UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

July 10, 2017

MEMORANDUM FOR: Captain Kurt Zegowitz, NOAA
Commanding Officer, NOAA Ship *Ronald H. Brown*

FROM: Captain Scott M. Sirois, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for RB-17-04
GOMECC-3: Gulf of Mexico Ecosystems and Carbon Cycle Cruise

Attached is the final Project Instruction for RB-17-04, GOMECC-3: Gulf of Mexico Ecosystems and Carbon Cycle Cruise, which is scheduled aboard NOAA Ship *Ronald H. Brown* during the period of July 18 – August 21, 2017. Of the 35 DAS scheduled for this project, 35 days are funded by a Line Office Allocation. This project is estimated to exhibit a Medium Operational Tempo. Acknowledge receipt of these instructions via e-mail to **Opsmgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Project Instructions

Date Submitted:	July 07, 2017
Platform:	NOAA Ship *Ronald H. Brown*
Project Number:	RB-17-04
Project Title:	GOMECC-3: Gulf of Mexico Ecosystems and Carbon Cycle Cruise
Project Dates:	July 18, 2017 to August 21, 2017

Prepared by: ____________________ Dated: 07/07/2017

Leticia Barbero
Chief Scientist
NOAA/OAR/AOML

Approved by: GLEDHILL.DWIGHT.KU EHL.1014418144 Dated: 07/07/2017

Dwight Gledhill
Deputy Director Ocean Acidification Program (Acting Director)
NOAA/OAR/OAP

Approved by: Robert M. Atlas Dated: 07/07/2017

Robert M. Atlas
Director, AOML
NOAA/OAR

Approved by: ____________________ Dated: 7/10/17

Captain Scott M. Sirois, NOAA
Commanding Officer
Marine Operations Center - Atlantic

I. Overview

A. Brief Summary and Project Period

The GOMECC-3 cruise will start in Key West, FL on July 18th 2017 and end in Fort Lauderdale, FL, on August 21st 2017. Twenty-four scientists from ten different institutions will be engaged in surface water, water column and atmospheric measurements en route. The cruise plan involves 11 cross-shelf transects of 8-12 stations each from the coast to beyond the 3000-m isobath, or pertinent current boundary such as the Loop Current or Gulf Stream. At the stations CTD/Rosette operations will occur using 24, 10-L bottles that will be filled consecutively over the entire water column from 1 to 2 m from the bottom to the near-surface. Bongo net tows will be performed at select stations to sample for biological species. Between transects the ship will nominally follow the 50-m isobaths and steam at speeds of 6-8 knots to assure adequate resolution of surface water measurements. The extensive surface water measurements will be taken from the scientific seawater line during the entire cruise. Air sampling from the bow using the bow intake air line will occur continuously in conjunction with meteorological measurements.

B. Days at Sea (DAS)

Of the 35 DAS scheduled for this project, _0_ DAS are funded by an OMAO allocation to the Ocean Acidification program of OAR , _35_ DAS are funded by a Line Office Allocation, _0_ DAS are Program Funded, and _0_DAS are Other Agency funded. This project is estimated to exhibit a __Medium__ Operational Tempo.

C. Operating Area (include optional map/figure showing op area)

The operating area is in the Gulf of Mexico, with a schematic of the cruise track shown in Figure 1.

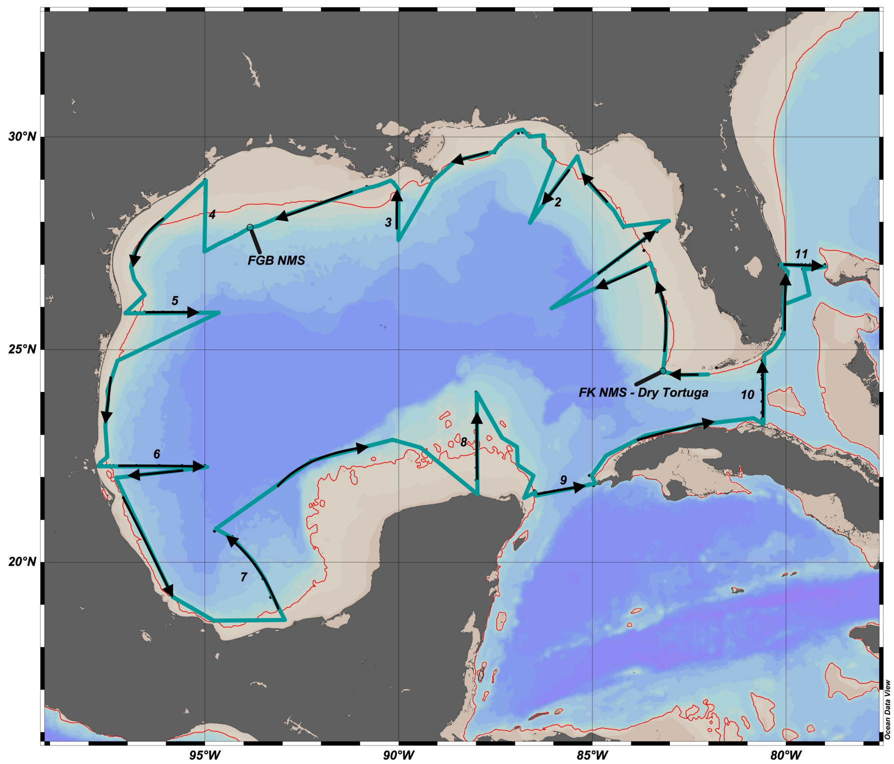

Figure 1: Cartoon of cruise track. The ship will depart Key West, FL and return to Fort Lauderdale, FL. The cruise will be 35 days. A preliminary cruise schedule is listed in Table 1.

D. Summary of Objectives

The Gulf of Mexico Ecosystems and Carbon Cycle (GOMECC-3) cruise is the third comprehensive survey of inorganic carbon, nutrients and other biogeochemical parameters along the coastal waters of the Gulf of Mexico. The effort is in support of the NOAA/OAR Ocean Acidification Program (OAP) that has as a major objective to monitor changes in inorganic carbon dynamics due to anthropogenic carbon input and natural changes in the coastal regions. These changes over time are often referred to as ocean acidification. The project will increase our understanding of the controls of ocean acidification and its impacts on coastal ecosystems, and the Gulf of Mexico in particular.

