U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

Technical Announcement

December 2002

Lagrangian Study of Circulation, Transport, and Vertical Exchange in the Gulf of Mexico

OCS Study MMS 2002-064

The Minerals Management Service (MMS), Gulf of Mexico OCS Region, announces the availability of a new study report, Lagrangian Study of Circulation, Transport, and Vertical Exchange in the Gulf of Mexico.

This report presents both experiments and results from a modeling study of the Gulf of Mexico using a primitive-equation numerical ocean model with high vertical resolution and seasonally varying inflow through the Yucatan Channel. The model realistically reproduces the observed upper-layer circulation features of the Gulf of Mexico as well as the three-dimensional structure of the Loop Current and Loop Current rings, which dominate the circulation in the eastern Gulf of Mexico. Lagrangian methods were used to analyze the trajectories of tens of thousands of inert tracer particles in an effort to characterize the three-dimensional circulation and transport pathways in the Gulf of Mexico. Specific goals were to identify regions where vertical exchanges may occur and what processes are responsible for ventilation of the deep water. The exchange of particles across density surfaces occurs mainly beneath the Loop Current in the eastern Gulf of Mexico, in the northwestern region where Loop Current rings spin-down, and near steep slopes. During the process of ring separation, particles were observed to spiral slowly upward within the lower layer of the water column. The descent of particles occurs in the eastern Gulf of Mexico as cold, fresh water cascades over the sill beneath the Yucatan Current and flows northward along the Florida Escarpment before turning westward. There was little communication between the eastern and central regions of the Gulf of Mexico across 88oW. longitude below the surface layer. Although tracer particles became entrained in Loop Current rings in the surface layer, tracer particles are not transported by deep eddies that migrate from east to west. Tracer particles in the deep Gulf of Mexico to the west of 88oW. longitude are observed to circulate continually in a generally cyclonic direction, indicating a mean cyclonic drift in deep water. Analysis of individual particle paths and comparison of those paths to the model circulation has provided information on the possible mechanisms for exchange of surface and deep water.

For more information about this study or the Environmental Studies Program in general, contact the Environmental Sciences Section (MS 5430), 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394, telephone (504) 736-2752.

You can obtain copies of the report from the Minerals Management Service, Gulf of Mexico OCS Region, at a charge of $20.00 by referencing OCS Study MMS 2002-064. You will be able to obtain this report also from the National Technical Information Service in the near future. Here are the addresses. You may also inspect copies at selected Federal Depository Libraries.

Minerals Management Service
Gulf of Mexico OCS Region
Public Information Office (MS 5034)
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394
Telephone requests may be placed at
(504) 736-2519 or 1-800-200-GULF
or FAX: (504) 736-2620

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4650 or FAX: (703) 321-8547
Rush Orders: 1-800-336-4700

MMS is the federal agency in the U.S. Department of the Interior that manages the nation's oil, natural gas and other mineral resources on the outer continental shelf in federal offshore waters. The agency also collects, accounts for and disburses mineral revenues from federal and Indian leases. These revenues totaled nearly $10 billion in 2001 and more than $120 billion since the agency was created in 1982. Annually, nearly $1 billion from those revenues go into the Land and Water Conservation Fund for the acquisition and development of state and federal park and recreation lands.

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MMS's Website Address: **http://www.mms.gov**

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