Geostationary Coastal & Air Pollution Events

GEO-CAPE
Ocean Color SWG Activities

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Acknowledgments
GEO-CAPE Oceans SWG
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GEO-CAPE Oceans STM

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Science Focus	Science Questions	Approach (Maps to Science Question)	Measurement Requirements	Instrument Requirements	Platform Requirem.	Ancillary Data Requirem
Short-Term Processes **Land-Ocean Exchange** **Impacts of Climate Change & Human Activity** **Impacts of Airborne-Derived Fluxes** **Episodic Events & Hazards**	**1** How do short-term coastal and open ocean processes interact with and influence larger scale physical, biogeochemical and ecosystem dynamics? (OBB 1) **2** How are variations in exchanges across the land-ocean interface related to changes within the watershed, and how do such exchanges influence coastal and open ocean biogeochemistry and ecosystem dynamics? (OBB 1 & 2; CCSP 1 & 3) **3** How are the productivity and biodiversity of coastal ecosystems changing, and how do these changes relate to natural and anthropogenic forcing, including local to regional impacts of climate variability? (OBB 1, 2 & 3; CCSP 1 & 3) **4** How do airborne-derived fluxes from precipitation, fog and episodic events such as fires, dust storms & volcanoes affect the ecology and biogeochemistry of coastal and open ocean ecosystems? (OBB 1 & 2; CCSP 1) **5** How do episodic hazards, contaminant loadings, and alterations of habitats impact the biology and ecology of the coastal zone? (OBB 4)	GEO-CAPE will observe coastal regions at sufficient temporal and spatial scales to resolve near-shore processes, tides, coastal fronts, and eddies, and track carbon pools and pollutants. Two complementary operational modes will be employed: (1) survey mode for evaluation of diurnal to interannual variability of constituents, rate measurements and hazards for estuarine and continental shelf and slope regions with linkages to open-ocean processes at appropriate spatial scales, and (2) targeted, high-frequency sampling for observing episodic events including evaluating the effects of diurnal variability on upper ocean constituents, assessing the rates of biological processes and coastal hazards. *Measurement objectives for both modes include:* (a) Quantify dissolved and particulate carbon pools and related rate measurements such as export production, air-sea CO2 exchange, net community production, respiration, and photochemical oxidation of dissolved organic matter. (b) Quantify phytoplankton properties: biomass, pigments, functional groups (size/taxonomy/Harmful Algal Blooms (HABs)), daily primary productivity using bio-optical models, vertical migration, and chlorophyll fluorescence. (c) Measure the inherent optical properties of coastal ecosystems: absorption and scattering of particles phytoplankton and detritus, CDOM absorption. (d) Estimate upper ocean particle characteristics including particle abundance and particle size distribution. (e) Detect, quantify and track hazards including HABs and petroleum-derived hydrocarbons. GEO-CAPE observations will be integrated with field measurements, models and other satellite data: (1) to derive coastal carbon budgets and determine whether coastal ecosystems are sources or sinks of carbon to the atmosphere, (2) to quantify the responses of coastal ecosystems and biogeochemical cycles to river discharge, land use change, airborne-derived fluxes, hazards and climate change, and (3) to enhance management decisions with improved information on the coastal ocean, such as required for Integrated Ecosystem Assessment (IEA), protection of water quality, and mitigation of harmful algal blooms, oxygen minimum zones, and ocean acidification.	Water-leaving radiances in the near-UV, visible & NIR for separating absorbing & scattering constituents & chlorophyll fluorescence Product uncertainty TBD **Temporal Resolution:** *Targeted Events:* • Threshold: ≤1 hour • Baseline: ≤0.5 hour *Survey Coastal U.S.:* • Threshold: ≤3 hours • Baseline: ≤1 hour *Regions of Special Interest (RSI): Threshold: ≥1 RSI 3 scans/day* • Baseline: multiple RSI 3 scans/day *Other coastal and large inland bodies of water within ocean color FOR:* • Baseline: ≤3 hours **Spatial Resol. (nadir):** • Threshold: ≤375 x 375 m • Baseline: ≤250 x 250 m **Field of Regard for Ocean Color Retrievals:** 60°N to 60°S; 155°W to 35°W **Coastal Coverage*:** width from coast to ocean: • Threshold: min 375 km • Baseline: min 500 km **Scanning Priority:** •Threshold: 1. U.S. Coastal Waters* 3 to 8 times per day 2. Other coastal and large inland bodies of water 3. Open ocean waters within FOR	**Spectral Range:** Hyperspectral UV-VIS-NIR • Threshold: 345-1050 nm; 2 SWIR bands 1245 & 1640 nm • Baseline: 340-1100 nm; 3 SWIR bands 1245, 1640, 2135 nm **•Spectral Sampling & Resolution:** • Threshold: UV-Vis-NIR: ≤2 & ≤5nm; 400-450nm: ≤0.4 & ≤0.8nm (for NO_2 at spatial resolution of 750x750m at nadir); SWIR resolution: ≤20-40 nm • Baseline: UV-ViS-NIR: ≤0.25 & 0.75 nm; SWIR: ≤20-50 nm **Signal-to-Noise Ratio (SNR) at Ltyp(70˚ SZA):** • Threshold: ≥1000 for 10 nm FWHM (350-800 nm); ≥600 for 40 nm FWHM (800-900 nm); ≥300 for 40 nm FWHM (900-1050 nm); ≥250 and ≥180 for 1245 & 1640 nm (20 & 40 nm FWHM); ≥500 NO_2 band. • Baseline: ≥1500 for 10 nm (350-800 nm); NIR, SWIR and NO_2 bands same as threshold; ≥100 for the 2135nm (50nm FWHM) • Threshold: Aggregate SWIR bands to 2x2 GSD pixels to meet SNR; Baseline: No aggregation. **Scanning area per unit time:** Threshold: ≥25,000 km²/min; Baseline: ≥50,000 km²/min **Field of Regard:** • Full disk: 20.8° E-W and 19° N-S imaging capability from nadir for Lunar & Solar Calibrations **Non-saturating detector array(s) at Lmax** **On-board Calibration:** • Lunar: Threshold: minimum monthly; Baseline: same as threshold • Solar: Threshold: none; Baseline: daily **Polarization Sensitivity:** <1.0% **Relative Radiometric Precision:** • Threshold: ≤1% through mission lifetime • Baseline: ≤0.5% through mission lifetime **Mission lifetime:** Threshold: 3 years; Goal: 5 years **Intelligent Payload Module** Baseline only: Near Real-Time satellite data download from other sensors (GOES, etc.) for on-board autonomous decision making. **Pre-launch characterization:** Adequate to achieve the required on-orbit radiometric precision	Geostationary orbit at 95W longitude to permit sub-hourly observations of coastal waters adjacent to the continental U.S., North, Central and South America Storage (up to 1 day) and download of full spatial data and spectral data.	Western hemisphere data sets from models, missions, or field observations **Measurement Requirements** (1) Ozone (2) Total water vapor (3) Surface wind velocity (4) Surface barometric pressure (5) Vicarious calibration & validation - coastal (6) Full prelaunch characterization (7) Cloud cover **Science Requirements** (1) SST (2) SSH (3) PAR (4) UV solar irradiance (5) MLD (6) Air/Sea pCO2 (7) pH (8) Ocean circulation (9) Tidal & other coastal currents (10) Aerosol deposition (11) run-off loading in coastal zone (12) Wet deposition in coastal zone (13) Wave height & surface wind speed **Validation Requirements** Conduct high frequency field measurements and modeling to validate GEO-CAPE retrievals from river mouths to beyond the edge of the continental margin.