E. Participating Institutions

Primary:

United States Department of Commerce
National Oceanic and Atmospheric Administration
Atlantic Oceanographic and Meteorological Laboratory (NOAA/AOML)
4301 Rickenbacker Causeway
Miami, FL 33149 USA
Telephone: 305 361 4380
Facsimile: 305 361 4392

Additional:

OAP	NOAA/OAR/Ocean Acidification Program
NOAA/NESDIS	NOAA National Environmental Satellite, Data and Information Service
RSMAS/ UM	Rosenstiel School of Marine and Atmospheric Science/University of Miami
USF	University of South Florida
NCSU	North Carolina State University
ULL	University of Louisiana at Lafayette
USM	University of Southern Mississippi
UABC	Universidad Autónoma de Baja California
CICESE	Ensenada Center for Scientific Research and Higher Education
ECOSUR	Colegio de Frontera Sur
Cuban institution1	
Cuban institution2	

F. Personnel/Science Party: name, title, gender, affiliation, and nationality

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
Barbero, Leticia	Chief Scientist	07/17/17	08/22/17	F	AOML/CIMAS	Spain
Barranco, Linda	Alkalinity	07/17/17	08/22/17	F	UABC	Mexico
Cano Compaire, Jesús	Ichthyoplankton	07/17/17	08/22/17	M	CICESE	Spain
Cervantes, Gabriela	Alkalinity	07/17/17	08/22/17	F	UABC	Mexico
Chen, Shuangling	Satellite	07/17/17	08/22/17	F	USF	China
Chomiak, Leah	O2	07/17/17	08/22/17	F	RSMAS	USA
Corradino, Gabrielle	Plankton Ecology	07/17/17	08/22/17	F	NCSU	USA
Hooper, James	CTD/Salinity	07/17/17	08/22/17	M	AOML/CIMAS	USA
Hudson-Heck, Ellen	UWpH/DiscpH	07/17/17	08/22/17	F	USF	USA
Lomán, Lucio	Pteropods	07/17/17	08/22/17	M	Ecosur	Mexico
Mears, Patrick	DIC	07/17/17	08/22/17	M	AOML/CIMAS	USA
Muñoz Caravaca, Alain	Cuban National Observer	07/17/17	08/22/17	M	CEAC	Cuba
Pathare, Mrunmayee	Plankton Ecology	07/17/17	08/22/17	F	ULL	India
Pierrot, Denis	Co-Chief Scientist	07/17/17	08/22/17	M	AOML/CIMAS	France
Pontes, Emma	O2	07/17/17	08/22/17	F	RSMAS	USA
Schockman, Katelyn	UWpH/DiscpH	07/17/17	08/22/17	F	USF	USA
Sharp, Jon	UWpH/DiscpH	07/17/17	08/22/17	M	USF	USA

Silva, Joletta	DIC	07/17/17	08/22/17	F	RSMAS	USA
Smith, Ian	Nutrients	07/17/17	08/22/17	M	AOML/CIMAS	USA
Stefanick, Andrew	CTD/Salinity	07/17/17	08/22/17	M	AOML	USA
Sullivan, Kevin	pCO2 discrete	07/17/17	08/22/17	M	AOML/CIMAS	USA
Tierney, Courtney	UWpH/DiscpH	07/17/17	08/22/17	F	USF	USA
Viamontes Fernandez, Jorge Luis	Cuban National Observer	07/17/17	08/22/17	M	GEOCUBA	Cuba
Zhang, Yingjun	Satellite	07/17/17	08/22/17	M	USF	China

G. Administrative

1. Points of Contacts:

Chief Scientist: Dr. Leticia Barbero
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway Miami, FL 33149 USA
Telephone: 305-361-4453 Facsimile: 305-361-4392
Leticia.Barbero@noaa.gov

Co-Chief Scientist: Dr. Denis Pierrot
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway Miami, FL 33149 USA
Telephone: 305-361-4441
Denis.Pierrot@noaa.gov

Project Lead: Dr. Leticia Barbero
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway Miami, FL 33149 USA
Telephone: 305-361-4379 Facsimile: 305-361-4392
Leticia.Barbero@noaa.gov

Alternate Point of Contact: CDR Justin Kibbey
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway Miami, FL 33149 USA
Telephone: 305-361-4544 Facsimile: 305-361-4449
AOML.Associate.Director@noaa.gov

2. Diplomatic Clearances

This project involves Marine Scientific Research (MSR) in waters under the jurisdiction of Mexico, Cuba and the Bahamas. Diplomatic clearance has been requested via the RATS system through Wendy Bradfield-Smith.

3. Licenses and Permits

Approval is requested to traverse “Areas to be avoided (ATBA) in the Florida Keys National Marine Sanctuary and the Flower Garden Banks.

This project will be conducted under the Scientific Research Permit # FKNMS-2017-056 issued by the Florida Keys National Marine Sanctuary (U.S. agency) on 07/07/2017 to Dr. Leticia Barbero.

II. Operations

The Chief Scientist is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives and priorities. The Commanding Officer is responsible for ensuring all operations conform to the ship’s accepted practices and procedures.

A. Project Itinerary:

The NOAA Ship *Ronald H. Brown* (RHB) will depart Key West, on July 18, 2017 to begin scientific operations. The cruise will end in Fort Lauderdale on August 21, 2017. The operational goals of the cruise are to sample along 11 hydrographic sections (see Figure 1, and Table 1 for preliminary station locations); continuous measurements of surface water from the uncontaminated scientific seawater supply; and continuous meteorological measurements from the bow of the ship. The actual hydrographic stations and sampling plan may deviate from this proposed plan in both number of stations and their locations. A description of each project is provided in Appendix C.

B. Staging and Destaging:

Staging of all equipment for the cruise will be conducted at the US Naval Base in Key West, FL. We request access to the ship starting on Friday July 14 for loading and equipment set-up. We will send to the ship a 20-foot lab container for CO_2 analyses and a 20-foot storage container containing the CTD/rosette package and scientific gear that will be loaded with a crane rented by AOML. Sufficient scientific personnel will be present for the purposes of scoping and securing the craned equipment. A list of equipment to be brought aboard is shown in the FACILITIES section of the Project Instructions and in Appendix B.

The members of the science party will arrive in Key West two to four days prior to sailing for final staging prior to the cruise (July 14-16). The science party requests permission to stay onboard the ship the night prior to sailing, to facilitate maximum time for setup of the scientific gear. We understand the galley may not be available for science party meals before sailing. We will require the assistance of the shipboard ET and Survey Technician for 4-8 hours on Friday and Monday prior to departure to assist with installing computer systems, interfacing with ships SCS, terminations for the CTD and other science equipment.

