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Large Diurnal Sea Surface Temperature Variability: Satellite and In Situ Measurements

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ABSTRACT

Data from a surface mooring located in the Sargasso Sea at 34°N, 70°W between May 1982 and May 1984 were compared with satellite data to investigate large diurnal sea surface temperature changes. Mooring and satellite measurements are in excellent agreement for those days on which no clouds covered the site at the time of the satellite pass. During the summer half-year at this site, there is a 20% chance of diurnal warming of more than 0.5°C, with values of up to 3.5°C observed in the two-year period.

Diurnal warming observed at the mooring has been simulated well by a one-dimensional model driven by local heat and momentum fluxes. Under the conditions of very light wind and strong insolation that produce the largest surface warming, the surface mixed-layer depth reduces to the convection depth, and wind-mixing becomes unimportant. The thermal response is then limited to depths between 1 and 2 m, making it likely that such events have been underreported in routine ship observations.

In all cases observed, the spatial extent of warming events as determined by satellite data are well correlated with the corresponding atmospheric pressure patterns. Conditions giving rise to the largest diurnal warming events are often associated with a westward-extending ridge of the Bermuda high. In the region studied, 57°–75°W and 29°–43°N, diurnal warming of more than 1°C was found on occasion to cover areas in excess of 300 000 km², with warming of more than 2°C covering areas in excess of 130 000 km².

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