Error (as % of nadir pixel)	Threshol	Baselin
Pointing Knowledge LOS	<50%	<10%
Pointing Accuracy LOS	<100%	<25%
Pointing Stability LOS	<50%	<10%
Geolocation Reconstr.	<100%	<10%

GEO-CAPE Science Questions are traceable to NASA's OBB Advanced Planning Document (OBB) and the U.S. Carbon Cycle Science Plan (CCSP).

* Coastal coverage within field-of-view (FOV) includes major estuaries and rivers such as Chesapeake Bay, Lake Pontchartrain/Mississippi River delta and the Laurentian Great Lakes, e.g., the Chesapeake Bay coverage region would span west to east from Washington D.C. to several hundred kilometers offshore (total width of 375 km threshold).

GEO-CAPE Ocean Science Questions

Short-Term Processes

1. How do short-term coastal and open ocean processes interact with and influence larger scale physical, biogeochemical and ecosystem dynamics?

Land-Ocean Exchange

2. How are variations in exchanges across the land-ocean interface related to changes within the watershed, and how do such exchanges influence coastal and open ocean biogeochemistry and ecosystem dynamics?

Impacts of Climate Change & Human Activity

- How are the **productivity and biodiversity of coastal ecosystems** changing, and how do these changes relate to natural and anthropogenic forcing, including local to regional impacts of climate variability?

