Abstract View

Volume 13, Issue 11 (November 1983)

Journal of Physical Oceanography
Article: pp. 2058–2069 | Abstract | PDF (960K)

Heat and Freshwater Budgets of the Gulf of Mexico

Paul C. Etter

ODSI Defense Systems, Inc., Rockville, MD 20852

(Manuscript received April 11, 1983, in final form July 5, 1983)

DOI: 10.1175/1520-0485(1983)013<2058:HAFBOT>2.0.CO;2

ABSTRACT

Monthly mean oceanic heat storage rates (Q_T) for the upper 200 meters of the Gulf of Mexico are calculated directly from multi-annual vertical temperature data. The annual march of Q_T exhibits a minimum of −170 W m^{-2} in January and a maximum of 170 W m^{-2} in May. Spatial distributions of Q_T are contoured on maps for February, May, August and November. These maps elucidate climatic features of air-sea interactions occurring over the Loop Current and also near the shelf edges of the northern Gulf. Three previous climatic heat budget studies encompassing the Gulf of Mexico are examined to determine the surface heat exchange: Budyko's and Bunker's—supplemented with more detailed but unpublished monthly results; and studies by Hastenrath and Lamb. While Budyko's values provide a familiar basis for comparisons, the more recent unpublished results of Brunker and Hastenrath and Lamb are averaged together to define the monthly mean radiative (Q_R) and turbulent (Q_A) heat exchanges in the Gulf of Mexico. Monthly mean advective heat changes (Q_V) are then derived as residuals in the heat budget equation ((Q_V) = (Q_R) − (Q_A) − (Q_T). These (Q_V) values are partially verified by direct computations of the monthly mean vertical and horizontal components of heat advection according to the divergent heat budget equation developed by Emery. The residual (Q_V) values reinforce the observations of Elliott concerning the role of detached anticyclonic Loop Current rings in redistributing heat within the Gulf of Mexico.

New estimates of the mean hydrologic balance in the Gulf of Mexico are advanced by combining the seasonal oceanic precipitation rates (P) of Dorman and Bourke with the evaporation rates (E) obtained from the averages of Bunker (unpublished) and Hastenrath and Lamb. An annual mean E–P value of 127 cm is obtained. These results are combined with estimates of river discharge rates to evaluate the freshwater continuity of the Gulf of Mexico.

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.