C. Operations to be Conducted:

1. CTD/O2 profiles along hydrographic transects in the Gulf of Mexico and East coast of the US. Approximately 107 stations will be completed to full water depth of maximum 3600 m; most stations will be less than 1000 m.
2. Water samples collected in 12 l Niskin type bottles mounted to the Rosette frame for chemical and biological measurements listed under 4-7.
3. Continuous recording ship mounted ADCP.
4. Inorganic carbon and nutrients in the water samples collected with the bottles.
5. Dissolved oxygen concentration in the water samples collected with the bottles.
6. Chlorophyll and DOM and CDOM (in the mixed layer) in the water samples collected with the bottles and filters.
7. Microplankton and phytoplankton in the water samples collected at select stations and depths.
8. Continuous recording of Thermosalinograph (TSG).
9. Measurements of CO_2, O_2, pH, DIC and other parameters from the uncontaminated scientific seawater supply line spigots in main lab and hydro lab.
10. Measurement of meteorology of the marine boundary layer (atmosphere) from the bow of the ship.
11. Water column light profile will be taken each day near noon time. The ship should be positioned such that it does not cast a shadow on the light meter.
12. Diagonal bongo net tows at around 40 stations, performed in general after the CTD cast. At least one person from the science party will assist with bongo net operations.
13. Hand-held net tows at up to 11 shallow stations.
14. Grazing and incubation experiments conducted on water collected from CTD. An incubation tank will be set up on the fantail deck.

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which preclude normal operations: CTD/Rosette deployments, net tows will be curtailed if weather conditions are such to create unsafe operating conditions.

There shall be no smoking, no painting, and no use of solvents in the area near the equilibrators and other underway equipment, or near the Niskin bottles at any time during the cruise.

III. Equipment

A. Equipment and Capabilities provided by the ship (itemized)

The following communications devices are currently on board the *Ronald H. Brown* and are expected to be in working order. The chief scientist should be apprised at earliest possibility of malfunction or poor function of equipment.

1. High Frequency SSB (SEA 330): SEA Inc. 300-watt high frequency transceiver. The transceiver covers a frequency range from 1.6 to 29.9 MHz
2. Sperry Global Maritime Distress and Safety System (GMDSS)
3. Satellite communication system (INMARSAT -A, -B, -M)
4. Five fixed VHF radios with eight channels pre programmed with a selection of marine band and NOAA frequencies.
5. Cell phones

The electronic instrumentation used for navigation includes:

6. Trimble Centurion P-code GPS
7. Magnavox MX-200 GPS
8. Northstar 941x differential GPS
9. Sperry Mark 37 Gyro Compass
10. Sperry Rascar Touch Screen navigational radar. (S-band (10 cm) 30 kW radar and an X-band (3 cm) 25 kW radar)
11. Simrad Robertson Dynamic Positioning System
12. Raytheon model DSN-450 Doppler Speed/distance log
13. NAVTEX receiving and printing the international automated medium frequency (518 KHz) weather warnings
14. Weather maps: Medium frequency/high frequency

Scientific Equipment requested from the Ship:

1. Echo Sounder (Ocean Data Equipment Corporation (ODEC) Bathy 2000 or the Knudsen system) used in12 kHz mode (to track CTD package to within 10 meters of the bottom) to be used while on CTD station.
2. Continuous Seabeam 2112 (12 kHz) swath bathymetric sonar system sampling while underway between stations.
3. Barometer
4. WOCE IMET sensors
5. Hydrographic Winch system and readouts (using 0.322 conducting cable (at least 6000-m length for CTD operations).
6. One backup hydrographic winch system for CTD operations with at least 6000 m of cable.
7. Hull mounted acoustic Doppler current profiler (RD Instruments (RDI), 75 kHz Ocean Surveyor acoustic Doppler current profiler) with gyro input.
8. MAHRS gyro system for acquisition of heading data used by acoustic Doppler current profiler.
9. Science walk-in fridge set at ~ +4 degrees Celsius
10. Science walk-in freezer set at ~ -20 degrees Celsius
11. Access to approximately 20L/day of pre-brominated water either from the evaporators or the RO water system, when the ship is producing fresh water.
12. Source of seawater to flow into /out of incubation tank on fantail. Seawater is for thermal purposes and does not need to be "uncontaminated". Deck or seawater hose is adequate

B. Equipment and Capabilities provided by the scientists (itemized)

In addition to the suite of oceanographic and meteorological instruments on board the *Ronald H.*

Brown, the science party will bring the following instruments and materials on board (see appendix for full specifications):

1. Seabird 911+ CTD/O2 to collect profiles of depth. An altimeter will be installed.
2. General Oceanics 24 bottle rosette wheel and 12-l Niskin type bottles to collect water samples for comparison with the CTD profiles and biogeochemical analyses.
3. Instrumentation to measure a variety of biogeochemical properties in ocean water and atmosphere as detailed in the summary of projects in Appendix C.

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per OMAO procedure, the scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents
- Chemical safety and spill response procedures, such as excerpts of the program's Chemical Hygiene Plan or SOPs relevant for shipboard laboratories
- For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, notify ship's Operations Officer regarding quantity, packaging and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program
- Confirmation that chemical safety and spill response procedures were brought aboard

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials brought onboard. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

Appendix A provides the inventory according to scientific analysis

C. Chemical safety and spill response procedures

A: ACID

- Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.
- Ventilate closed spaces before entering them.
- Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
- **Large Spills**: Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.
- **Small Spills**: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
- Never return spills in original containers for re-use.
- Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.
- J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

M: Mercury

- Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Use Mercury Spill Kit if need be.

F: Formalin/Formaldehyde

- Ventilate area of leak or spill. Remove all sources of ignition.
- Wear appropriate personal protective equipment.
- Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible.
- Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container.
- Do not use combustible materials, such as saw dust.

Other response procedures are provided on appendix A or along with MSDS forms.

(See attached Appendix A)

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials

No Radioactive Materials are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") Projects

Underway Measurements in support of Global Carbon Cycle Research

The underway sensors on RHB will be used in support of the objectives of the Global Carbon Cycle Research (GCC) to quantify the uptake of carbon by the world's ocean and to understand the bio-geochemical mechanisms responsible for variations of partial pressure of CO_2 in surface water (pCO_2). This work is a collaborative effort between the CO_2 groups at AOML and PMEL.

Principal investigators:

Dr. Rik Wanninkhof, AOML 305-361-4379 rik.wanninkhof@noaa.gov

Contact person:

Dr. Denis Pierrot, AOML 305-361-4441 denis.pierrot@noaa.gov

The semi-automated instruments are installed on a permanent basis in the hydro lab of RHB. All work is performed on a not-to-interfere basis and does not introduce any added ship logistic requirements other than the continuous operation of the bow water pump and thermosalinograph. The chief scientist assumes responsibility of the hazardous materials aboard RHB for this project. A list of the HAZMAT associated with this project is provided in Appendix A.