Impacts of Airborne-Derived Fluxes

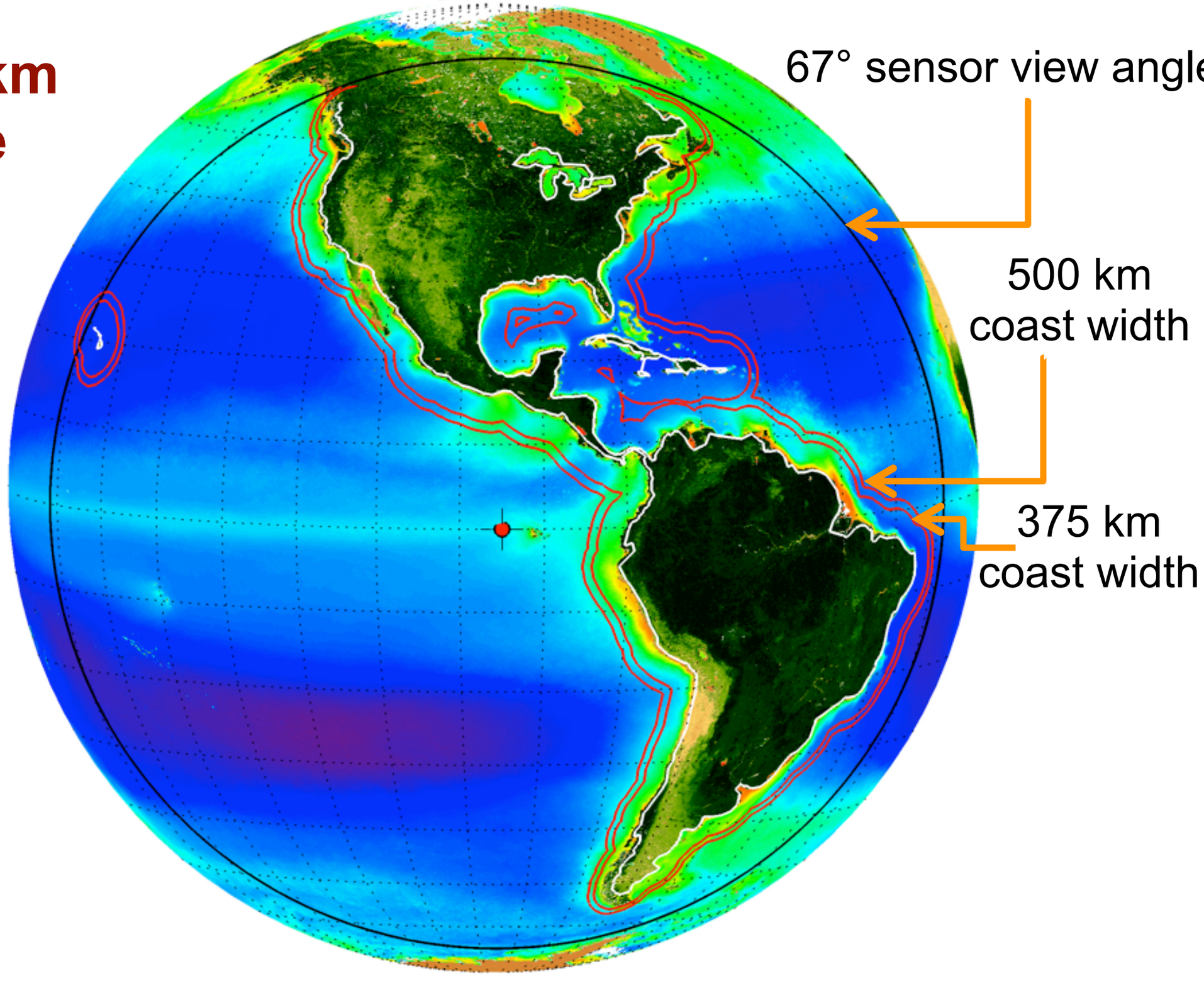
- How do airborne-derived fluxes from precipitation, fog and episodic events such as fires, dust storms & volcanoes significantly affect the ecology and biogeochemistry of coastal and open ocean ecosystems?

Episodic Events & Hazards

- How do episodic hazards, contaminant loadings, and alterations of habitats impact the biology and ecology of the coastal zone?

Geostationary view from 95°W

~36,000 km altitude



• Within AMF ≤ 5, where atmospheric correction is feasible, coverage extends to nearly ~60º latitude in summer and ~50º in winter and from ~30ºW to ~155º W (at equator).

Measurement & Instrument Requirements

	Threshold (minimum)	Baseline (goal)
Temporal Resolution Targeted Events	1 hour	0.5 hour
Survey Coastal U.S.	<3 hours	0.5 hour
Region of Special Interest (RSI)	≥1 RSI at 3 scans/day	multiple RSI
Other Coastal & Inland waters	none	≤3 hours
Spatial Resolution (nadir)	375 m x 375 m	250 m x 250 m
Field of Regard for OC retrievals	~60°N to 60°S; ~155°W to 35°W	same as threshold
Coastal Coverage (coast to ocean)	375 km	500 km
Spectral Range	345-1050 nm; 2 SWIR bands 1245 and 1640 nm	340-1100 nm; 3 SWIR bands 1245, 1640, 2135 nm
Spectral Resolution	**UV-VIS-NIR: ≤5 nm**; 400-450nm: ≤0.4 (NO_2); SWIR: ≤20-40 nm	**UV-VIS-NIR: ≤0.75 nm**; SWIR: ≤20-50 nm
Signal-to-Noise Ratio (SNR) for Ltyp at 70° SZA	**1000:1 for 350-800 nm (10nm FWHM)**; 600:1 for NIR (40nm FWHM); 250:1 & 180:1 for 1245 & 1640 nm (20 & 40nm FWHM); ≥500:1 NO_2	**1500:1 (350-800 nm)**; 100:1 for 2135nm (50nm FWHM); NIR, SWIR and NO_2 same as threshold
Onboard Calibration	Lunar monthly	Lunar monthly; Solar daily
Lifetime Design	3 years	5 years

Ocean Color & Related Products

Mission Critical Products (drive requirements; heritage algorithms)

