

Mechanisms Controlling Hypoxia



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MCH Cruise MS06

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A. CRUISE OVERVIEW

Cruise Program

MCH Survey 6 (MS06)

Cruise Schedule

Flower Garden Banks National Marine Sanctuary

Modeling

14-12 August 2012

Moorings

R/V Manta

Data Portal

Cruise Description:

To conduct oceanographic research in the northwestern Gulf of Mexico, 14 – 21 August 2012, to estimate the areal extent and vertical distribution of dissolved oxygen concentration and hydrographic properties. Cruise mobilization begins 1000 CST, 14 August 2012. The cruise designator for the MCH project is MS06, please use this in all correspondence regarding the cruise.



Objectives:

1. Perform 16 cross-shelf sampling lines between East Matagorda, TX, and to the Southwest Pass on the western side of the Mississippi River delta;
2. Collect hydrographic profiles of temperature/salinity/dissolved oxygen/fluorometer/turbidity using an undulating towed vehicle (SeaSciences Acrobat);
3. Collect shipboard acoustic current velocity profiles using an RDI 300-kHz ADCP;
4. Collect underway surface properties using the ship's flowthrough system;
5. Collect vertical profiles of hydrographic properties: CTD and 6-bottle rosette system;
6. Collect particulate and light transmission and beam attenuation data;
7. Collect CDOM data.
8. Accommodate TV journalists, the Water Brothers.

B. Science operations/descriptions:

We will conduct two shelf-wide surveys of the Texas-Louisiana Shelf to provide an estimate of the spatial extent of hypoxia and the distribution of dissolved oxygen. These cruises will utilize the R/V Manta, a twin-hull vessel operated by NOAA's Flower Garden Banks National Marine Sanctuary and Texas A&M University at Galveston. The vessels home port in Galveston, TX. We will use a TAMU-owned SeaSciences Acrobat towfish (<http://seasciences.com/acro.htm>; undulating towed body, pictured below) that is equipped with a SeaBird SBE43 dissolved oxygen sensor, RINKO dissolved oxygen sensor, Seabird 55 CTD, and Wetlabs Fluorometer/Turbidity and CDOM sensors. The Acrobat will undulate between 1-2 m from bottom and 1-2 m below surface. The cruise plan will follow a jigsaw (or lawnmower) pattern along the northern Gulf of Mexico. Area coverage will be from East Madagorda Bay to the Mississippi Delta at Southwest Pass. The operational tow velocity of the vessel will be about 5 knots. Calibration data will be taken using onboard Winkler titration and water samples to be run on shore using a salinometer. To insure proper coverage of the shelf, the ship will not stop except to collect samples for sensor calibrations. The short duration and fast speed of these cruises is also designed so that the survey is done as synoptically as possible. We plan to coordinate the survey cruises with the NOAA-NMFS SEAMAP summer cruises (Oregon II) as the SEAMAP can report valuable information such as where the hypoxia is prior to or during the survey cruise. Data from the SEAMAP cruise will be communicated to the ship via INMARSAT email. Dr. Nancy Rabalais of LUMCON will be performing the C and F monthly transect on 16-17 June 2012. Shipboard flow-through observation of salinity, temperature, beam attenuation, CDOM, and fluorometry will be taken. Occasionally water samples will be collected for

chlorophyll and nutrient concentrations. These will be taken at the inshore and offshore ends of each cross-shelf line and when necessary, at the midpoint between lines.

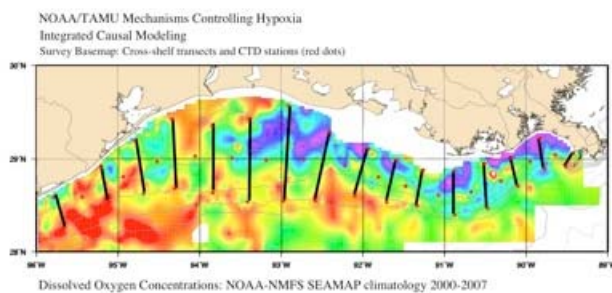


Figure 1. Sample survey plan for Field Year 2012 cruises. Cross-shelf transects are heavy black lines, bathymetry shown are 10, 20, 30, 40, 50, 200, and 500 m isobaths. Color contours represent mean near bottom oxygen concentrations (red: high; blue: low) based on NOAA-NMFS SEAMAP summer survey data 2000-2007.

Prior to the survey cruise, we will use outputs from the MCH numerical coupled physical-biochemical model to test sampling strategies and cruise plans for the survey cruise to optimize spatial coverage and areal extent of hypoxia.