CARTHE drifter deployment

The main goal of the CARTHE project is to accurately predict the fate of hydrocarbons (oil) released into the environment, thereby guiding risk management and response efforts to minimize damage to human health, the economy and the environment. During GOMECC-3 25 drifting instruments will be deployed into the Gulf of Mexico at select stations. The drifters are activated with a magnet and thrown overboard ideally as the ship is starting to move after a station. No ship personnel are required for this operation. One person from the science crew is sufficient for activation and deployment of the float. The low-cost, biodegradable, and sacrificial CARTHE drifters track currents centered 40 cm below the surface and they are designed to enable large-scale deployments. The patented design was developed by a team of physical oceanographers and engineers at the University of Miami.

Principal investigator and contact person:

Dr. Josefina Olascoaga, RSMAS 305-421-4647 jolascoaga@rsmas.miami.edu

B. NOAA Fleet Ancillary Projects

Any additional work will be subordinate to the primary project and will be accomplished only with the concurrence of the Commanding Officer and the Chief Scientist(s).

VI. Disposition of Data and Reports

Disposition of data gathered aboard NOAA ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

A. Data Classifications: *Under Development*

a. OMAO Data

b. Program Data. All program data will be publically available through NCEI within two years of completion of project as per agreement with the OAP program management. Data will be available to program scientists as soon as it is reduced though a password protected website at AOML

B. Responsibilities: *Under Development* The chief scientist is responsible for all program data and for submitting data to nations as required for MSR in the EEZs.

VII. Meetings, Vessel Familiarization, and Project Evaluations

A. <u>Pre-Project Meeting</u>: The Chief Scientist and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Chief Scientist in arranging this meeting.

B. Vessel Familiarization Meeting: The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting: The Commanding Officer is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and shortcomings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report: Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at https://sites.google.com/a/noaa.gov/omao-intranet-dev/operations/marine/customer-satisfaction-survey and provides a "Submit" button at the end of the form. It is also located at https://docs.google.com/a/noaa.gov/forms/d/1a5hCCkgIwaSII4DmrHPudAehQ9HqhRqY3J_FXqbJp9g/viewform. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ship, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the project.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current makeup of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website http://www.corporateservices.noaa.gov/noaaforms/eforms/nf57-10-01.pdf.

All NHSQs submitted after September 1, 2015 must be accompanied by NOAA Form (NF) 57-10-02 - Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than 4 weeks prior to the start of the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:

Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone 757-441-6320
Fax 757-441-3760
Email MOA.Health.Services@noaa.gov

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

C. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine

Operations Center is via email and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged through the ship's Commanding Officer at least 30 days in advance.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the *OMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

(1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
(2) Installation of the latest critical operating system security patches.
(3) No external public Internet Service Provider (ISP) connections.

Completion of the above requirements prior to boarding the ship is required.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). National Marine Fisheries Service personnel will use the Foreign National Registration System (FNRS) to submit requests for access to NOAA facilities and ships. The Departmental Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated Line Office Deemed Export point of contact to assist with the process.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the email generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this email will be transmitted by FNRS.) This email will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.
2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.
3. Ensure all non-foreign national members of the scientific party receive the briefing on

Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.
4. Export Control - Ensure that approved controls are in place for any technologies that are subject to Export Administration Regulations (EAR).

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the Chief Scientist or the DSN of the FNRS or Servicing Security Office email granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.
7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.
2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

VIII. Appendices

Appendix O

Station Operations

CTD Operations: CTD casts will include the CTD/O2 unit, a Rosette sampler and 24, 10-L bottles on the Rosette frame. Approximately 107 casts will be conducted to full water column depth, maximum estimated at 4000 meters. The majority of stations with be less than 1000m. We will require a package tracking system and display for the CTD operations (Knudsen/Bathy2000). We recommend that the ship carries a back-up CTD conducting cable for this cruise and a functioning spare winch. Approximate station locations are listed in Table 1. Science party will provide one person to assist in the launching and recovery of the CTD and a CTD computer operator.

Table 1. Station locations using a transit speed of 7.5 knots between stations and on longer transits.

GOMECC-3 Line	Station	Latitude (N)	Longitude (W)	Depth (m)
DRY NPS	CTD A	24.3	82.8	**20**
Line 1	CTD 1	28.018	83.017	**16**
	CTD 2	27.778	83.333	**32**
	CTD 3	27.556	83.667	**48**
	CTD 4	27.333	84.00	**72**
NET TOW	CTD 5	27.111	84.333	**136**
NET TOW	CTD 6	26.889	84.667	**231**
	CTD 7	26.667	85.00	**3293**
	CTD 8	26.444	85.333	**3285**
NET TOW	CTD 9	26.222	85.667	**3254**
NET TOW	CTD 10	26.00	86.00	**3243**
Line 2	CTD 11	29.55	85.37	**15**
	CTD 12	29.378	85.509	***30***
	CTD 13	29.206	85.648	***80***
NET TOW	CTD 14	29.033	85.787	***190***
	CTD 15	28.861	85.926	***260***
NET TOW	CTD 16	28.689	86.064	***320***
	CTD 17	28.517	86.203	***400***
	CTD 18	28.344	86.342	***620***
NET TOW	CTD 19	28.172	86.481	***925***
NET TOW	CTD 20	28	86.62	***3000***
GUIS NPS	CTD B	30.11	86.8	***20***
Line 3/ NET TOW	CTD 21	27.583	90.00	***1263***
	CTD 22	27.75	90.00	***856***
NET TOW	CTD 23	27.917	90.00	***667***
NET TOW	CTD 24	28.083	90.00	***435***

	CTD 25	28.25	90.00	***172***
NET TOW	CTD 26	28.50	90.00	***98***
	CTD 27	28.75	90.00	***48***
	CTD 28	28.935	90.123	***26***
	CTD 29	28.972	90.212	***20***
	CTD 30	28.867	90.483	**20**
	CTD 31	28.833	90.817	**17**
Line 4	CTD 32	27.92	93.58	***100***
Diel study	CTD 33	27.87	93.83	***80***
	CTD 34	27.691	94.22	***300***
	CTD 35	27.512	94.61	***950***
NET TOW	CTD 36	27.333	95	***1115***
NET TOW	CTD 37	27.4992	95	***890***
NET TOW	CTD 38	27.6493	95	***632***
NET TOW	CTD 39	27.833	95	***217***
	CTD 40	28.0838	95	***55***
	CTD 41	28.3325	95	***56***
	CTD 42	28.6838	95	***57***
	CTD 43	29	95	***58***
PAIS NPS	CTD C	27.7	96.5	***25***
Line 5	CTD 44	25.88	97.05	***20***
	CTD 45	25.88	96.808	***45***
	CTD 46	25.88	96.566	***65***
NET TOW	CTD 47	25.88	96.324	***200***
	CTD 48	25.88	96.082	***800***
NET TOW	CTD 49	25.88	95.84	***1000***
NET TOW	CTD 50	25.88	95.55	***1500***
	CTD 51	25.88	95.12	***2500***
NET TOW	CTD 52	25.88	94.67	***3200***
Line 6	CTD 53	22.27	97.73	***17***
	CTD 54	22.27	97.6375	***38***
	CTD 55	22.27	97.545	***48***
	CTD 56	22.27	97.4525	***65***
NET TOW	CTD 57	22.27	97.36	***250***
NET TOW	CTD 58	22.27	96.77	***1500***
	CTD 59	22.27	96.18	***2350***
NET TOW	CTD 60	22.27	95.59	***2680***
NET TOW	CTD 61	22.27	95	***3440***
Line 7	CTD 62	18.64	92.95	***18***
Mx c10	CTD 63	19.17	93.3	***47***

