MMS OCEAN SCIENCE

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MMS OCEAN SCIENCE is published bi-monthly by the Minerals Management Service to communicate recent ocean science and technological information and issues of interest related to offshore mineral recovery, ocean stewardship, and mineral revenues.

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ABOUT THE COVER

Top: Texas A&M University research vessel *R/V Gyre.*

Bottom: A National Data Buoy Center (NDBC) data buoy used to collect surface wind and current information. Photo courtesy of NDBC.

All photos courtesy of Minerals Management Service unless otherwise noted.

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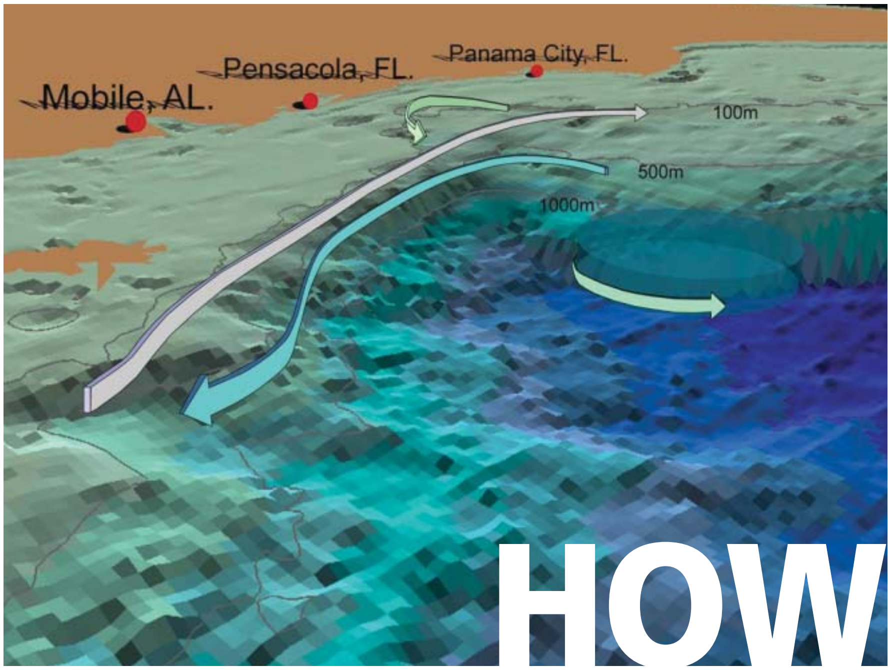


HOW WATER MOVES

Using Physical Oceanography

Imagine that you are stranded on a desert island less than 100 miles from shore. You write a message, stuff it into a bottle, and toss it into the ocean. Do you know what the chances are that a floating message in a bottle will be found? They're not bad -- you actually have about a 50% chance that the bottle will be carried by the ocean to land. The ocean is a constantly moving force that influences our global climate, provides routes for ships, and creates fascinating challenges and movements that we are just beginning to understand.

"Researchers use many different methods to measure the ocean's moving forces."

The ocean moves in many ways; tides, waves, and currents aren't the only forces at work in the ocean. Eddies, gyres, deep currents, and rings provide circulation patterns that make each Outer Continental Shelf (OCS) region of the Minerals Management Service (MMS) unique. After 30 years of funding scientific studies, the MMS has found that, although some characteristics, such as the response of currents to wind forcing, are common to many continental shelves, the relative importance of various physical processes in influencing the shelf varies from region to region.

Researchers use many different methods to measure the ocean's moving forces. Drifters, which are instruments that move with the water and record location, have long been used by oceanographers like a message in a bottle to discover and study ocean currents. Technological advances have led to important discoveries. Through the use of satellite imagery, specialized moorings, and acoustic techniques, researchers have gained vital information used to model and predict the ocean's movements.

The physical oceanography research supported by MMS provides information used in oil-spill trajectory analyses, discharge models, larval dispersal, and engineering designs for platforms. These studies directly support MMS management decisions and are useful in the review of development and production plans and oil-spill contingency plans.

Top left: A graphic demonstrating the flow of water at various depths in the northeastern Gulf of Mexico. Top center: Recovery of CTD rosette that includes an instrument to measure conductivity, temperature, and depth as well as collect water samples. Top right: A cluster of glass floats from a mooring. Above: A pressure inverted echo sounder (PIES) used to measure currents at depth.

