Abstract View

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Oceanic Thermal Response to Strong Atmospheric Forcing II. The Role of One-Dimensional Processes

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ABSTRACT

The oceanic response to individual atmospheric forcing events during September to December is studied using ocean weather ship observations supplemented by simulations with a bulk turbulent kinetic energy model. A total of 49 cases with durations of 10–30 days and including one or more impulsive increases in wind speed were selected from three ocean weather ship records. A characteristic response of rapid deepening and cooling of the ocean mixed layer is round as extratropical cyclones pass. Periods between storms tend to exhibit little deepening, or even layer retreat, if the net heat flux at the surface is downward. The success in simulating a major fraction of the upper ocean response during strong forcing events with the use of the bulk turbulent kinetic energy model suggests that one-dimensional mixing processes play an important role. The successful simulation of the mixed layer response permits an inference of the heat fluxes and potential energy changes in the column when observations are missing during some events. During the early cooling season the heat flux at the base of the mixed layer can be 10 times the magnitude of the surface heat flux. Strong forcing events at OWS *Papa* tend to increase the potential energy, whereas the relatively greater surface heat flux contribution at OWS *November* and *Victor* results in a potential energy decrease.