

DEVELOP Students Use NASA Satellite Imagery to Monitor Gulf Coast Disasters

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DEVELOP, part of NASA's Applied Sciences Program, is challenged with extending the use of NASA Earth observing sensors to society and broadening the community of those benefiting from NASA technology.

NASA DEVELOP interns at Stennis Space Center (SSC) know firsthand the type of natural and human-induced disasters that can take place in the Gulf of Mexico region. Since the team's establishment in the fall of 2002, DEVELOP students have witnessed such disasters as Hurricane Katrina in 2005 and the recent *Deepwater Horizon* oil spill. They have seen the major impact of these events on the Gulf Coast environment and economy, as well as the resulting changes in policy and decision making. DEVELOP, part of NASA's Applied Sciences Program, is challenged with extending the use of NASA Earth observing sensors to society and broadening the community of those benefiting from NASA technology.¹

In the past two years, students from universities located near SSC, such as the University of New Orleans, University of Southern Mississippi, and University of South Alabama, have completed over a dozen science research projects. These projects have focused on environmental issues concerning the Gulf Coast such as deforestation, offshore oil seeps, degraded water quality, increased fire occurrence, and hurricane-induced habitat loss. Student teams, working under the guidance of science advisors **Kenton Ross** [Goddard Space Flight Center (GSFC)/Science Systems and Applications, Inc.—*Senior Research Scientist*] and **Joe Spruce** [SSC/Universities Space Research Association—*Senior Research Scientist*], demonstrated how NASA's satellite measurements could address these problems with research outcomes potentially used in local partner organizations decision support and policy making.



Stennis DEVELOP interns present their work at NASA Headquarters in August 2009. Left to right: **Brandie Mitchell**, **Kate Woods**, **Madeline Brozen**

(USFS) Forest Inventory and Analysis (FIA) Program struggled to assess forest damage in the area using field surveys, students found the perfect opportunity to utilize NASA satellite imagery to evaluate forest vegetation degradation and loss in the area. Students employed the Geoscience Laser Altimeter System (GLAS) on NASA's Ice, Cloud and land Elevation Satellite (ICESat)—created primarily to measure polar ice sheet mass and cloud property information—to detect changes in forest canopy height as an indicator of post-hurricane forest disturbances. The team also used the Moderate Resolution Imaging Spectroradiometer (MODIS) fire detection products to track the

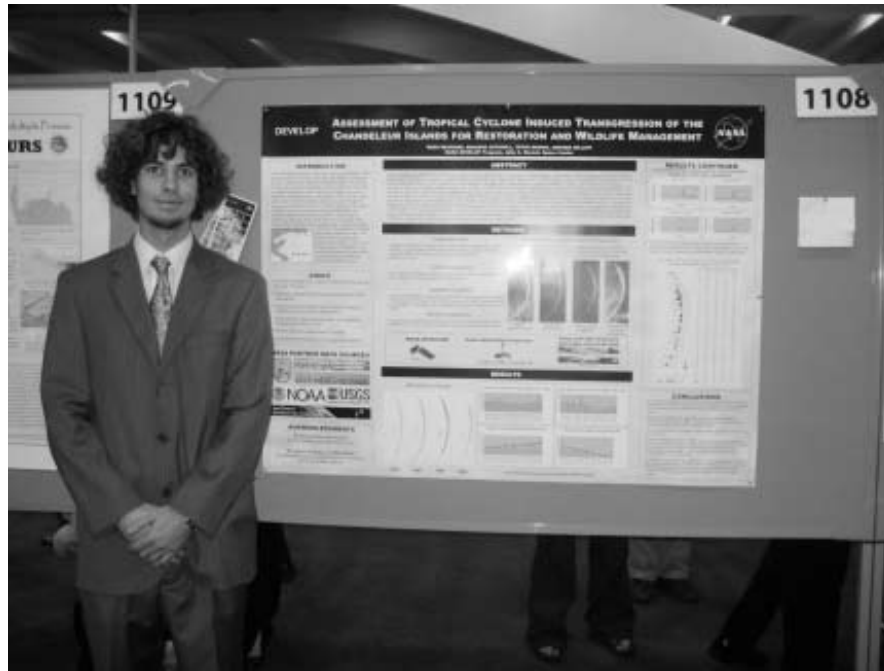
When the eye of Hurricane Katrina passed directly over Stennis Space Center in 2005, DEVELOP students experienced firsthand the destruction and damage left in the storm's wake. As the U.S. Forest Service