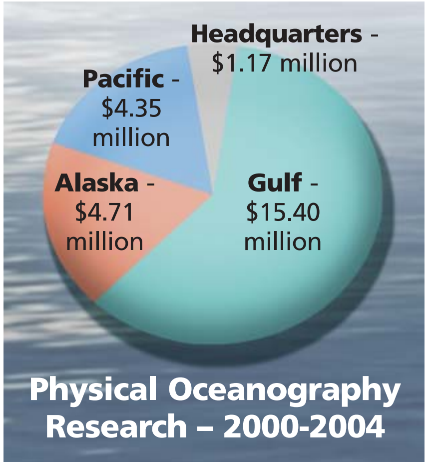
The need to balance the value of OCS resources against the potential for environmental damage is an important concern for MMS. As offshore activities expand into new geographic areas such as the deep waters of the Gulf of Mexico, an understanding of the complete dynamic environment of the ocean will play a major role in MMS's management of these ocean resources.

PHYSICAL OCEANOGRAPHY –

CATCHING THE WAVE!

Understanding physical oceanography is vital to the environmental future of our ocean resources – in fact, the Minerals Management Service (MMS) has spent over $200 million on the study and research of the physics and geography of ocean currents and properties of water. In the past five years, MMS has spent more than $25 million on the study of ocean currents, making it a leader in ocean science research. Just within the Gulf of Mexico region, more than $15 million was spent to understand water movement. The interaction of wind and water and the effect of that interaction on ocean currents, climate changes, water temperature, and salinity are of special interest.

Oceans cover over 70% of earth's surface and are constantly moving and interacting with wind and coastal structures. This interaction between wind and water regulates our climate. Wind brings daily short-term climate changes, while water has slower, but long-lasting effects. Whether short or long-term, such climate variations affect human safety, biological distribution, and the equipment used in exploration and development for oil and gas and other mineral resources. The ability to anticipate these changes will ensure the safety of both onshore and offshore environments.

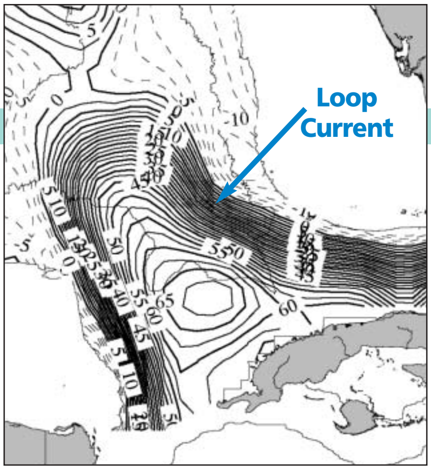


Above: Distribution of funds spent by MMS for physical oceanography research in each of the three regions and headquarters for the past five years.

Methods

Studies of physical oceanography are done by direct observations or by modeling. Direct observations are expensive and can only be accomplished in a relatively small area. Direct methods range from simple to complex. For example, samples collected in water bottles are used to determine salinity, oxygen, and nutrients, while thermometers attached to the bottles measure temperature. Buoys tethered to the bottom of the body of water provide hourly observations to measure wind speed, direction, and gusts, barometric pressure, air temperature, sea surface temperature, wave heights, and currents. These measurements are sent via satellite and made available in real time at NOAA's website on the Internet. Floats or drifters actually move with the water and are tracked by satellite or programmed to store their movements until they are recovered, depending on whether they are at the surface or beneath the water at depth. Inverted Echo Sounders (IES) are moored on the ocean bottom and measure the time it takes for acoustic pulses to travel from the ocean floor to the surface and back. The IES can calculate hydrostatic pressure and temperature profiles as the acoustic pulse travels through water columns.

Remote sensing is done in large areas by satellite-borne devices such as altimeters, which calculate ocean heights within centimeters, and scatterometers, which measure how microwaves are reflected back from the ocean surface. From these data, direction and speed of near-surface winds and the amount of heat stored in the ocean can be measured.

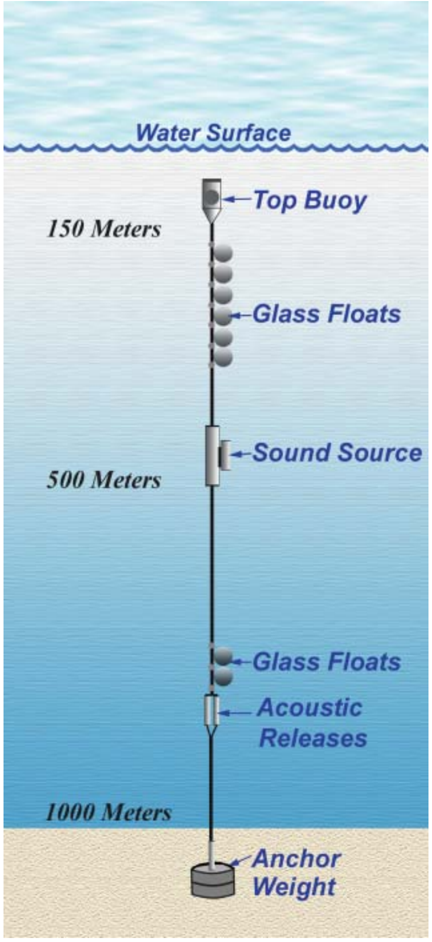


Above: The Loop Current as defined by sea surface height from satellite data. The contour intervals represent 2.5 centimeters or one inch.

