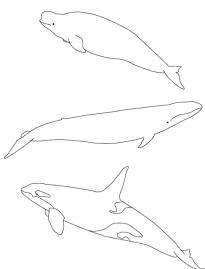


Lesson V. Marine Mammal Tracking

The goal of this unit is to explain how eddies are used in marine mammal tracking.

Keywords: *eddies, loop currents, anticyclonic eddies, sea surface lows, cyclones*

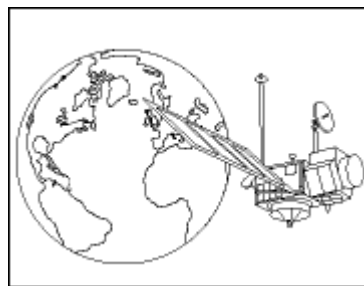
The scientists at Texas A&M University are working to study the distribution and abundance of sperm whales and other marine mammals in the northern Gulf of Mexico. Sperm whales are an endangered species of marine mammals, so therefore they



are most interested in how many presently reside in the northern Gulf of Mexico.

Satellite data and knowledge about the whales feeding habits led scientists to the gulf's

ocean oases where whales gather to feast.



Scientists used data from TOPEX/Poseidon to track the location of the **Loop Current**, and to monitor the **anticyclonic eddies** that periodically separate from its northward intrusions into the eastern Gulf of Mexico.

Eddies

Source: Texas A&M University Quarterdeck Magazine

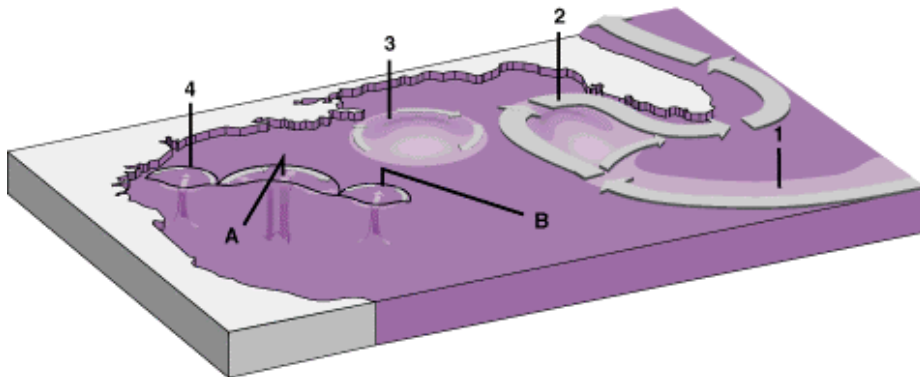
Eddies are swirls of water currents spun off from a main current or forced by the wind. Ocean eddies may persist from a week to as long as a year, have diameters of tens to hundreds of kilometers, and extend to great depths in the oceans. These currents play an important role in ocean circulation by transporting heat, salt and nutrients through the waters.

In the atmosphere, weather consists of the random airflow. The world's oceans have their own weather, consisting of the random fluctuation of ocean currents. Eddies may be thought of as a type of oceanic weather. They play a critical role in ocean circulation, the Earth's climate and the biogeochemical systems.

Eddies also play a role in human pursuits. Some large fish like to feed near the edges of cold eddies. As eddies come and go, so do schools of fish. TOPEX/Poseidon uses microwave frequencies to locate eddies and the average sea-surface height changes they cause. TOPEX/Poseidon produces high-resolution maps of local highs and lows in the ocean surface. The **sea surface lows**, also known as **cyclones**, are shown in the diagram below. These are areas of upwelling

where cool, nutrient-rich water moves to the surface. In these areas, scientists find higher numbers of phytoplankton and zooplankton than in normal waters. Because of this abundance there is a higher number of squid, shrimp, fish and sperm whales feeding in these areas.

Anticyclones are areas of sea surface highs and areas of downwelling. In these areas, there are only small amounts of plankton because of a lack of nutrient-rich water due to the lack of surface waters renewal.