¹To read more about the DEVELOP program, see pages 7-9 in *The Earth Observer's* March-April 2010 issue [Volume 22, Issue 2] and pages 11-13 in the May-June 2010 issue [Volume 22, Issue 3].

increased fire activity in the area due to intensified fuel availability, and Landsat Thematic Mapper (TM) to analyze how land cover change affected the above ground carbon availability in the study area.

The students created maps and graphs of the project results to show the spatial occurrence of fire activity, fire occurrence by forest fuel type, canopy height change by county, and correlation to carbon change in relation to area. “The students had a special stake in this research. They personally experienced the destruction and loss caused by Hurricane Katrina, and wanted to help the Gulf Coast recovery efforts. Their research showed how NASA technology could be applied to post-hurricane damage assessments and the environmental changes that followed,” said **Cheri Miller** [SSC—*DEVELOP Gulf Coast Regional Manager*].

Six months before the *Deepwater Horizon* oil spill disaster, DEVELOP students partnered with the Minerals Management Service (MMS) to investigate a potential application of MODIS true color *sun glint* products. The team tested the ability of the products to detect natural oil seeps in the Atlantic Ocean off the coast of Virginia and North Carolina. The Atlantic Ocean has been closed to gas and oil drilling since 1982, however, recent proposals for offshore drilling leases led to research into the location of potential deposits. Students utilized the MODIS *off nadir sun glint* imagery to detect oil slicks in an area that had not previously been surveyed for natural oil seeps using satellite remote sensing. This methodology of detecting natural oil seeps



Stennis DEVELOP intern **Ross Reahard** presents his team's work at the AGU Fall Meeting in December 2009.



The 2009 Fall Term Stennis DEVELOP team: [standing L-R] **Kenton Ross** (science advisor), **Joe Spruce** (science advisor), **Jason Jones**, **Ross Reahard**, **Cheri Miller** (NASA Gulf Region Manager), **Anthony Ojada** [sitting L-R] **Lucas Lee**, **Kate Woods**, **Mark Mitchell**, and **Brandie Mitchell**

The right image is from the Stennis DEVELOP team's natural oil seep detection project in the Atlantic Ocean using the MODIS sun glint product. The image on the left is the same type of imagery, but displays the *Deepwater Horizon* oil spill in the Gulf of Mexico. The MODIS instrument onboard the Terra spacecraft collected the image on May 17, 2010.

remotely was useful to the MMS and their decision-making process, representing a potential tool for aiding field surveys and focusing exploratory drilling.

Following the *Deepwater Horizon* spill, NASA and other monitoring organizations used the same methodologies and MODIS products to examine the extent of the disaster. This case study demonstrated the relevance of previous Stennis DEVELOP projects to current issues and events impacting the Gulf of Mexico region. At that time, the students had no idea that the research they were doing would soon be used to examine the impact of a real-life disaster.

This summer, the Stennis DEVELOP team is working on two new projects, both with Gulf Coast study areas. The first partners with the Environmental Protection Agency (EPA) *Region 5* and uses MODIS, Landsat TM, and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) data to measure air quality related to sugarcane burning in Louisiana. The second study utilizes NASA's Tropical Rainfall Measuring Mission (TRMM) sensor to measure precipitation patterns during La Niña and El Niño oscillations in the Florida panhandle, for assistance in agricultural planning and management. The team will present project results at NASA Headquarters at the end of the summer term, as well as at the American Geophysical Union (AGU) Fall Meeting in December in San Francisco, CA.

For more information on the DEVELOP Program, please visit: develop.larc.nasa.gov. ■