The information is charted to show the direction of water flow and intensity. To supplement this information and predict the movement of water, scientists also use complex mathematical models. Models are used to expand predictions over large areas on the basis of measurements at a few points.

Gulf of Mexico OCS Region

The Gulf of Mexico Outer Continental Shelf (OCS) has been the site of major research efforts investigating the effects of the Loop Current and Loop Current Eddies (LCEs) on offshore facilities. The Loop Current flows up from the Caribbean, across the Gulf and exits at the Florida Straits near Cuba. The current is inconsistent and moves farther north and west, then back south and east depending on time and season. Periodically, the current parts and an eddy current spins off like a cyclone and travels freely across the Gulf until it dissipates or dies in the western Gulf, in an area called the Eddy Graveyard. The Loop Current is known to have speeds



Above: An example of a mooring showing the various pieces of equipment attached. At the top is a buoy and glass floats to keep the cable vertical. The top buoy is at least 65 ft below the surface to avoid having a ship damage it. A variety of instruments are attached to the cable to measure the currents; in this example there is a sound source. Near the bottom is an acoustic release that is triggered by sound when it is time to recover the instruments. At the base is an anchor, frequently railroad car wheels, to keep the mooring in place. Graphic by Terry L. Rankin.

"Oceans cover over 70% of earth's surface and are constantly moving and interacting..."

reaching as high as four knots, the equivalent of a 60 mile-per-hour gale-force wind at depths down to 1,000 feet but slowly dissipating at depths of 3,000 feet.

Another less predictable current exists below 3,000 feet. This current is usually slow, but occasionally can speed up near flat bottoms or near escarpments or cliffs. Intense cold water jets appear sporadically here – giving no warning. The jets have speeds of up to four miles per hour and may last for hours or days.

Deepwater leases are now extending beyond depths of over 10,000 feet, but current studies only extend to approximately 4,300 feet. The MMS is funding several studies that extend from the eastern Gulf of Mexico to the western, off the coast of Texas and south into Mexican waters. Through collaborations with Mexican scientists, the recently awarded study *Direct Observations of Ocean Currents Over the Western Slope in the Gulf of Mexico*, will result in a more complete understanding of currents, from top to bottom, throughout the Gulf.

Alaska OCS Region

Current, temperature, and salinity time series are – for the most part – not available in the Arctic Ocean, which includes Alaska's Beaufort Sea, the area of active oil and gas exploration in the Alaskan OCS. Only one year of data collected along the Alaskan Beaufort coast exists, and MMS has funded a second year of data acquired from moored instruments along the outer shelf and slope. Buoys transmitting to satellites are being used for "drifter" testing in the Cook Inlet. Although the tides are the dominant currents in the inlet, the testing will include "locally forced, wind-generated currents." The data from each of the sites will be used to help MMS establish an accurate oil-spill trajectory model to be used when choosing among lease sites.

Surveys of the sea ice in the Beaufort Sea covering the last 44 years are now available through a study funded by MMS. The data have been compiled from diverse charts and sources, digitized as vector data and then converted to gridded fields consistent with the World Meteorological Organization's Sea Ice Format. The atlas shows not only ice movements, but changes in the historic temperature of the Beaufort Sea. These changes will be factored into ice condition studies for current and proposed oil and gas exploration and development plans.

Pacific OCS Region

For over a decade, MMS has supported studies and modeling programs in the Santa Barbara Channel-Santa Maria Basin, California, to understand better the physical oceanographic processes needed to support management decisions, such as reviews of oil-spill response plans. The ocean circulation model aids in the primary form of risk assessment of spilled oil. Varying oceanographic currents affect variations of the biological characteristics in the area, such as the transport of nutrients, fish larvae, plankton, and other biota.

The MMS has recently funded a $1.3 million circulation study of the Santa Barbara Channel and Santa Maria Basin. Buoys gather meteorological information for ocean studies being conducted in the area. Wind and wave data in the region have been recorded long enough to be used as input for the Oil-Spill Risk Analysis (OSRA) model, as well as air quality and ocean circulation studies. Biological studies are also being helped by sea surface temperature, wind, and wave conditions measurements from the buoys.