- Spectral remote sensing reflectances - Rrs
- Chlorophyll-a, Primary Productivity
- Particulate Organic Carbon, Dissolved Organic Carbon, Particulate Inorganic Carbon (coccolithophore blooms)
- Total Suspended Matter
- Absorption coefficients of Colored Dissolved Organic Matter, Particles & Phytoplankton; Particle backscatter coefficient
- Water clarity (k_d[490nm]; euphotic depth)
- Photosynthetically Available Radiation
- Fluorescence Line Height, Phytoplankton Carbon
- Functional/taxonomic group distributions
- Harmful Algal Bloom detection & magnitude
- *Aerosols, NO_2 & other products for atmospheric corrections*

Highly Desirable Products (experimental products)

- Particle size distributions & composition, other plant pigments, phytoplankton physiological properties, vertical migration detection
- Net Community Production, Export Production, Respiration, Photooxidation
- Air Sea CO_2 fluxes, pCO_2(aq)
- Terrigenous Dissolved Organic Carbon
- Petroleum detection and thickness

Approach

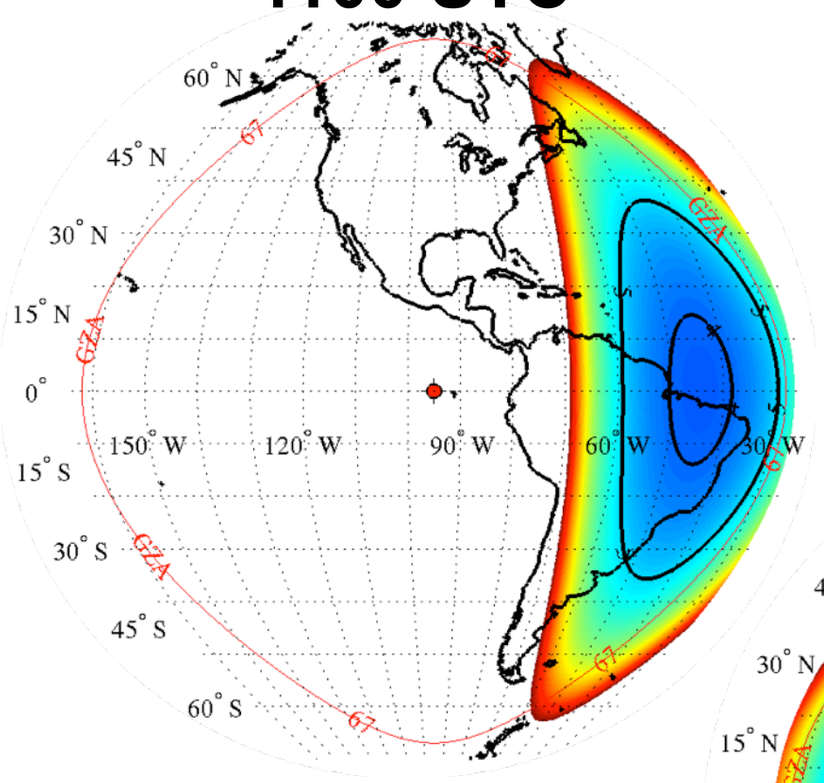
GEO-CAPE will observe coastal regions at sufficient temporal and spatial scales to resolve near-shore processes, tides, coastal fronts, and eddies, and track carbon pools and pollutants.

Two modes of operation:

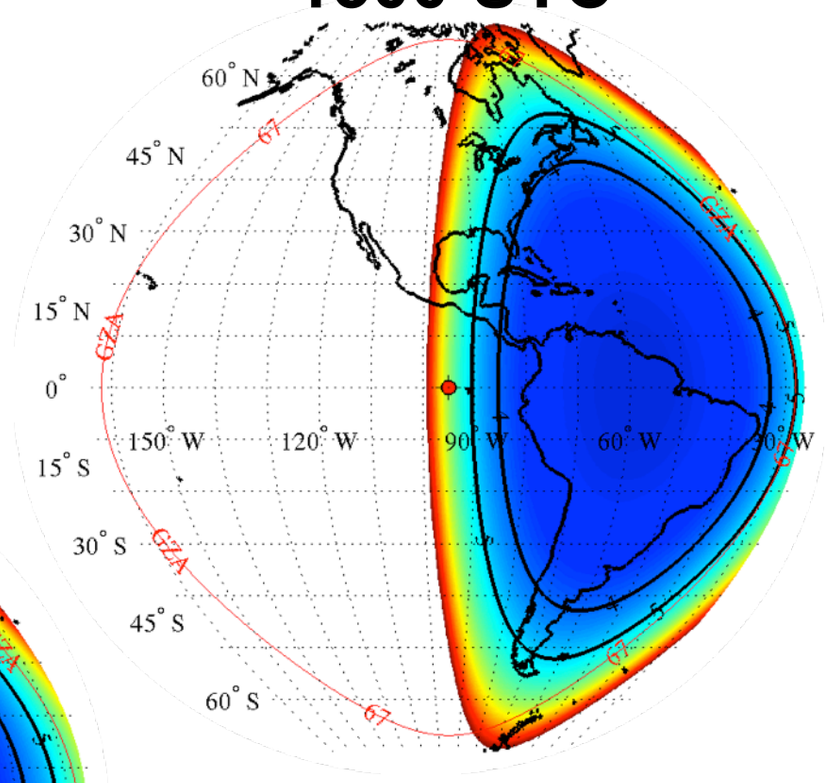
1. **survey mode** for evaluation of diurnal to interannual variability of constituents, rate measurements and hazards ...
    - U.S. coastal waters
    - Regions of special interest
    - All other coastal waters from ~50°N to 50°S
2. **targeted, high-frequency sampling** for observing episodic events (and support for coastal and deep ocean cruises) ...