Mx c11	CTD 64	19.61	93.5	***30***
Mx c12/NET TOW	CTD 65	20.02	93.77	***100***
Mx c13/NET TOW	CTD 66	20.6	94.29	***475***
Mx c14/NET TOW	CTD 67	20.73	94.75	***3000***
Line 8	CTD 68	21.63	88.00	***30***
	CTD 69	21.926	88.00	***25***
	CTD 70	22.225	88.00	***45***
	CTD 71	22.519	88.00	***60***
	CTD 72	22.815	88.00	***40***
	CTD 73	23.111	88.00	***50***
NET TOW	CTD 74	23.408	88.00	***90***
	CTD 75	23.704	88.00	***85***
NET TOW	CTD 76	24.00	88.00	***2700***
Line 9	CTD 77	21.548	86.758	***17***
	CTD 78	21.590	86.500	***40***
NET TOW	CTD 79	21.633	86.240	***680***
NET TOW	CTD 80	21.675	85.982	***1550***
	CTD 81	21.718	85.723	***1900***
NET TOW	CTD 82	21.760	85.464	***2000***
NET TOW	CTD 83	21.802	85.205	***1750***
	CTD 84	21.844	84.946	***40***
Line 10	CTD 85	23.245	80.62	***20***
NET TOW	CTD 86	23.513	80.62	***1050***
	CTD 87	23.78	80.62	***1110***
NET TOW	CTD 88	24.048	80.62	***1110***
NET TOW	CTD 89	24.315	80.62	***630***
NET TOW	CTD 90	24.583	80.62	***210***
	CTD 91	24.85	80.62	***30***
EVER NPS	CTD D	25.5	80.1	***25***
Line 11	CTD 92	26	80.003	**40**
	CTD 93	27	79.987	**67**
	CTD 94	27	79.933	**160**
	CTD 95	27	79.867	**275**
	CTD 96	27	79.783	**400**
	CTD 97	27	79.683	**550**
	CTD 98	27	79.617	**653**
	CTD 99	27	79.500	**780**
	CTD 100	27	79.383	**700**
	CTD 101	27	79.283	**628**
	CTD 102	27	79.200	**509**

CTD 103	27	79.175	**431**

Appendix A. List of Chemicals

I. CHEMICAL REAGENTS USED FOR THE
DETERMINATION OF **DISSOLVED OXYGEN** IN SEA WATER

NAME OF CHEMICAL	AMOUNT OF CHEMICAL	COMMENTS
Manganese Chloride	2 Liters, (600gr/Liter)	Solution
Alkaline Sodium Iodide	2 Liters, (320gr. Sodium Hydroxide + 600gr. Sodium Iodide, in each liter).	Solution
Sulfuric Acid	2 Liters, 280ml/liter	Dilute Solution
Sodium Thiosulfate	3 Liters, 10gr/Liter	Very Dilute Solution
	3 vials of 10gr. Thiosulfate	Granular Salt
Potassium Iodate	1 Liter, (0.3567gr/Liter) Std.	Very Dilute Solution Primary Standard
Triton(R) X-100	1 Liter (Polyethylene Glycol Octylphenyl Ether)	Solution

II. CHEMICAL REAGENTS USED FOR THE DETERMINATION OF **NITRATE, NITRITE, PHOSHATE, AND SILICATE** IN SEAWATER

NAME OF CHEMICAL _	bottles	AMOUNT OF CHEMICAL		COMMENTS
		wt. Ea. (g)	total (g)	
Oxalic Ac.	7	50	350	Granular
NaOH	1	40	40	Granular
Cd	12	25	300	Granular
NEDA	10	1	10	Granular
Imidazole	6	13.6	81.6	Granular
Ascorbic Ac.	14	17.6	246.4	Granular
NH4.Molybdate	14	7.1	99.4	Granular
NH4.Molybdate	14	10	140	Granular
Hydrazine	14	10	140	Granular
Sulfanilamide	12	10	120	Granular
Antimony Potassium Tartrate	3	3	9	Granular
Brij-35	2	125	250	Liquid

Dowfax	2	125	250	Liquid
HCl	4	2.5	10	Liquid
H2SO4	4	0.5	2	Liquid
Acetone	2	0.5	1	Liquid

III. CHEMICAL REAGENTS USED FOR THE DETERMINATION OF TOTAL **DISSOLVED INORGANIC CARBON (DIC), pCO_2, and Underway pCO_2**

NAME OF CHEMICAL	AMOUNT OF CHEMICAL	COMMENTS
Magnesium Perchlorate	2 bottles, 500 g each	Granular Salt
Ascerite (hydroxide)	1 bottle, 500 g	Granular Salt
Isopropanol	4 Liters (1 x 4 L bottle)	Solvent
Acetone	4 Liters (1 x 4L bottle)	Solvent
Coulometer solution (cathode)	12 liters (3 x 4L bottle	Liquid
Coulometer solution (anode)	2 liters (4 x 0.5L bottle	Liquid
Nitrogen, compressed	5 steel cylinders Carrier Grade	Compressed Gas
Air, compressed	8 aluminum cylinders (size a)	Compressed Gas
HgCl2	3, 300 ml of saturated solution	Liquid for sample preservation

IV. CHEMICAL REAGENTS USED FOR THE *SPECTROPHOTOMETRIC* DETERMINATION OF **pH, AND CARBONATE ION CONCENTRATIONS** IN SEAWATER

Material	Qty	Container	Location	Contact	Spill control
Lead Perchlorate, 0.022M	4 x 50ml	Bottle	MainLab	Sharp	G
Metacresol Purple, 0.010M	2 x 50ml	Bottle	MainLab	Sharp	G
Hydrochloric Acid, 1.0N	1 x 100ml	Bottle	MainLab	Sharp	A
Sodium Hydroxide, 1.0N	1 x 15ml	Bottle	MainLab	Sharp	C
Metacresol Purple, 0.010M	2 x 500ml	Reagent Bag	MainLab	Sharp	G
Bromocresol Purple, 0.010M	2 x 500ml	Reagent Bag	MainLab	Sharp	G
Hydrochloric Acid, 1.0N	2 x 1000ml	Reagent Bag	MainLab	Sharp	A
Sodium Bicarbonate Standard, 2mM	6 x 1000ml	Reagent Bag	MainLab	Sharp	G
Sodium Bicarbonate Standard, 2mM	2 x 3000ml	Reagent Bag	MainLab	Sharp	G

We'll have a spill kit with us for all acids and caustics we'll be bringing.