The decisions MMS makes about oil and gas exploration affect the environmental future of the Nation. It is vital that they be made with knowledge of the natural processes involved, the areas to be leased, the ecosystems affected, the safeguards needed, the equipment used, and the ramifications if safeguards fail. As data are gathered, interpreted, and applied to computer-generated models, the body of knowledge increases, ensuring quality development decisions now and in the future.

WORKING WITH STUDENTS AND TEACHERS

COOK INLET STUDY

Students and teachers from eight Kenai Peninsula Borough high schools recently participated with the Coastal Marine Institute (CMI) at the University of Alaska Fairbanks and the Cook Inlet Regional Citizens Advisory Council (CIRCAC) in measuring of temperature, salinity, and circulation in the Cook Inlet, Alaska. Minerals Management Service (MMS) funds the CMI in partnership with the University of Alaska.

Approximately 7,500 4x4-inch drift cards were cut from 3/8-inch plywood, each painted orange or pink, affixed with a unique identification code, and contact information for the CIRCAC and were deployed from various locations within the Cook Inlet. Five hundred eighty-five identifiable cards were recovered, the majority of which were found in Kachemak Bay. The students then ran the CIRCAC numerical spill trajectory model using the deployment areas as point source spills. They compared the recovery locations of their drift cards with the simulated groundings of spilled oil.

Eighteen students helped in cross-sectioning plots of temperature, salinity, density, and geostrophic velocity across the mouth of the Kachemak Bay. They used specialized programs to produce surface maps, maps of drift card deployment and recovery, and maps of oiled beach locations predicted by the

Top: Two students in Nanwalek making the drift cards out of plywood. Photo courtesy of Cook Inlet Regional Citizens Advisory Council.
Above: Kanai Peninsula, Alaska. Map courtesy of AlaskaInsight.com.

For more information:

Water and Ice Dynamics in Cook Inlet, Alaska

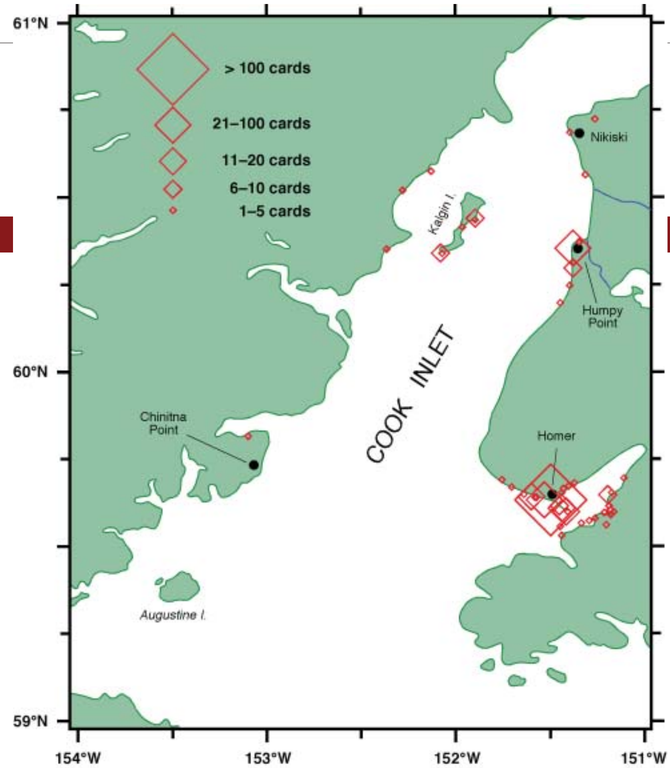
Website: http://halibut.ims.uaf.edu/~johnson/cmi/

Cook Inlet Regional Citizens Advisory Council

Website: http://www.circac.org/

CIRCAC numerical model. The graphing and analysis of the information help the students to visualize results and implications.

The information collected through this study will provide MMS information used in validating a numerical spill trajectory model that could help responders track an oil spill. Existing oil-spill models haven't included temperature or salinity data, and researchers hope to continue in developing better models to predict the trajectory of oil spills.



Above left: A Homer Flex High School student deploying a CTD, an instrument that measures conductivity, temperature, and depth, over the side. Above: A map indicating the locations where the drifter cards were recovered. Both courtesy of Cook Inlet Regional Citizens Advisory Council.

Cook Inlet platform. Photo is courtesy of Cook Inlet Regional Citizens Advisory Council. Photo by Terrance Bryant.