AMF during early morning & late day

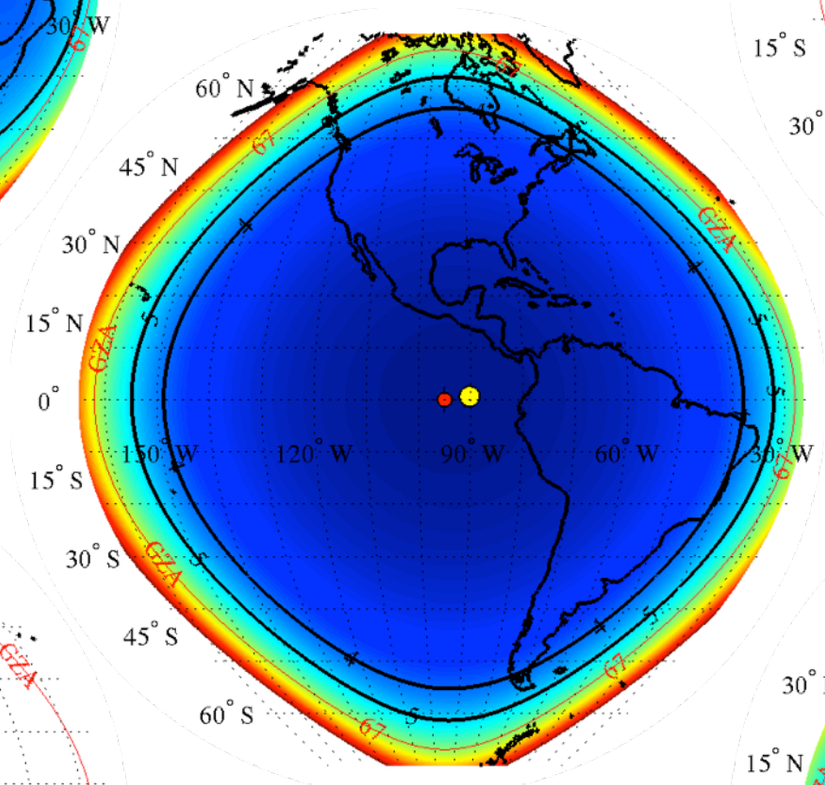
1100 UTC



1300 UTC



1800 UTC



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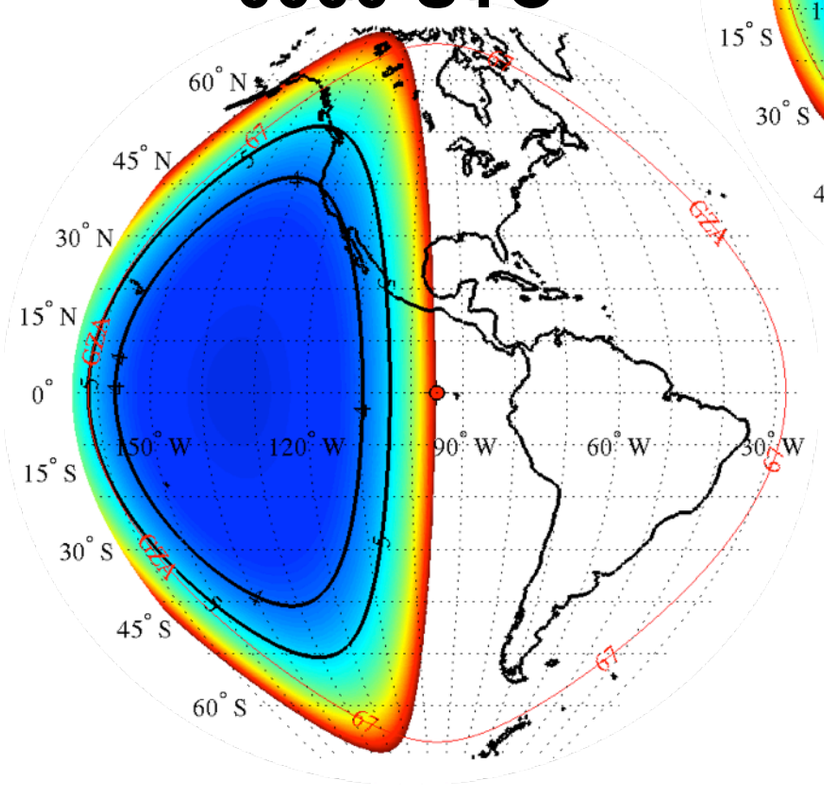
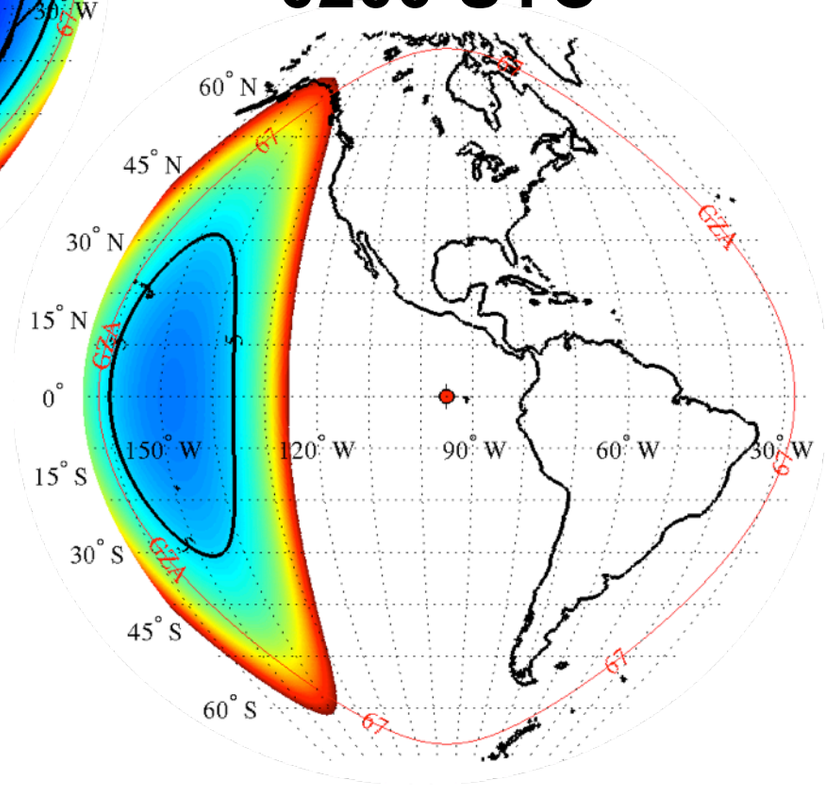
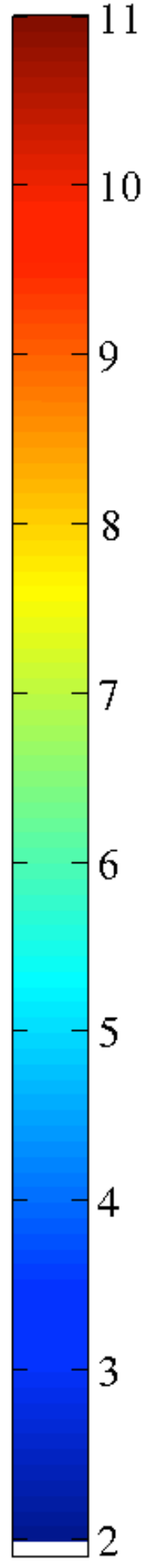


0200 UTC





Scanning Time per Requirements

	Scan Region	Scenes Required	Scan Time Available per Day			Required Scan Time per Region	
			Equinox	June 21	Dec. 21	Threshold	Baseline
U.S. Coastal Waters	U.S. East Coast	5	~9.5 hr ~1230 to 2200 UTC	~10 hr	~7.5 hr	1.25 hr	0.625 hr
	U.S. Gulf of Mexico Coast	4	~10 hr ~1300 to 2300 UTC	~10.5 hr	~9 hr	1 hr	0.5 hr
	Laurentian Great Lakes	4	~9 hr ~1300 to 2200 UTC	~9.5 hr	~5hr	1 hr	0.5 hr
	U.S. West Coast	3	~8.5 hr ~1600 to 0030 UTC	~9.5 hr	~7hr	0.75 hr	0.375 hr
	Total	**16**	**~12 hr**	**~13 hr**	**~10.5 hr**	**4 hr**	**2 hr**

- Threshold scan rate: up to 3 scans/day for U.S. coastal waters
- Baseline scan rate: up to 6 scans/day

- for scene size of ~750 km N to S and ~500 km E to W.
- scan rate: threshold=25,000 km^2 min^{-1}; baseline=50,000 km^2 min^{-1}
- 375 m GSD at nadir - from 95W
- Total scan time daily within AMF<5 for full disk is ~16 hr (1030-0230 UTC).

Recent SWG Activities - Coastal Ecosystems

- Continued to revise measurement & instrument requirements in STM
- Developed applications traceability matrix
    - NOAA, EPA & NAVY requirements documented
    - Input from commercial applications (fishing, etc.)
- White paper describing coastal ocean ecosystem mission science and requirements to be published as NASA TM (June 2013)
    - Presents, describes and justifies STM
    - Science Applications Traceability Matrix
    - general specifications of instrument concepts
    - obtained external reviews
- Currently working on Science Value Matrix

