Geostationary Coastal & Air Pollution Events

Gulf of Mexico (GoMex) Field Campaign Sept. 9-22, 2013 Preliminary Plans with DISCOVER-AQ

GOAL: to evaluate whether current STM sensor requirements are optimized to address STM objectives while minimizing satellite sensor complexity, size and cost

Mission Risk Mitigation - 1

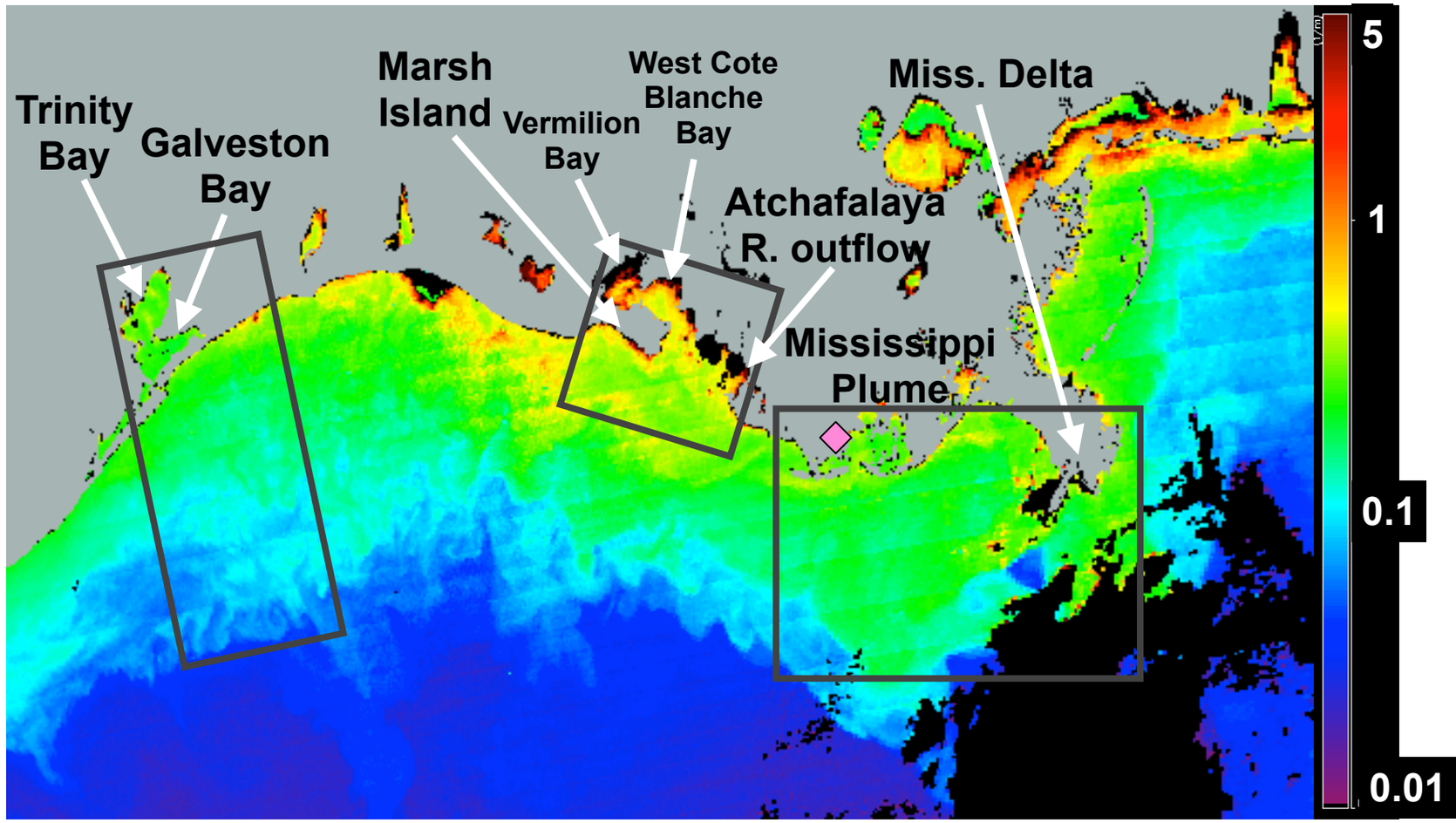
- Obtain ship- & airborne-based UV-Vis-NIR hyperspectral and SWIR data
  - Evaluate spectral range and resolution requirements to minimize sensor complexity, size and cost.
  - Develop and evaluate bio-optical algorithms & confirm requirements
- Improve retrievals of non- and absorbing aerosols including near-UV capabilities for absorbing aerosols and trace gases (NO2, ozone, etc.) and determine their impact on ocean color retrievals.
  - Refine requirements (SNR, spectral range & resolution) for aerosol and trace gas retrievals necessary for ocean color atmospheric corrections and interdisciplinary science to minimize sensor complexity, size & cost.
- Further constrain sensor requirements for required temporal frequency and spatial resolution based on the dynamics of coastal optical and biogeochemical variability - **IMPACT on sensor complexity, size and cost.**
- Adequacy of current STM requirements to retrieve mission critical and highly desirable products for various water types to address science questions.