The Strength of Tidal Currents

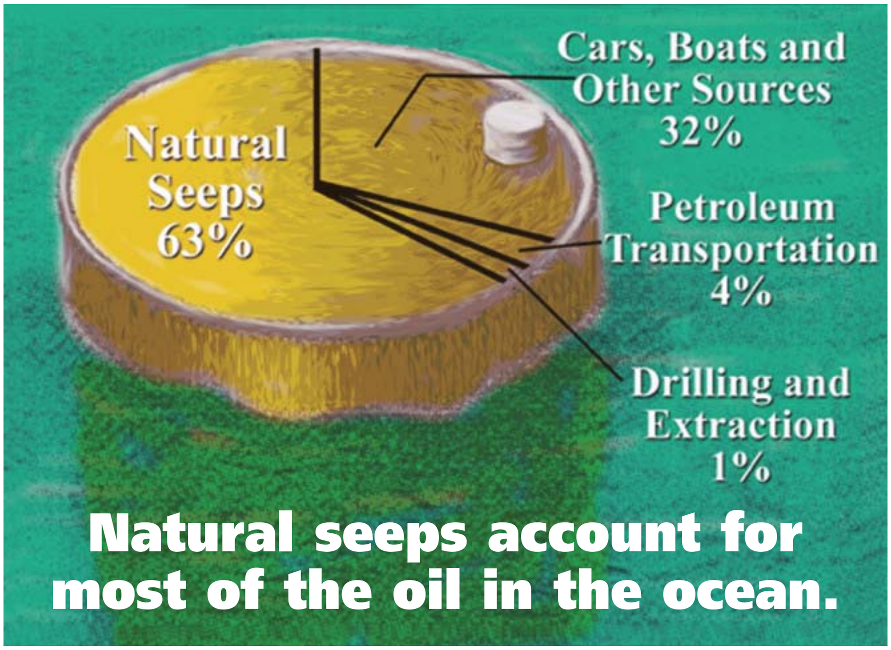
Tidal currents are the horizontal motion that is a result of the rise and fall of the water level caused by tides, a vertical motion. The effects of tidal currents on the movement of water in and out of bays and harbors can be substantial. The Cook Inlet of Alaska has remarkable tidal heights, reaching nearly 39 feet in Upper Cook Inlet. Nova Scotia's Bay of Fundy in Newfoundland has the greatest range with a maximum of 52 feet. The resulting tidal currents in Cook Inlet average one to two knots maximum at the entrance and five to six knots at the head. During times of extreme tides, maximum current speeds of eight knots occur near the Forelands. A knot is a unit of speed equivalent to one nautical mile (1.150779 survey miles) an hour.

The tidal currents in Cook Inlet are of interest to MMS for oil-spill modeling, prevention, and response. The rip currents created by the tides concentrate fish, attracting some brave local fishermen.

OIL-SPILL MODELING

The Outer Continental Shelf (OCS) is one of our Nation's most valuable resources, providing approximately 30 percent of the domestically produced crude oil and 25 percent of the domestic natural gas. But offshore energy development, like any human enterprise, comes with an inherent risk. The need to balance the value of any energy resources against the potential for environmental damage is an important concern for the Minerals Management Service (MMS). As steward of the Nation's offshore resources, MMS must assess the potential damage to the environment from any accident while ensuring that the probability of such accidents is as low as possible. As part of that risk assessment, MMS uses the Oil Spill Risk Analysis (OSRA) model to project the path, likely fate, and environmental impact of any spilled oil. A model is used rather than simple statistics from past oil spills, because there have been too few spills to make an accurate assessment.

Predicting the trajectory of a potential accidental oil spill on the basis of ocean movement and depths is an important step in protecting the ecosystems of all OCS regions. The Pacific OCS Region supports a large effort in physical oceanography research. The MMS, through a cooperative agreement with the Scripps Institution of Oceanography, is conducting the Santa Barbara Channel-Santa Maria Basin Circulation study. This decade-long study will provide information and understanding of circulations needed for risk assessment. This research includes the study of ocean currents and how the currents respond to various forcing mechanisms such as the wind.



Above: Pie chart of the sources of oil in the ocean. Natural seeps account for 63% of the oil while oil and gas extraction is only 1%.

Scientists use field data collections, analysis, and modeling studies to calculate the circulation for a given area. These calculations provide the basis for OSRA models. The OSRA model takes into account the currents and other forces that immediately begin to move oil spills. This information is used by MMS to evaluate the risk to a particular area or resource from an oil spill.

The OSRA model examines oil-spill risks over long periods of time, ranging from five years to decades. It analyzes thousands of potential oil-spill trajectories over large areas of the continental shelf and charts the frequency of contact with land and sensitive environments within a certain number of days after the spill. The oil-spill analysis depends on the meteorological, geographical, and oceanographic conditions of the study area (such as wind velocities and surface ocean currents), the environmental resources that are at risk, and the estimated volume of oil resources that are assumed to be recovered and transported in the area.

