NASA Gulf of Mexico Initiative Hypoxia Research

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 Carré Spillway
Principal Investigator: Bill Graham, NASA Stennis Space Center

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 Carré spillways in May 2011, allowing freshwater 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 influx of nutrients into fresh water into the coastal lakes, the Mississippi Sound and the Louisiana shelf.

Project Title: Enhancing Estuarine Water Quality Management Through Integrating Earth Science Research Results: A Targeted Project for Tampa Bay, Florida
Principal 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 fail to build 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 an existing water quality decision model (WQDM) through use of the latest high-spatiotemporal satellite (MODIS and others) observations of Tampa Bay. Florida’s largest estuarine estuaries. The second objective was to expand such remote sensing capacity to other estuaries and to work with the Gulf of Mexico Alliance Water Quality and Nutrient Reduction Priority Information Team, as well as other research groups, to establish a concerted and consistent plan for Gulf of Mexico estuaries. The series of images to 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: On the recurrent Ulva prolifera blooms in the Yellow Sea and East China Sea
Principal Investigator: Chuanmin Hu, University of South Florida

Approximately location and distribution of Ulva prolifera identified from MODIS imagery between April 2000 and May 2006. The background MODIS false-color images from 9 June 2003 showed the Ulva prolifera bloom from the Sulphur Spring Bank in the East China Sea (ECS). Nearly all Ulva proliferating blooms in the ECS were found in the downstream portion of this bloom, which occurs every year between fall and spring following upwelling currents from the Sulphur Spring Bank. The background MODIS false-color images from 25 July 2005 showed Ulva prolifera blooms in 3 x 3 images in the Yellow Sea and ECS on 31 May 2005 and 17 July 2005, respectively.

Project Title: Improved Hypoxia Modeling for Nutrient Control Decisions in the Gulf of Mexico
Principal Investigator: Sharad Halib, 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 advection to get the best predictions and the resulting effect on concentrations of dissolved oxygen in coastal waters of Louisiana and Texas. The project will use NASA data products from models currently in development to begin improving the estimation of wet and dry deposition of nitrogen.