V. CHEMICAL REAGENTS USED FOR FIXING **PLANKTON SAMPLES** OBTAINED FROM NET

TOWS

Material	Qty	Location	Contact	Comments
Sodium tetraborate decahydrate	740 g	BioLab	Compaire	Granular
Sodium phosphate dibasic anhydrous	985 g	BioLab	Compaire	Granular
Magnesium chloride hexahydrate	715 g	BioLab	Compaire	Granular
Sodium phosphate monobasic monohydrate	34 g	BioLab	Compaire	Granular
Ethanol	200L	BioLab	Compaire	Liquid
37% formaldehyde	5L	BioLab	Compaire	Liquid

VI. CHEMICAL REAGENTS USED FOR **MICROPLANKTON EXPERIMENTS**

Material	Qty	Location	Contact	Comments
RNase*Zap*™ RNase Solution	250 ml	BioLab	Corradino	Liquid
RNAlater™ Stabilization Solution	100 ml	BioLab	Corradino	Liquid
Formaldehyde (37%)	500 ml	BioLab	Corradino	Granular
Acetic Acid	500 ml	BioLab	Corradino	Granular
Glutaraldehyde, 25% aq. soln	500 ml	BioLab	Corradino	Liquid
Lugols Solution (Iodine/Potassium iodide solution)	1L	BioLab	Corradino	Liquid

VII. CHEMICAL REAGENTS USED FOR **COLORED DISSOLVED ORGANIC MATTER**

NAME OF CHEMICAL	AMOUNT OF CHEMICAL	COMMENTS
Nitrogen (N_2)	30 Liters	Liquid, in 34L Dewar

Appendix B. Equipment/Van List

1. Oxygen (AOML/RSMAS) SITE: main Lab

WT: 200 kg

SIZE: Small miscellaneous equipment tools, & laptops

Oxygen Equipment:

1. Sample bottles- 10 blue plastic cases, 24 x 16 x 12, 20 lbs. each.
2. Reagents- 2 blue plastic cases, 24 x 18 x 14, 50 lbs. each.
3. Titration Equipment- 1 aluminum box, 24 x 24 x 16, 70 lbs.
4. Misc. supplies- 2 cardboard boxes, 16 x 15 x 14, 30 lbs. each.

Misc. Equipment

1. Instruction manuals
2. 2 computers, 16x16x10, 20 lbs. total
3. 2 laptops, 14x2x9, 10 lbs. total
4. 2 LCD monitors, 16x12x2, 4 lbs. total
5. 2 tool boxes, 30”x16”x30”, 200 lbs. total
6. 2 boxes misc. supplies, 16”x16”x36”, 150 lbs. total

2. CTD Rosette with console (AOML/PhOD) SITE: Computer Lab/ O1 Deck (CTD/Niskins)

WT: 1 ton

SIZE: 4'L x 4'W x 6'H

SITE: Standard CTD Location

1. 3- Seabird 9 CTDs, 8”x8”x36”, 90 lbs. total
2. 2 – CTD frame, underwater sampling package, 6.5’x48”diameter, 1300 lbs./each
3. 2 boxes CTD sensors, 16”x18”16, 30 lbs. total
4. 30, 10 L Niskin Bottles

3. TAlk equipment (AOML/UABC) SITE: Hydrographic Lab

The 2 TAlk titrators have a small size of less than 0.5x0.5x0.5 m each. We need a bench space of 2-3-m. We will bring 10 sample cases with borosilicate bottles for collecting samples. Samples will be titrated with ~0.25M solution of HCl. In addition to the titration system, we will bring two instrument laptops and assorted supplies.

4. CDOM SITE: Main Lab/Hydro lab

HyperPro

1. HyperPro in transport case: 50”x24”x10”
2. Power/comm. cable in bucket: 22” diameterx18” high
3. Power supply & cable in box: 22”x17”x13”
4. Mounting pole and HyperPro holster: 6’x3”
5. Laptop 16”x12”x7”

ALFA system

1. Alfa system in transport case: 24”x32:18”
2. Sampling bottles: 11”x14”x7”
3. Spare parts & plumbing kit: 12”x12”x8”
4. ALFA system computer can be shipped in transport case

Rrs equipment:

1. Black case with greycard: 18”x14”x8”
2. Grey case with SD HH2: 14”x14”x8”

3. Laptop in case: 16”x12”x7”
4. Small box of accessories: 8”x8”x12”

Microtops & tool kit

1. Microtops in case: 7”x10”x4”
2. Tool kit 18”x9”x8”

Filtration gear:

1. 34-L liquid nitrogen dewar (20x20x30”; ~100 lbs)
2. Wooden 4-flask filtration rig (36x15x25”; ~50 lbs)
3. Sample bottles (6 cases of 24) – 100 quart blue Igloo cooler (34x17x17”; ~80 lbs)
4. Sample bottles (2 cases of 24) – 48 quart cooler (26x14x14”; 40 lbs)
5. Misc. filtration supplies – gray Rubbermaid container w/ black lid (22x15x16”; ~40 lbs)
6. Misc. filtration supplies – black Husky container w/ gray lid (27x18x15”; ~60 lbs)
7. 3 10-gal. carboys

If coolers are needed for transport of samples
2 or 3 coolers, each 36”x18”x18”

5. Total dissolved inorganic carbon (DIC) (AOML/OCED) SITE: Van

A laboratory van containing the DIC measurement systems will be placed onboard in Key West. The van will contain two DIC analyzers 4 compressed gas standards (2 with CO_2 in air and two with compressed ultra pure nitrogen), 80, 250 ml sample bottles, and auxiliary equipment. The pertinent information for the laboratory van is listed below.

CO_2 van

Weight	12000 lbs.
Size	8' x 8' x 20'
Power input	30 amps, 3 phase, and 440v.
Location	Main (01) deck aft
Door:	center, right side of van
	Needs power, compressed air, fresh water available, phone and Ethernet.

Contact Person: Esa Peltola, AOML, esa.peltola@noaa.gov

The container is ISO fitting compatible. Investigators will arrange the shipping so that the vans will be delivered for loading on the desired date. Coordination of a rental crane for loading the vans on the RONALD H. BROWN may save costs. The contact for crane scheduling is Esa Peltola (AOML). After loading, electric power needs to be supplied to the van with assistance of ship's engineer for testing of the analytical instruments in port. Appropriate power plug will be supplied by scientific party.