Deepwater exploration requires physical oceanographic information. The Clarkson Deepwater Oil and Gas Blowout model (CDOG model) simulates the behavior of oil and gas potentially released in deepwater areas. Oil and natural gas in deepwater behave much differently than those in shallow

Recent MMS Physical Oceanography Studies:

MMS publications are available at: http://www.gomr.mms.gov/homepg/whatsnew/publicat/publicat.html

Intermediate Depth Circulation in the Gulf of Mexico: PALACE Float Results for the Gulf of Mexico Between April 1998 and March 2002 (MMS publication 2004-013)

Cross-Shelf Exchange Processes and the Deepwater Circulation of the Gulf of Mexico: Dynamical Effects of Submarine Canyons and Interactions of Loop Current Eddies with Topography, Final Report (MMS publication 2004-017)

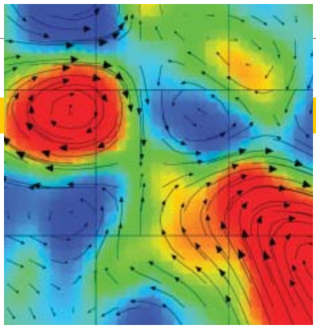
Strong Mid-Depth Currents and a Deep Cyclonic Gyre in the Gulf of Mexico (MMS Publication 2004-040)

water. Density layers, high pressures, and low temperatures found in deepwater may significantly reduce the buoyancy of the oil-spill plume and keep the oil submerged for an extended time. In addition, there are strong currents at water depths between 3,000 and 6,000 feet. All of this must be factored into environmental impact assessment, oil-spill cleanup, contingency planning, and source tracing.

In Alaska, ice conditions must also be considered when determining the movement and final disposition of spilled oil. Research shows that rough water and low temperatures increase the oil's viscosity and film thickness. In addition, oiled ice can be transported by currents for a considerable distance before melting occurs and the oil is released. The understanding of under-ice currents is also necessary for estimating the potential impact area from oil spills. Current research is gathering information used to create numerical spill trajectory models that take into account the unique characteristics of the Alaska OCS Region.

Left: Pancake ice forming on the sea surface. Pancake ice is made of plates of ice, which are formed from thickened plates of organized ice crystals called grease ice. The plates have up-turned edges where they have bumped into each other.

These studies are helpful for simulating arctic circulation, improving oil-spill trajectory modeling, and enhancing MMS's environmental impact evaluations. The results of OSRA and CDOG model simulations and ice studies are used by MMS for environmental documentation, by other Federal and State agencies for evaluation of environmental impact statements, environmental assessments, and endangered species reviews, and by oil industry professionals preparing oil-spill response plans.



Above: Satellite image of sea surface height, with red as elevations and blue as depressions, and the flow of surface currents drawn. While jets are observed at depth, the movement at the surface may be creating them.

STUDY OF RESPONSIBLE FORCES

EXPLORING JET POWER IN THE GULF

Unusually high-speed, subsurface intensified currents, known as jets, have disrupted or suspended exploration and production operations in the northern Gulf of Mexico (GOM) in recent years because of safety concerns. To improve the ability of present equipment to withstand vortex induced vibrations (VIV) caused by jets, especially on risers and tendons, an understanding of the frequency, persistence, and speed characteristics of jets is vital.

The Minerals Management Service (MMS) has completed a study of the possible forces responsible for the generation of the jets (*Subsurface, High-Speed Current Jets in the Deepwater Region of the Gulf of Mexico: Final Report,* MMS Publication 2004-022). Thirteen jets were picked from an observational database to be examined and analyze d for this study. Data for 11 of these jets were collected using Acoustic Doppler Current Profilers (ADCP's), which can yield data with excellent vertical resolution for identifying and measuring a jet occurrence.

Observations to date indicate that the jets have speeds up to and occasionally even exceeding four miles per hour and may last for hours or days. They give no warning and give little or no indication of their appearance on the ocean surface. Preliminary hypotheses speculate that the possible causes for jets include the Loop Current and associated eddies, eddy-eddy and/or slope-shelf/eddy interactions, internal or inertial wave motions, and instabilities along eddy frontal boundaries. It seems unlikely that these jets could be associated with strong, deep flow over an undulating seabed as has been observed elsewhere, since there is no evidence to date that the density structure that can support this mechanism for generating jets exists in the Gulf of Mexico.

Although studies are ongoing, the causes of jets in the GOM remain a mystery. Drilling, safety and production designers, and engineers are charged with designing equipment to withstand these forces, and MMS is committed to assisting with this task by ensuring that the research continues to be "jet" powered!

LEARNING ABOUT OCEAN DYNAMICS

MAKING DRILLING SAFE FOR ALL

ConocoPhillips composite riser, a new technology that incorporates the use of state-of-the-art materials for greater strength while reducing weight. Photo courtesy of ConocoPhillips.

