Abstract View

Volume 14, Issue 4 (April 1984)

Journal of Physical Oceanography
Article: pp. 769–780 | Abstract | PDF (699K)

Sensitivity of Mixed layer Predictions at Ocean Station Papa to Atmospheric Forcing Parameters

David Adamec and Russell L. Elsberry

Department of Meteorology, Naval Postgraduate School, Monterey, CA 93943

(Manuscript received July 1, 1983, in final form January 27, 1984)

DOI: 10.1175/1520-0485(1984)014<0769:SOMLPA>2.0.CO;2

ABSTRACT

The effect of errors and biases in the atmospheric forcing for oceanic mixed layer model predictions is studied using data sensitivity techniques. First the bulk model of Garwood is used to predict 17 years of mixed layer evolution and temperature structure at Ocean Station Papa using forcing derived from the 3 h atmospheric observations. The model is then integrated again varying, one at a time, each atmospheric forcing variable by a Gaussian error whose spread is proportional to the standard deviations of that variable during late winter or midsummer. The results of those integrations are then compared with the control run to assess the effects of the added random errors or biases. A positive or negative bias in the atmospheric forcing is much more detrimental to the ocean prediction than is a random error with zero mean. The predicted mixed layer depths are more sensitive to errors introduced in the forcing in winter than in summer. Conversely, the mixed layer temperature is more sensitive to errors in summer than in winter. For both winter and summer, the wind speed is the most critical factor in predicting mixed layer depth and temperature. Dew point temperature is an important variable for mixed layer predictions during the winter. During summer, cloud cover becomes an important variab1e. The results of this study are compared with errors in mixed layer depth and temperature predictions that are due to errors in the initial profile. The errors in the predictions which are due to errors in the atmospheric forcing are comparable in magnitude to those errors which are due to imperfect initial conditions.