Abstract

A general circulation model of the ocean is developed for the study of dynamical response to the wind stress change. The model is idealized in the horizontal dimension having a rectangular shape with flat bottom topography. The purpose of the present report is to describe the model developed and to present the results in detail.

The numerical model extends over 100° in the east-west direction from 30°S to 54°N in the meridional direction with 8 levels in the vertical direction and 2° (N−S)×2.5° (E−W) horizontal grid spacing. Zonally uniform wind stress and heat and salt fluxes imposed on the sea surface drive the steady normal general circulation in 140 years of integration.

Anomalies of wind stresses corresponding to (1) relaxation of the easterly winds in the equatorial region and (2) intensification of the trade winds in the tropical/subtropical region are imposed for 90 and 180 days, respectively. Temperature anomalies defined as the difference between the results for anomalous and normal wind stresses are traced for a few years.

Separation of the response into the baroclinic mode and the surface mode is apparently recognized. The surface mode anomaly is mainly advected by the background quasi-zonal steady circulation. Temporal variation of SST is very sensitive to the horizontal structure of the normal temperature field, due to the advection of temperature by anomalous horizontal currents associated with the Ekman pumping or subsurface temperature anomaly.