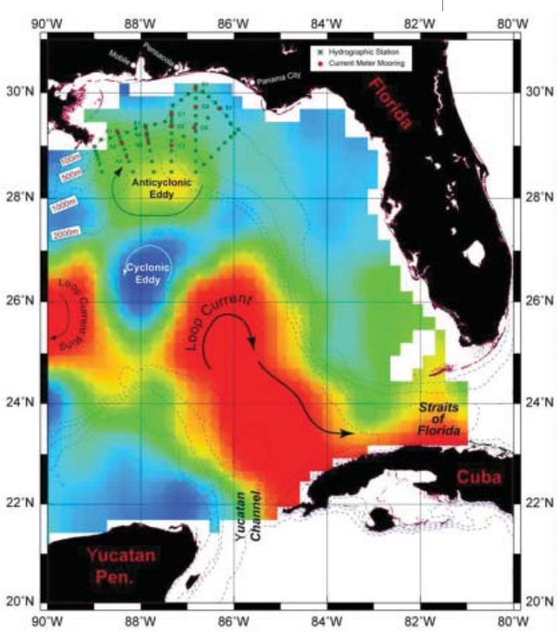
Ocean currents and depths have an enormous influence on the exploration and development of oil and gas operations in the Outer Continental Shelf (OCS) and deepwater areas of the Gulf of Mexico. Not only are the structures themselves affected by current forces and hydrostatic pressures, but the speed, depth, and pattern of the currents, tides, and waves can determine the extent of damage from accidental oil spills. But the influence is not limited to human activities – the habitats and behaviors of biological species are also shaped by the currents, tides, and waves. Even weather patterns can be affected. Physical oceanographic studies, which investigate ocean movements, are helping the Minerals Management Service (MMS) understand the dynamics of the ocean and how each marine ecosystem interacts with other systems and how that interaction affects the safe, responsible development of the area.

The Gulf of Mexico is a semi-enclosed sea. The strong and warm Loop Current (LC) enters from the Caribbean through the Yucatan Strait and occasionally sheds Loop Current Eddies before it moves out to form the Gulf Stream of the Atlantic Ocean. The LC is a dominant feature in the Gulf of Mexico, but the variations of the wind forcing by cyclogenesis, tropical storms, and the river input from the mighty Mississippi River all provide additional energy into the system. With these additional factors, the dynamics of the Gulf become extremely complicated.

In the Gulf of Mexico region, the development of deepwater oil exploration and extraction has increased rapidly in recent years. During the last couple of years, strong bottom currents have been reported by offshore operators during their deepwater exploratory operations. As a result, a series of deep mooring stations designed by MMS have been established to study the shelf/slope/rise dynamics to fill the information gap. One of the pilot studies for deepwater currents was completed last year. The data collected included bottom pressure, velocity, temperature, and salinity depth profiles from various current meters and other sensors.

The development of new technologies that can safely withstand both the deepwater depths and current forces has challenged engineers to develop newer, stronger, and lighter technologies. Because of the speed with which new technological discoveries are being made and the economic necessities of finding newer and cheaper methods of exploration, MMS and industry work closely together during the planning stages to make sure that the new technology is as safe as the old one.

In November 2002, MMS announced the approval of first permanent use of synthetic moorings made of polyester to anchor a platform to the seabed. The MMS participated in nine joint industry projects and studies on synthetic mooring with over $765,000 in research funding directed towards this effort. The moorings were extensively tested to ensure that they could withstand the action of waves and currents in the Gulf of Mexico. With approvals granted now for the second permanent use of synthetic moorings, the operators are working with MMS to ensure proper installation and maintenance procedures



Left: A satellite picture of sea surface height with major surface features of the Gulf of Mexico identified.

FOR MORE INFORMATION:

Synthetic Mooring Research

http://www.mms.gov/tarprojectcategories/mooringsandanchors.htm

Hurricane Research – MMS Hindcast Study of Hurricane Lili (2002) Offshore Northern Gulf of Mexico

http://www.mms.gov/tarprojects/467.htm

from "LEAP Visit to MMS - N.O. Region"

Comparison Shopping

The current cost of a barrel of oil is = $45.00

Compared to the cost of a barrel of

- Bottled Water.............$ 59.22
- Coca-Cola®.................$ 116.85
- Milk............................$ 137.76
- A1® Steak Sauce ....$ 2,024.96
- Chanel No. 5® ..$1,397,760.00

are followed. Other developments such as composite risers are being studied to determine if the new technology will provide the safe service needed in deep water. Composite risers made of carbon fibers and epoxy resin may overcome the hydrostatic pressures that can cause steel to collapse in deep water.