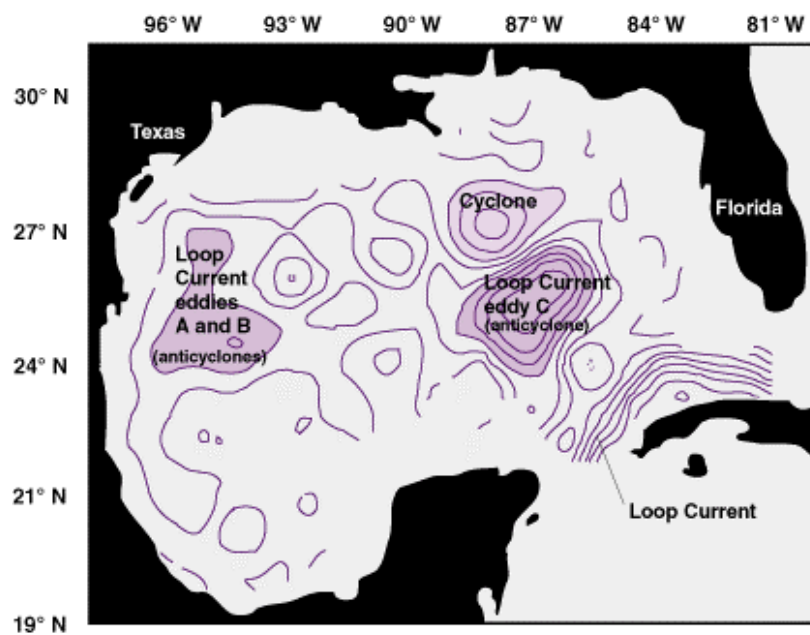


1. Warm water from the Caribbean Sea enters the gulf.
2. A "Loop Current" gradually forms in the eastern gulf. Eventually, the loop breaks off and forms an eddy.
3. The eddy has a core of warm water, and rotates clockwise as it moves west across the gulf. Clockwise rotating eddies in the Northern Hemisphere are called anticyclones.

4. Smaller eddies spin off the warm anticyclones. These rotate in the opposite direction, and are called cyclones.

A. In an anticyclone, warm water converges in the eddy center and is pushed toward the seafloor. Anticyclones contain few nutrients to support plant and animal life. They can be thought of as "ocean deserts."

B. Cyclones draw cold, nutrient-rich water from the deep gulf up toward the surface. Near the surface the combination of sunlight and plenty of nutrients creates an "ocean oasis," with abundant plankton for marine animals to eat.



A contour map of the gulf depicts the variations in sea-surface height caused by Loop Current eddies. This map shows the Loop Current soon after it shed Eddy C in mid-September 1996. Dark purple areas indicate anticyclonic Loop Current eddies A, B, and C moving through the gulf. (Data courtesy of **George Born** and Robert Leben, Colorado Center for Astrodynamics Research).

Activities

There are several excellent web resources for marine mammal tracking. Listed below are some sources where you can "track a whale". Satellite tracking of mammals is a new field of study so keep in mind that the web sites that are available are "radio tag" tracking of mammals, not satellite.

TOPEX/Poseidon Live interactive tracking:

<http://www-ccar.colorado.edu/research/topex/html/topex.html>

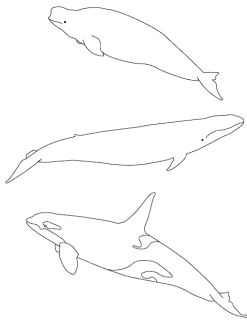
<http://www.satlab.hawaii.edu/>

Student Information Sheet

Lesson V. Marine Mammal Tracking

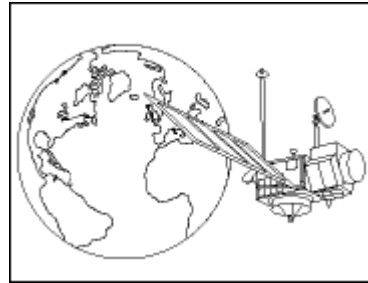
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