Science Applications Traceability Matrix - example

Agency	Application	Satellite Product	Requirements	Citation	GEO-CAPE Science Focus & Questions	Req. not met by GEO-CAPE Threshold	Req. not met by GEO-CAPE Baseline
EPA	Safe and Sustainable Water Resources Research Program (SSWR)	Chlorophyll a (chl-a); Photosynthetically available radiation (PAR); Diffuse attenuation (PAR); Colored dissolved organic matter (CDOM) absorption; Phytoplankton absorption; Detritus absorption; Primary production; Salinity proxy; Suspended particulate matter; Dissolved organic carbon; Coastal HAB detection , chl-a, cell abundance and species identification; Lake cyanobacterial cell abundance, chl-a and identification; Pathogen detection; Petroleum detection, type and thickness; Effluent detection; Sea surface pCO2; Seagrass extent; Coral reef habitat mapping; UV attenuation; Nutrient proxies	**Spatial (GSD local):** *Estuaries:* ≤250m *Coastal Waters:* ≤500m **Temporal:** *Estuary & Coastal Water Surveys:* ≤3hrs *Events:* ≤0.5 hrs *Event Real Time Data:* ≤0.5 hrs **Coverage (**Width from coast to ocean): *Minimum distance:* 5.5 km (3 nmi) *Maximum distance:* 22 km (12 nmi) **Field of Regard for Retrievals:** 50°N to 14°N; 160°W to 60°W	SSWR 1.1 (Specifies the use of remotely sensed data); SSWR 1.4; SSWR 2.3; SSWR Science Question 3; SSWR 4.2; SSWR Science Question 6; Gulf Coast Ecosystem Restoration Task Force	**Focus:** Short-term Processes; Land-Ocean Exchange; Impacts of Climate Change & Human Activity; Episodic Events & Hazards; **Questions**: 1, 2, 3, & 5	GSD for Estuaries;	None
	Air, Climate, and Energy Research Program (ACE)			ACE Climate Mitigation & Adaptation Project MA-1, MA-2; ACE Research Theme 3; ACE Modeling & Decision Support Tools MDST-3; ACE NAAQS & Multipollutant NMP-8;	**Focus:** Impacts of Climate Change & Human Activity; Impacts of Airborne Derived Fluxes; **Questions**: 3 & 4	Several products require algorithm development: Coastal HAB detection, chl-a, cell abundance & identification; Lake cyanobacterial abundance, chl-a and identification; Pathogen detection; Petroleum detection, type and thickness; Effluent detection; Sea surface pCO2; Seagrass extent; Coral reef habitat mapping; Nutrient proxies	
	Sustainable and Healthy Communities Research Program			SHC Task 2.1.4.2; SHC Task 3.3.1.3; SHC Task 3.3.1.8; SHC Task 3.3.1.11; SHC Project 3.1.4;	**Focus:** Short-term Processes; Land-Ocean Exchange; Impacts of Climate Change & Human Activity; Episodic Events & Hazards; **Questions**: 1, 2, 3, & 5		

Science Value Matrix

GEO-CAPE Products ↓		Spatial Resolution GSD nadir	Temporal Resolution Targeted Events	Temporal Resolution Survey Coastal U.S.	UV radiometry	SWIR bands	Hyperspectral	Spectral Sampling/Resolution	Spectral Sampling/Resolution for NO2	Coastal Coverage (500 km)	SNR 400-800 nm 10nm FWHM	SNR for 350-400 nm 10nm FWHM	Rrs uncertainty (UV to 412 nm: 0.0006 sr^{-1}; green bands (~555 nm): 0.0002 sr^{-1}; red bands (~670 nm): 0.00005 sr^{-1})
	BASELINE	250 m	≤ 0.5 hour	≤ 1 hour	340-400 nm	1245 & 1640 nm	340-1100 nm	≤ 0.25 / ≤ 0.75 nm	≤ 0.25 / ≤ 0.75 nm	≥ 500 km	≥ 1500	≥ 1500	
	THRESHOLD	375 m	≤ 1 hour	≤ 3 hour	345-400 nm	1245, 1640, & 2135 nm	345-1050 nm	≤ 2 / ≤ 5 nm	≤ 0.4 / ≤ 0.8 nm	≥ 375 km	≥ 1000	≥ 1000	
Chlorophyll-a	BASELINE												
	THRESHOLD												
Diffuse Attenuation Coefficient	BASELINE												
	THRESHOLD												
$a_{CDOM}(\lambda)$	BASELINE												
	THRESHOLD												
$a_t(\lambda)$	BASELINE												
	THRESHOLD												
$b_{bp}(\lambda)$	BASELINE												
	THRESHOLD												
$a_{ph}(\lambda)$	BASELINE												
	THRESHOLD												

GEO-CAPE Science Questions ↓	Chlorophyll-*a*	Diffuse Attenuation Coefficient	$a_{CDOM}(\lambda)$	$a_t(\lambda)$	$b_{bp}(\lambda)$	$a_{ph}(\lambda)$	$a_{nap}(\lambda)$	Euphotic Depth
How do short-term coastal and open ocean processes interact with and influence larger scale physical, biogeochemical and ecosystem dynamics?								
How are variations in exchanges across the land-ocean interface related to changes within the watershed, and how do such exchanges influence coastal and open ocean biogeochemistry and ecosystem dynamics?								
How are the productivity and biodiversity of coastal ecosystems changing, and how do these changes relate to natural and anthropogenic forcing, including local to regional impacts of climate variability?								
How do airborne-derived fluxes from precipitation, fog and episodic events such as fires, dust storms & volcanoes affect the ecology and biogeochemistry of coastal and open ocean ecosystems?								
How do episodic hazards, contaminant loadings, and alterations of habitats impact the biology and ecology of the coastal zone?								