Mission Risk Mitigation - 2

- Simulated GEO-CAPE datasets to demonstrate whether research and exploratory coastal products can be derived at the necessary accuracy to distinguish real temporal (diurnal and day-to-day) and spatial variability from sensor or algorithm induced uncertainty.
- Investigate the circumstances where in situ within pixel variability is so great that validation of satellite products yields erroneous assessment of algorithms – **impacts mission success**.
- Examine extent of what geo-unique issues must be resolved such as BRDF (varying sun-sensor geometry), diurnal variability in atmospheric constituents, product retrieval accuracy to quantify diurnal and day-to-day changes in biological and biogeochemical stocks and processes.
- Examine hourly changes of bio-optical properties within different spatial ground resolutions. Define how short term processes (such as tides) affect the spatial and temporal coherence scales of optical properties. Define the changes occurring in bio-optical processes between physical advection of water masses and bio-geo processes (such as particle settling, photo-oxidation, etc).

General Plans

- Departure from & return to Cocodrie, LA ◆
- 3 days of overflights w/ King Air - ACAM or GCAS & HSRL
  - 1 or 2 days over Louisiana shelf & Texas shelf
  - D-AQ overflights of opportunity - TX shelf & Galveston Bay
- 14 days at sea on R/V Pelican - 14 scientists
- ~5 days on LA shelf;
- ~5 days on TX shelf (one day in Galveston Bay
- ~2 day transit to TX
- ~2 day transit to LA



Sampling Approaches - Preliminary

- Transects along gradients
  - nearshore to offshore, river plumes, algal bloom patches
  - addresses aquatic & atmospheric spatial variability
- Tracking water masses (follow instrumented drogue)
  - diurnal evolution of biology & biogeochemistry
- Stationary
  - diurnal within pixel variability
- Small boat operations (more optically complex waters)
  - Marsh Island area; Galveston & Trinity Bay
- Diurnal Sampling - ~every 90 minutes (6 to 8 stations/day)
  - Rosette casts (water samples; salinity, temp., IOPs)
  - IOPs (absorption, backscatter, fluorescence, etc.)
  - Radiometry profiles UV-NIR
- Continuous underway near-surface IOPs
- Above-water radiometry UV-SWIR
- Instrumented drogue - evolution of DO, salinity, temp., IOPs

Planned Measurements

- IOPs: profiles and underway (a, b, c, bb, VSF)
- Radiometry: profiles and underway
- Water sample IOPs (Particle abs., CDOM abs. & fluorescence)
- Phytoplankton cell counts & taxonomy
- Underway O2, pCO2, DIC, TA & pH
- Discrete organics (POC/PN, DOC, DON, HPLC pigments, black carbon & lignin
- Suspended particulate matter (SPM)
- Discrete nutrients inorganic and organic
- Aerosols (AOT spectra) and trace gases (NO2, ozone, ...) from the ship (total column).
- Primary production

