The Applied Science & Technology Project Office at Stennis Space Center (SSC) manages NASA's Gulf of Mexico Initiative (GOMI). Addressing short-term crises and long-term issues, GOMI participants seek to understand the environment using remote sensing, in-situ observations, laboratory analyses, field observations and computational models. New capabilities are transferred to end-users to help them make informed decisions. Some GOMI activities of interest to the hypoxia research community are highlighted below.

Project Title: Monitoring the Mississippi River Plume from the Opening of the Bonnet Carre Spillway

In the spring of 2011, there was tremendous flooding along the Mississippi River. To save Baton Rouge and New Orleans, the US Army Corps of Engineers opened the Morganza and Bonnet Carre spillways in May 2011, allowing floodwaters to flow into Lake Pontchartrain and the Mississippi River basin. Supporting the United States Geological Survey National Wetland Research Center flood response, NASA scientists at Stennis Space Center used data from the MODIS, ASTER, ALI and Landsat instruments flying on four satellites to generate flood maps. The maps were used to study the extent of the flooding and to monitor the outflow of nutrient-rich fresh water into the coastal areas, the Mississippi Sound and the Louisiana shelf.

In this image, sediment in the floodwater is yellow. Daily updates from these sensors enabled MODIS and ASTER scientists to monitor flooding on a regional scale and quickly detect local features such as the flow of fresh water from Lake Pontchartrain into Lake Borgne.

### Project Title: Enhancing Estuarine Water Quality Management Through Integrating Earth Science Research Results: A Targeted Project for Tampa Bay, Florida

Prime Investigator: Chuanmin Hu, University of South Florida

Presently, monitoring of estuarine water quality in the Gulf of Mexico is largely based on in-situ surveys. These costly and labor-intensive efforts may be inadequate to fully characterize short-term status and long-term trends, and thus could lead to biased statistics and decisions. Tampa Bay researchers have been monitoring for several decades using boat surveys, which provided a unique dataset to test our remote sensing approaches to water quality monitoring and management. The first objective was to improve the existing water quality decision-making process for surface water using MODIS (and others) observations of Tampa Bay, Florida's largest open-ocean estuary. The second objective was to expand our remote sensing capacity to other estuaries and to work with the Gulf of Mexico Alliance Water Quality and Nutrient Reduction Priority Information Teams, as well as other research groups, to establish a concerned and consistent plan for Gulf of Mexico estuaries. The series of images on the right show annual mean chlorophyll-a concentrations derived from MODIS. The decreasing trend from 2003–2004 to 2005–2006 is primarily driven by climate variability (precipitation).

### Project Title: DEMANDE - DSS Environment for Modeling of Atmospheric/Nutrient Deposition

Principal Investigator: Cynthia Nair, University of Alabama, Huntsville

Atmospheric nutrient deposition plays a role in the formation of hypoxic zones in the Gulf of Mexico. MODIS AOD derived with output from the chemical/air transport model (CMAQ/AERO-PAMS) are used to estimate and dry deposition of nutrients (N, S, Fe and P) over land, inland water bodies, estuaries and the Gulf of Mexico region. Output from the model is used to partition observed aerosol column loading into different categories and deposition potentials are computed. DEMANDE supports decision-making processes related to water quality and nutrient inputs into aquatic ecosystems in coastal and inland areas within the state of Alabama. Results are hosted on the Virtual Alabama (VA) system. VA is a Google Earth-based system developed by the Alabama Department of Homeland Security with the express purpose of sharing information between different government agencies within the state of Alabama. End users include the Alabama Department of Environmental Management and the Mobile Bay Estuarine Program.

### Project Title: Improved Hypoxia Modeling for Nutrient Control Decisions in the Gulf of Mexico

Principal Investigator: Shahid Habib, NASA Goddard Space Flight Center

The Gulf of Mexico Modeling Framework is a suite of coupled models linking the deposition and transport of sediment and nutrients to oceanographic processes and the resulting effect on concentrations of dissolved oxygen in coastal waters of Louisiana and Texas. The project uses NASA data products from MODIS-Aqua to attempt to improve the estimation of wet and dry deposition of nitrogen.