6. Partial pressure of CO_2 (discrete pCO_2) (AOML/OCD) SITE: Hydrographic Lab

A discrete pCO_2 analyzer along with 6 compressed gas standards (6 with CO_2 in air and two with compressed ultra pure nitrogen will be operated in the hydrolab. The system consists of a water bath and an instrument box. The unit includes Approximately 48 500-ml sample bottles will be used.

Size/weight of equipment:

The weight of equipment, supplies, and sample bottles is approximately 1000 lbs.

7. Underway pH/DIC and pCO_2 (USF) SITES: Hydro Lab and Main Lab

Pelican 1650 cases - 3 (31" x 21" x 12"), these will contain spectrophotometers (3) laptops (3), kimwipes (lots), and power/patch cables

Pelican 1620 cases - 2 (24" x 18" x 15"), one will include all of our glass and quartz spectrophotometric cells, the other will include the MICA in a box (small flow through instruments) and equipment for it (tubing, pumps, reagents, etc.)

Pelican 1610 case - 1 (24" x 19" x 13"), any laptops, kimwipes, MICA equipment, reagents, etc. that wont fit in the other cases

Pelican 1490 cases - 3 (20" x 14" x 6"), these will be used for transport of cells between the lab and the CTD Rosette. for transportation, they'll contain small miscellaneous equipment (wrenches, gilmont pipettes, pipette and tips, markers, tape, string, bungees)

Large duffel bag - 1, (~36" long), this will include steel toe boots, water proof overalls, water bath tubing, tubing insulation

Water baths - 3 (6" x 12" x 20")

Gas cylinder - 1 (7" x 33"), 30% CO2 gas for flow through alkalinity

8. Underway pH (UABC) SeaFet SITES: Hydro Lab

WT: 25 kg

Seafet Equipment, laptops and Misc. Equipment:

1. 1 SeaFet instrument and batteries
2. 2 laptops, 14x2x9, 10 lbs. total
3. 1 tool boxes and misc. supplies, 30"x16"x30", 6 lbs. total

9. Microbiology experiments (NCSU/ULL) SITE: Bioanalytical laboratory

a. Dissecting scope with external light source, 6lbs, 13x11x6”

b. 2 laptops, 14x2x9”, 12 lbs. total

c. PreSens system (1.5x7x5” , 2 lbs.)

10. Icthyoplankton and zooplankton community (CICESE, ECOSUR) SITE: Bioanalytical laboratory/main lab

Conical net (3), bongo frame (1), plastic net bucket (3), swivel (1), screwdriver (1), pliers (1), string (1), cable ties (170), sieve (3), ziplock bag (38), whirlpack bags (51), plastic tray (1), plastic jars (2), flowmeters (3), plastic measuring cylinder (1), Hensen-Stempel pipette (1), glue (2), penetrating oil WD40 spray (1), silicone tube (1), vegetal paper to label (107 small labels), mask to formaldehyde (1), safety boots (1), waterproof boots (1).

Appendix C: Synopses of Individual Projects.

A. Project name: Total Alkalinity (TAlk) measurements and assessing TAlk distribution pattern and the internal consistency of the CO_2 system parameters
Responsible investigator: Rik Wanninkhof/Martín Hernández Ayón
Cruise participants: Linda Barranco and Gabriela Cervantes (UABC), Leticia Barbero and Denis Pierrot (AOML)

Period: July 16 – August 22
(leave on July 18; equipment transported in AOML van)

Summary of scientific objectives:

1) Measuring Total Alkalinity (TAlk) on all water samples;

2) Synthesis of TAlk distribution pattern and export flux.

Sampling and Analysis:

1) All hydrocast water samples will be titrated for TAlk on board ship. TAlk samples will be collected from the 10-L Niskin bottles into 500 ml glass-stoppered bottles and analyzed within 24 hours.
2) While on transit from one line to the next one, underway samples will be collected every 3 hours.

Location of setup: Hydro Lab

B. Project name: Measurement of partial pressure of CO_2 (discrete pCO_2) and total dissolved inorganic carbon (DIC) on bottle samples
Principal investigator: Rik Wanninkhof (AOML)
Cruise participants: Leticia Barbero, Denis Pierrot, Kevin Sullivan, Patrick Mears (AOML), Joletta Silva (RSMAS)
Summary of scientific objectives: DIC and pCO_2 are two of the four inorganic carbon system parameters that are used to characterize the oceanic carbon system. Together with the TAlk, pH and inorganic nutrient measurements the observations will be used to estimate the effect of riverine input, air-sea CO_2 gas exchange, biological productivity and lateral carbon exchange on the coastal carbon dynamics.
Sampling and Analyses: The chemistry groups from AOML will measure DIC and pCO_2 at the hydrocast stations. DIC samples will be collected from the 10-L Niskin bottles into 250 ml glass-stoppered bottles containing 0.025 mL of a saturated solution of $HgCl_2$ to retard bacterial oxidation of organic matter prior to analysis. DIC samples will be measured by the coulometric titration method and will be done in a temperature-controlled van. Discrete pCO_2 samples will be collected from Niskin bottles into 500 ml for analyses by IR in the hydrolab.

C. Project name: Oxygen (O_2) measurements
Principal investigator: Chris Langdon (RSMAS)
Cruise participants: Emma Pontes and Leah Chomiak (RSMAS).
The AOML amperometric titration equipment will be used. They will be sampling every Niskin from every cast. Including rinses and overflow they will require approximately 500 ml of water.

Summary of scientific objectives: The O_2 measurements are core measurements that will be taken on all bottles of all CTD casts. The main purpose is to elucidate the biogeochemical controls of these parameters in coastal waters.
Sampling and Analysis: Oxygen samples will be taken in standard volumetric iodine flasks from all Niskin bottles as the first aliquot after the Niskin bottle is opened. Draw temperatures will be taken for all samples.
Location of setup: Main Lab

D. Project name: Measurement of nutrients (NO_3, NO_2, NH_4, PO_3 and $Si(OH)_4$) on bottle samples
Principal investigator: Jia-Zhong Zhang
Cruise participant: Ian Smith (AOML)
Summary of scientific objectives: Nitrate, Nitrite, ammonium, phosphate and silicate are major inorganic nutrients that control oceanic primary production and carbon exports. Together with the measurements of inorganic carbon parameters the observations will be used to estimate the effect of riverine input, air-sea CO_2 gas exchange, biological productivity and lateral carbon exchange on the coastal carbon dynamics.
Sampling and Analyses: The nutrient group from AOML will measure NO_3, NO_2, NH_4, PO_3 and $Si(OH)_4$

concentrations at the hydrocast stations. Nutrient samples will be collected from the 10-L Niskin bottles into 50 ml plastic sampling bottles. Water samples will be equilibrated to room temperature prior to analysis. Nutrient samples will be measured by a modified Alpkem autoanalyzer using a gas-segmented continuous flow colorimetric technique in a temperature-controlled shipboard laboratory. An underway system for ammonia measurements will be placed in the bio analytical lab.
Location of setup: The Main Laboratory on NOAA Ship RH Brown
Assistance with nutrient sampling is requested when I. Smith is not on duty.