OBB Field Support Group at GSFC
to provide water analysis support for Rosette bottle samples: HPLC pigments, CDOM & particle abs., POC/PN, DOC and SPM AT NO COST

Selected Proposals

PI	Title	Discrete	Underway	Profile	Other	Required FSG measurements
Joe Salisbury	Langrangian studies and measurement support during the NASA GEOCAPE Gulf of Mexico field campaign	DIC, pH, total & non-carbonate alkalinity, Winkler O2, Respiration, triple O2 isotopes (NCP)	pCO2, DO, ac-9, Chl-Fluor, CDOM-Fluor, ISUS-UV abs, O2, S, T, O2:Ar (NCP)	ac-s, CTD, bb-9, DO, Chl-Fluor, CDOM-Fluor	**Lagrangian** O2, DIC, POC (NCP)	POC
Chuanmin Hu	Analysis of and interpretation of DISCOVER-AQ data for GEO-CAPE mission planning a proposal to analyze the FY13 and FY11 field campaign airborne data				Analysis of ACAM data to retrieve ocean color data	
Zhongping Lee	Measurement of water-leaving radiance and inherent optical properties in support of GEO-CAPE	Lw, Ed(0+) and Rrs (350-800nm), AOD		ac-s		
Stan Hooker & John Morrow	Next-generation algorithm development for GEO-CAPE leveraged from the Northern Gulf of Mexico September 2013 Field Campaign and Linked to Discover AQ 2011	Above water radiometry (sky & ocean): (1) 19 bands or (2) hyperspectral, both with SWIR bands		Ed, Lu & Rrs (19 channel UV-Vis-NIR) and other derived AOP products		POC, SPM, CDOM & particle abs., DOC, HPLC pigments
Antonio Mannino & Maria Tzortziou	GEO-CAPE: capturing CDOM and DOC short-term and small-scale dynamics in highly vulnerable coastal ecosystems	Dissolved lignin and black carbon, plus small boat measurements of CDOM absorption & EEMs, POC, PN, DOC				POC, DOC, CDOM abs.
Maria Tzortziou & Jay Herman	Refining requirements for aerosol and trace gas retrievals necessary for ocean color atmospheric corrections from GEO-CAPE	Microtops AOT (340-936 nm) and ozone	Pandora NO2, ozone and other gases			
Margaret Mulholland	Primary productivity in coastal waters in the western Gulf of Mexico	13C-NPP (4 & 24 hr), NO3, NO3, NH4, TDN, DON, N2 fixation rates, PC, PN				
Frank Muller-Karger & Gerardo Toro-Farmer	Major phytoplankton functional types in the Gulf of Mexio: A hyperspectral assessment in preparation of GEO-CAPE algorithm and product development	phytoplakton taxonomic enumeration, subset of particle & CDOM absorption, Flurometric Chl-a	total & dissolved ac-s, bb-3, Chl & CDOM fluor., Temp., and Salinity	PENDING		HPLC pigments), particle & CDOM absorption, Flurometric Chl-a
Carolyn Jordan	SHIPBOARD IN SITU AEROSOL SAMPLING FOR THE 2013 GULF OF MEXICO CRUISE AFFILIATED WITH DISCOVER-AQ	Aerosols: Na+,NH4+,K+,Mg2+,Ca2+,Cl-, NO3-, SO4=, OC, EC/OC, FTIR organic functional groups,	absorption coefficient @ 565nm, scattering @ 550n, extinction 300-650nm, size distribution (15-700nm)			

Data Policy

All measurements and data collected must be sent to Antonio for distribution to all cruise participants and GEO-CAPE SWG members, and submitted to SeaBASS (http://seabass.gsfc.nasa.gov/ - following all relevant policies in place for data submission to SeaBASS) ideally within 6 months of the cruise and no later than Sept. 22, 2014.

Each investigator is responsible for submitting their own datasets to SeaBASS.