Abstract View

Volume 13, Issue 7 (July 1983)

Journal of Physical Oceanography

Article: pp. 1131–1145 | Abstract | PDF (1.22M)

Testing a Dynamical Model for Mid-Latitude Sea Surface Temperature Anomalies

Claude Frankignoul

Department of Meteorology and Physical Oceanography, Massachusetts Institute of Technology, Cambridge, MA 02139

Richard W. Reynolds

Climate Analysis Center, NMC, NWS, NOAA, Washington, DC 20233

(Manuscript received October 18, 1982, in final form March 23, 1983)

DOI: 10.1175/1520-0485(1983)013<1131:TADMFM>2.0.CO;2

ABSTRACT

A slab model of the oceanic mixed layer is used to predict the statistical characteristics of the sea surface temperature anomalies that are forced by day-to-day changes in air-sea fluxes in the presence of a mean current. Because of the short time scale of the atmospheric fields, the model validity can be tested without quantitative information on the atmospheric forcing. A procedure is developed for the case where the mean current is given. It is applied to sea surface temperature (SST) anomaly data from the North Pacific using ship drift data as estimates of the mean ocean currants. At the 95% level of significance the model is consistent with the data over more than 85% of the investigated region. The results indicate that the atmospheric forcing acts as a white noise forcing; in regions of large currents, advection effects are important at low frequencies. However, SST anomaly autospectra are equally well represented by a local model where advection is neglected.

The available meteorological data are then used to estimate the forcing due to heat flux and Ekman advection anomalies. This forcing compares well with the stochastic forcing estimated from the SST data over most of the North Pacific. It is found that heat flux anomalies play a more important role than advection by anomalous Ekman currents; direct wind forcing and the resulting mixed-layer depth variability seem important at high latitudes but could not he estimated here. Finally, the cross-correlations between the SST anomaly and the atmospheric forcing fields are consistent with the stochastic forcing model and suggest that heat exchanges also contribute to the SST anomaly damping, thereby acting as a negative feedback.

top

Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.