E. Project name: pH and carbonate measurements
Principal investigator: Robert H. Byrne (USF)
Cruise participants: Jon Sharp, Ellen Hudson-Heck, Katelyn Schockman, Courtney Tierney (USF)
Summary of scientific objectives:
Carbonate ion concentration and pH are two important variables that will be used to characterize the CO_2 system. These variables will be critical in assessing carbon fluxes, the effects of in situ biological processes, and the extent of ocean acidification in the Gulf of Mexico. Also, the testing of a small flow-through system to measure surface pH, total alkalinity, and dissolved inorganic carbon will be an important step in the development of affordable CO_2 system sensors.

Sampling and Analyses:
Samples for both pH and carbonate will be collected from the 10L Niskin bottles into ~30mL glass (pH) and quartz (carbonate) cells. Both parameters will be measured using spectrophotometry after addition of mCP indicator (pH) or lead perchlorate solution (carbonate) to the cells. Our flow through system (MICA in a Box) will draw from the seawater intake line and use spectrophotometric principles along with colorimetric dyes to measure pH, total alkalinity and dissolved inorganic carbon.

Location of setup: The CO_2 instrument will be set up in Hydro Lab. pH and carbonate equipment and analyses will be performed in the main lab.

F. Project name: Quantifying movement of surface-produced carbon through planktonic food webs across gradients of eutrophication-induced acidification and hypoxia in the Gulf of Mexico
Principal investigator: Astrid Schnetzer (NCSU) and Beth Stauffer (ULL)
Cruise participants: Gabrielle Corradino (NCSU) and Mrun Pathare (ULL)
Summary of scientific objectives:
Major knowledge gaps exist in our understanding of how ocean acidification influences energy production and flow at the base of aquatic food webs. As part of the GOMECC cruise, we seek to address these gaps by quantifying variability in microplankton community structure (protistan and metazoan) and function (growth, respiration, feeding) along strongly pronounced spatial gradients in temperature, salinity, CO2, pH, and dissolved oxygen throughout the Gulf of Mexico. By characterizing the plankton communities and quantifying micro- and mesozooplankton grazing rates across the GOMECC study region, we will build a more complete picture of how physical and chemical changes interact with the transfer of carbon and energy through planktonic food webs.

Sampling and Analyses:
Plankton community composition will be characterized by collecting samples from CTD casts along each of transects 1 through 8, at three stations on each transect (onshore, intermediate, offshore) and three depths per station (surface, chlorophyll max, and deep). Plankton samples will be preserved for analysis via light-, and epiflourescence microscopy (photo,-mixo and heterotrophic microplankton), flow cytometry (auto- and heterotrophic pico-and nanoplankton) and complemented by high throughput sequencing (V4, Illumina). Grazing rates will be quantified via feeding experiments carried out at a subset of GOMECC stations (onshore & offshore) on each of 4 transects that focus on i) micrograzers such as ciliates and heterotrophic/ mixotrophic dinoflagellates (dilution experiments) and ii) metazoans, mainly copepods (exclusion/addition experiments). Changes in plankton abundances and composition in the presence/absence of different grazer assemblages will be determined using a combination of microscopy, flow cytometry, and molecular approaches.
Location of setup: Bio Lab

G. Project name: Determination of Icthyoplankton and zooplankton community composition
Principal investigator: Sharon Herzka (CICESE), Daniel Pech (ECOSUR) and Frank Hernandez (USM)
Cruise participants: Jesus Cano Compaire (CICESE), Lucio Loman (ECOSUR)
Summary of scientific objectives:
Plankton communities are vulnerable to ocean acidification effects. OA impacts on eggs and larvae can have significant impact on fishing and aquaculture activities in coastal regions. Pteropods and other calcifying organisms have been selected in other US coastal regions as adequate organisms to monitor OA impacts on coastal ecosystems. The purpose of this project is to do a Gulf-wide characterization of ichtyoplankton and other plankton communities and to identify the most adequate species to track OA impacts in the Gulf of Mexico.
Sampling and Analysis:
We will take samples for the analysis of the community structure of zooplankton (interest groups, ichthyoplankton and pteropods). We will use bongo nets for oblique tows from 0-200 m at a speed of at ca. 1.5 knots. The bongo net has two 60 cm diameter rings and nets with a mesh size of 335 um. Payout will be set at between 15-35 m/min (which will depend on the water column depth) and there will be a 1 minute stop at the bottom. Both nets will be equipped with two flowmeters to estimate the volume filtered. The samples collected with one of the nets will be fixed in 4% formalin buffered with sodium borate. The second sample will be divided: 20% by volume will be frozen for isotope analysis, and the rest will be fixed in 96% ethanol for genomic analysis.
Location of setup: Bio lab.

H. **Project name: Surface pH underway system**

Principal investigator: J. Martin Hernández-Ayón (UABC)
Cruise participants: Linda Barranco-Servin y Gabriela Cervantes-Diaz (UABC)
Summary of scientific objectives:
Surface pH and temperature maps will be made using a SeaFet sensor in underway mode to measure in

real time every two minutes. The underway system will be connected next to the other underway instruments. Robust comparison is considered between this sensor and other surface measurements as pCO2 and DIC measurement. In specific as a group we want to contribute to get an assessment how accurate the calculated pCO2 is using the pH output (and alkalinity). This is, in part to see how well we can estimate pH from BGC ARGO floats.

Sampling and Analyses: The chemistry groups from AOML, USF and UABC will measure DIC, pCO_2, pH and alkalinity for surface water. In addition nutrients and oxygen will also be collected.

I. **Project name: Satellite validation observations**

Principal investigator: Michael Ondrusek (NOAA/NESDIS) and David English (USF)

Cruise participants: Shuangling Chen and Yingjun Zhang (USF)

Summary of scientific objectives:

The USF Optical Oceanography Lab intends to make measurements of the near-surface light field in order to estimate remote sensing reflectance (Rrs) for use in validating VIIRS satellite imagery. In order to relate these measurements to particles and dissolved material in the water, surface waters will be filtered to obtain optical absorption spectra particulate and colored dissolve materials (CDOM). A Laser fluorometry system may be deployed to record information about the phytoplankton fluorescence along the transects. To provide an above- water Rrs measurement, a handheld above-water radiometer will be used to make measurements near the time of surface water collection. These measurements are made during the daylight hours, and some require relatively clear skies in order to provide useful information.