Mobilization will be in Galveston, Texas. After departure from Galveston, we will transit to the Texas Windfarm for the first CTD station, southeast of Galveston. Following the Windfarm station we will do one cross-shelf line L03 and pull the Acrobat. Then, working eastward we will visit stations A12 thru A01 and likely L161 and L162 before performing two stations south of the Mississippi balize delta and stations E011-E012. The exact order of these station in the vicinity of Southwest Pass will be determined by sea-state, environmental conditions, and fuel considerations. Beginning with stations L152, we will run 15 cross-shelf transects (CST) of roughly 30 miles each will be conducted from Southwest Pass, (SWP) to East Matagorda Bay, TX. The transects are designed to run roughly across bathymetric lines. Transects are designed with consideration to frequency of occurrence of hypoxia distributions based on mid-summer surveys and NOAA-NMFS SEAMAP survey bottom oxygen climatology (Figure 1). All transects will have a shoreward end near the 10 m isobath (or 5 m if conditions allow). Near the Southwest Pass (east of 89°W), transects will extend seaward to the 50 m isobath, between 90°W and 93°W, transects will extend to the 40 m isobath, west of 93°W, transects will extend to the 30 m isobath.

The Acrobat and shipboard ADCP system will be deployed during each CST. The ship will maintain a constant heading and speed (5 knots) during each CST. The flowthrough system will be run continuously during the cruise. A CTD cast will be performed at the inshore and offshore edges of the CST; water samples from surface, mid-water, and near bottom depths will be collected using the six-bottle rosette sampler. Transits between CSTs will be done at the fastest/safest speed possible; the Acrobat and ADCP systems are not deployed during these transits. A CTD/rosette cast may be done at the mid-point or other location(s) along the transits between CSTs at the discretion of the Chief Scientist. This will be done to best define the hypoxic area of the northern Gulf of Mexico.

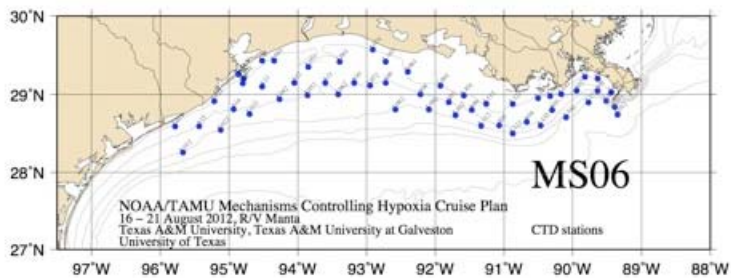


Figure 2. CTD station locations for August 2012 cruise. Bathymetry shown are 10, 20, 30, 40, 50, 200, and 500 m isobaths.

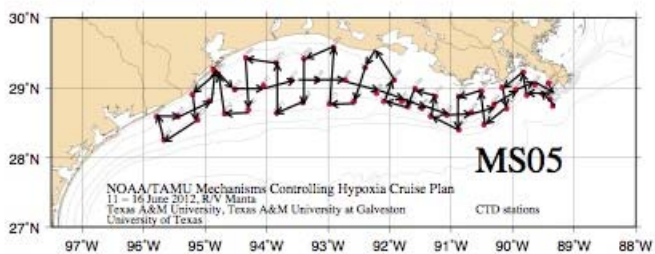


Figure 3. Example cruise track, showing MS05 stations (June 2012) (black lines and arrows) superimposed onto CTD station locations. Bathymetry is same as in figure 2.

C. SCIENCE PARTY

Chief Scientist

Dr. Steven F. DiMarco, Texas A&M University

Senior Scientists

Dr. Piers Chapman, Texas A&M University

Dr. Matthew K. Howard, Texas A&M University

Dr. Chris Shank, University of Texas, Marine Science Institute

Graduate Students

Allyson Burgess, (Biology) Texas A&M University at Galveston

Emma Cochran, (Geology) Texas A&M University

Ruth Mullins, (Physics/Biology) Texas A&M University

Laura Harred, (Biology) Texas A&M University

Marine Technicians

Andrew Dancer, Geochemical and Environmental Research Group, TAMU

Eddie Webb, Geochemical and Environmental Research Group, TAMU

Television Journalists (<http://thewaterbrothers.ca/>)

Alex Mifflin

Tyler Mifflin

Manta Crew

Captain: Darrell Walker

Michael Shetler, Mate

Julia O'Hern: Deckhand

Tina, Cook



D. EQUIPMENT TO BE PROVIDED BY PROJECT

SeaSciences Acrobat Towed Vehicle

SeaBird CTD

WetLabs Fluorometer/turbidity sensor

WetLabs CDOM fluorometer sensor

RINKO Oxygen sensor

SeaBird SBE43 Oxygen sensor (and spare)



Deckbox

Computer
Winch unit and controller
Cables
racking pinger



CTD/rosette system
Six Niskin Rosette
Seabird CTD
Wetlabs Fluorometer/Turbidity/Oxygen/PAR
Deckbox
Computer

RDI 300-kHz ADCP (deployed over the side, port side mounting pole)
Cables
Deck Unit
Computer
Ashtech GPS

Winkler Titration system
Titrator
Computer

Fluorometry and Primary Productivity
Filter apparatus
Vacuum Pump
Fluorometer
Quigg instrumentation

Total Particulate Matter and Particulate Organic Carbon
Filtration apparatus
Vacuum pump

Cap'N software and navigation/event logging computer, GPS

INMARSAT communication system

Relevant websites and links.

Project website: <http://hypoxia.tamu.edu>

Funding is provided by the NOAA Center for Sponsored Coastal Ocean Research:
<http://www.cop.noaa.gov/>

Hypoxia Blog: <http://georesearch.tamu.edu/blogs/hypoxia/>