Abstract View

Volume 10, Issue 3 (March 1980)

Journal of Physical Oceanography
Article: pp. 399–410 | Abstract | PDF (815K)

Small-Scale Sea Surface Temperature Structure

James J. Simpson and Clayton A. Paulson

School of Oceanography, Oregon State University, Corvallis, 97331

(Manuscript received September 4, 1978, in final form October 5, 1979)

DOI: 10.1175/1520-0485(1980)010<0399:SSSSTS>2.0.CO;2

ABSTRACT

Observations of sea surface temperature and wave height were made from a large, manned spar buoy (*R*/P *FLIP*) ~ 100 km off the coast of Baja California. Surface temperature was measured with a radiation thermometer which viewed a disc on the surface 12 cm in diameter. The instrument responded to frequencies up to 3 Hz. Wave height was measured with a resistance gage located close to the field of view of the radiometer.

Log-log plots of spectra of sea surface temperature exhibit a plateau between 0.05 and 0.5 Hz, followed by a rapid decrease in energy at frequencies >1 Hz. A coherence of 0.5 between waves and surface temperature occurs at the same frequency as the peak in the wave spectrum. Phase spectra show that warm temperatures associated with the thinning of the surface viscous layer occur systematically upwind of the crests of the dominant gravity waves and downwind of the crests of steeply sloping, shorter period gravity waves. The warm temperatures are hypothesized to be caused by enhanced wind stress upwind from the crests and by surface instability and surface convergence downwind from the crests.

The magnitude of the mean temperature difference between the surface and the warmer, well-mixed water below is estimated from the surface temperature record. It is assumed that the warmest surface temperatures observed are associated with thinning of the viscous layer and are representative of the well-mixed water below. The dimensionless constant in a formula due to Saunders (1967), which relates the temperature difference to wind stress and heat flux, is found to be seven.