The effect of ocean movement phenomena such as the LC and its accompanying Warm Core Rings (WCR) and Cold Core Rings (CCR) on storm activity, such as hurricanes, is just beginning to be understood. It is believed that WCR, which are large eddies that have a core of warm water extending to a depth of 300 to 400 feet, intensified Hurricane Camille in 1969. By studying WCR, scientists may be able to predict accurately where a hurricane will gain strength and warn those in its path, thus saving lives.

This advance warning is especially important to the personnel of oil and gas platforms in the Gulf. One of the most dangerous situations on an oil and gas platform occurs during a hurricane. Although platform construction standards and production safety system requirements have thus far minimized oil spills as a result of hurricane damage (as in the case of Hurricane Lili), warning of an impending hurricane ensures the safety of workers, equipment, and the environment that surrounds them. Ongoing research ensures that the impact of hurricanes on OCS activities is minimal in terms of damage to equipment and the surrounding environment.

As more is discovered about the movements in the ocean and the effects it has on the ecosystems around it, the need for additional research becomes evident. The MMS's continuing partnerships with researchers in industry and academia will ensure that the decisions made about the future of the deepwater Gulf of Mexico will be based on the best information and knowledge available – both now and in the future.

How much is a trillion cubic feet of gas?

Natural gas is measured in cubic feet at a temperature of 60 degrees Fahrenheit and an atmospheric pressure of 14.7 pounds per square inch. Gas production from wells is referred to in thousands or millions of cubic feet (Mcf and MMcf). Resources and reserves are large enough to be calculated in trillions of cubic feet (Tcf). How much is one trillion cubic feet? Enough to completely fill a cube with sides two miles long, two miles wide, and two miles tall!

LATEST DISCOVERY – GULF OF MEXICO SHELF

SHALLOW-WATER GAS DISCOVERY

Recent natural gas price spikes and volatility have attracted the interest of government policymakers and industry to consider new sources of the prized commodity. Natural gas, the lifeblood of many American homes and industries, accounts for 23% of all energy consumed in America. Half of all American homes, about 56 million, are heated by natural gas. The shallow-water deep-gas area of the Gulf of Mexico lies 15,000 feet or greater below the seafloor in water depths up to 656 feet. Much of the deep shelf is accessible to energy producers from existing infrastructure in the Gulf. To encourage industry and offset the expense of new technology, the Minerals Management Service (MMS) has provided new rules for royalty incentives.

Above: The jack-up rig *Rowan Paris* drilling for deep gas at depths greater than 15,000 ft below the seafloor. Photo courtesy of The Rowan Companies, Inc.

Recently, Newfield Exploration Company announced a deep shelf discovery at West Cameron Block 77, located about 10 miles offshore Louisiana in about 40 feet of water. The West Cameron Block 77 #1 well encountered approximately 120 feet of net gas pay in two zones between 16,800 and 17,600 feet. The well was deepened to 19,603 feet and encountered an additional zone that appears to have possible pay over a large gross interval. Newfield is evaluating development plans for the discovery and expects first production from the field in early 2005. Depending on the depths of the pay sections completed in this wellbore, the field will qualify for 15-25 billion cubic feet of royalty relief under MMS rules. To date, Newfield has drilled 12 successful deep-gas exploration wells out of 19 attempts.

Securing Ocean Energy and Economic Value for America

North Star Platform in the Beaufort Sea, Alaska
Photo by Kyle Monkelien, MMS Alaska OCS Region

NEW WAVES

Late-breaking News & Information

Living in a Wreck – Exploring Deepsea Artificial Reefs

While scientists have established the value of offshore platforms as artificial reefs close to shore, the significance of artificial structures as habitat in deep-sea ecosystems has yet to be fully explored. Since most structures in deep water were put in place recently, MMS decided to look to shipwrecks as long-term surrogates.

Aboard the research vessel HOS *Dominator,* the Deep Wrecks Project Team – a partnership of MMS, the National Oceanic and Atmospheric Administration, and academic and industry professionals working through the National Oceanographic Partnership Program (NOPP) – is studying the effects of shipwrecks and the hard-bottom habitat they provide for deepwater ecosystems.

The team's exploration has yielded some exciting discoveries. On August 8, 2004, the team made a fascinating discovery of a "forest of coral" on the *Gulfpenn,* a WWII tanker sunk in 1942. Three vertical "wall corals" were found. The first measured 20 feet high, while the other two were approximately 10 feet.

Shipwrecks ranging in depth from 280 feet to 6,500 feet were studied by the interdisciplinary team. A day-by-day account of the mission can be viewed on the Deep Wrecks Project website at *http://www.pastfoundation.org/DeepWrecks/* and a full curriculum based on the mission is available to academic institutions.

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