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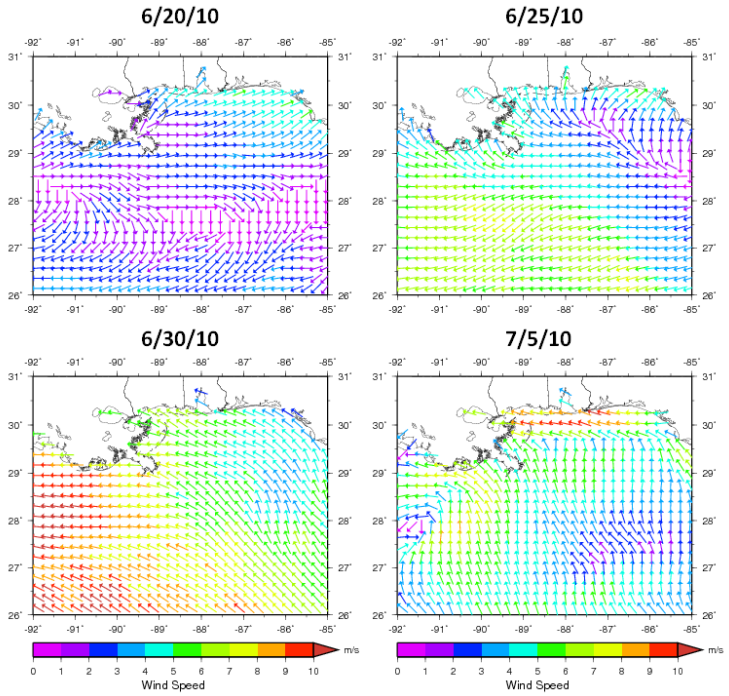
Discovery Porthole

Sharing Research with Educators and the Public

Influence of weather and ocean currents in predicting oil movement after Deepwater Horizon

The Deepwater Horizon oil spill alone presented a potentially devastating environmental and economic threat to the northern Gulf of Mexico region. Unfortunately, an additional threat loomed as the summer of 2010 marched on and hurricane season became more active. In late June and early July, the oil that had remained offshore for the most part, began washing up on beaches and salt marshes from Louisiana to Florida. Scientists at Mississippi State University (MSU) largely attribute this inundation of oil to two strong weather systems and are developing models to help predict where and how oil moves in light of such climatic conditions.



Wind data depicting the weather conditions during a period of interest begining with typically weak summertime winds associated with a high pressure ridge (top left), then winds off of Mississippi becoming easterly associated first with a developing Tropical Storm Alex off of Yucatan, followed by fringe effects of category 2 Hurricane Alex as it approaches Mexico (lower left), concluding with an offshore cold front in the eastern Gulf (not shown) in which a non-tropical low forms on the front's western end and circulates south of Louisiana (lower right).

Weather events, especially ***hurricanes***, have the potential to alter the movement of oil. They can also either magnify or lessen overall impacts of oil on an area. Dr. Patrick Fitzpatrick, a meteorology and climatology expert at MSU, has applied his expertise to better understand the potential effects of an oil spill in the face of dramatic weather events. After the Deepwater Horizon exploded, surface oil moved across the northern gulf largely as a result of ocean currents like the ***Loop Current*** and eddies. Initially, wind had very little effect on what path the oil took. It was not until Tropical Storm Alex, and later Hurricane Alex, moved through that the oil veered dramatically from the path it was on. Although Alex made landfall in the southwestern Gulf along the Mexican coast, its effects could be felt across the northern Gulf. Water levels ran well above average due to the ***storm surge*** and oil briefly impacted ***the Rigolets***, Lake Borgne and the western Mississippi coast. Alex was followed by a non-tropical low pressure system that also created unusually high water pushing oil towards the shore.

In addition to oil spill simulations and trajectory models, Fitzpatrick's team has created a database of all the oil impact information collected in Shoreline Cleanup and Assessment Technique (***SCAT***) surveys. The information collected in these surveys helps confirm what they have found in the models and is available to aid other scientists researching the effects of the oil spill.

Recently, the northern Gulf of Mexico region experienced its first significant tropical activity since the summer of 2010 with Hurricane Isaac. Although surface oil is no longer a threat in the gulf, the tropical activity and dramatic landfall did churn up coastal waters resulting in a scattering of tar balls from Louisiana to Florida.

Education Extension

Key Terms: *tropical cyclone, hurricane, meteorology, latitude, longitude*

Classroom Activity: Hurricane Tracking

Hurricanes, known by scientists as tropical cyclones, are extreme meteorological events. They can bring strong winds, heavy rain, cause widespread flooding and even spawn tornadoes. In this activity students will learn about tropical cyclones, how and where they develop, and plot one using historical data.

Supplies: *computers with internet access*

Directions: 1) Discuss tropical cyclones with students. Where do they form and why? What are the different stages in the life cycle of a cyclone? How are people affected by them. 2) Use the resources and information from the NOAA Coastal Services Center website **http://www.csc.noaa.gov/hurricanes** to look at historic US hurricanes. 3) Describe the relationship between barometric pressure and wind speed. 4) Discuss how water temperature can affect the intensity of a storm. 5) Use the latitude and longitude information to plot the hurricane on a tracking chart.

Ocean Literacy Principles: 3. The ocean is a major influence on weather and climate, 6. The ocean and humans are inextricably interconnected

National Science Standards: B. Physical Science: Motion and forces; D. Earth and Space Science: Energy in the Earth system; E. Science and Technology: Understanding about science and technology; F. Science in Personal and Social Perspectives: Natural and human-induced hazards

Visit **http://dhp.disl.org/resources.html** for lesson plans and additional marine-related activities.

****Use the key terms above to search for additional lesson plans on the web!***

Did You Know...

Hurricanes, or tropical cyclones, are warm-core, low pressure systems that develop over warm tropical or subtropical waters.

The ***Loop Current*** is a warm water ocean current that flows northward into the Gulf of Mexico from the Yucatan and loops to the southeast past the Florida Keys. From there it is called the Florida Current until it becomes the Gulf Stream in the Atlantic. There were initial concerns that the Loop Current would carry oil out of the Gulf of Mexico and contaminate south Florida and Atlantic coast habitats.

The ***Rigolets*** is an 8 mile long channel that supplies Lake Pontchartrain with salt water from the Gulf of Mexico. It also connects Lake Pontchartrain and Lake St. Catherine with Lake Borgne, which is actually now a lagoon, as a result of erosion.

SCAT surveys provide a systematic and comprehensive method of surveying oil affected shorelines. Standardized terminology is used in the collection of data and detailed reports and sketches are submitted. The information collected from these surveys has been valuable to scientists researching the effects of the spill.

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The Northern Gulf Institute (NGI) is a National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute addressing the research needs of the northern Gulf of Mexico. Mississippi State University leads this collaboration of the University of Southern Mississippi, Louisiana State University, Florida State University, Alabama's Dauphin Island Sea Lab, and NOAA scientists at laboratories and operational centers.

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