motion. The eddy thermal conductivities wrote the ice-edge front are approximately 2.0×10^3 m^2 S^{-1} in the horizontal and 4.5×10^{-2} m^2 s^{-1} in the vertical, consistent with order estimates in similar situations.