GEO-CAPE Science Questions ↓		Spatial Resolution GSD nadir	Temporal Resolution Targeted Events	Temporal Resolution Survey Coastal U.S.	UV radiometry	SWIR bands	Hyperspectral	Spectral Sampling/Resolution	Spectral Sampling/Resolution for NO2	Coastal Coverage (500 km)	SNR 400-800 nm 10nm FWHM	SNR for 350-400 nm 10nm FWHM	Rrs uncertainty (UV to 412 nm: 0.0006 sr^{-1}; green bands (~555 nm): 0.0002 sr^{-1}; red bands (~670 nm): 0.00005 sr^{-1})
	BASELINE	250 m	≤ 0.5 hour	≤ 1 hour	340-400 nm	1245 & 1640 nm	340-1100 nm	≤ 0.25 / ≤ 0.75 nm	≤ 0.25 / ≤ 0.75 nm	≥ 500 km	≥ 1500	≥ 1500	
	THRESHOLD	375 m	≤ 1 hour	≤ 3 hour	345-400 nm	1245, 1640, & 2135 nm	345-1050 nm	≤ 2 / ≤ 5 nm	≤ 0.4 / ≤ 0.8 nm	≥ 375 km	≥ 1000	≥ 1000	
How do short-term coastal and open ocean processes interact with and influence larger scale physical, biogeochemical and ecosystem dynamics?	BASELINE												
	THRESHOLD												
How are variations in exchanges across the land-ocean interface related to changes within the watershed, and how do such exchanges influence coastal and open ocean biogeochemistry and ecosystem dynamics?	BASELINE												
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How are the productivity and biodiversity of coastal ecosystems changing, and how do these changes relate to natural and anthropogenic forcing, including local to regional impacts of climate variability?	BASELINE												
	THRESHOLD												
How do airborne-derived fluxes from precipitation, fog and episodic events such as fires, dust storms & volcanoes affect the	BASELINE												

Recent Major Science Activities

- Chesapeake Bay field campaign in July 2011 (CBODAQ)
  - 10-days of aquatic and atmospheric sampling and measurements from a small research vessel
  - coordinated with DISCOVER-AQ
  - Data submitted to SeaBASS (NASA database) for community access and application to GEO-CAPE science
- Planning field campaign in northern Gulf of Mexico for September 2013
  - in coordination with DISCOVER-AQ
  - more details later
- Various science studies supported in FY11-13
  - FY13 studies include analysis of CBODAQ data

Synthesis of Science Study Recommendations on Requirements

- **Temporal resolution:** <3 hour frequency needed;
  <1-2 hour desirable
- **Spatial resolution:** <500 x 500m (local) needed;
  250 x 250m desirable
- If uncorrected, atmospheric variability (aerosols, NO_2, O_3, etc.) will lead to a false estimate of time-dependent underwater processes in coastal areas.
  - **Spectral resolution** of 0.8 nm (spectral sampling of 0.4 nm) would be required, at least in the 400-450 nm spectral range, for NO_2 correction.
  - Retrieval of aerosol properties (SSA and aerosol layer height) critical for nLw retrievals.
    - Detection (& correction) of absorbing aerosols necessary
- Strong need for in situ data sets with high temporal resolution (15-30 min) & spectral resolution (2-5nm) and range (up to 750nm); above water Rrs to 1670nm.

Recent Engineering Activities

- Supported FY11 Line-of-Sight (LOS) Pointing study
- Summer 2011 obtained input from Ball, Raytheon, JPL & GSFC on instrument concept specifications to aid SWG in establishing requirements
- IIP-funded Ball multi-slit offner (2011-2014)
- Astrium presentation to Ocean SWG in Oct. 2012 on Hosted Ocean Color Imager (HOCI)
- Recommended and supporting FY13 Pointing LOS study on ocean color requirements - can we meet GSD pointing stability?
- Supported TRL assessment activities

Recent Activities - International

- Discussions on collaboration with KIOST on Ocean Color
  - Participation in GOCI and GOCI-II PI meeting - Jan. 2012
    - Presentation on GEO-CAPE mission
    - Discussions on potential KIOST-NASA collaborations
  - Meeting at Goddard between KOSC and GSFC-OBPG Aug. 2012
    - Collaboration between KOSC and OBPG moving forward for data mirror site & SeaDAS processing of GOCI data
      - NASA USPI proposal selected to support collaboration
- Promote further dialogue with international community in 2013
  - Splinter session on geo ocean color & presentation on GEO-CAPE at International Ocean Color Science Meeting (May 2013)
  - International Geo meeting on Thursday initiated from dialogue with Dr. Ahn (KIOST)
  - Contacted space agency personnel & scientists from North & South America, Europe and India
    - strong interest but only Korean & European representation

GEO-CAPE Publications

- Hu, C., L. Feng, Z. Lee, C.O. Davis, A. Mannino, C.R. McClain and B.A. Franz. 2012. Dynamic range and sensitivity requirements of satellite ocean color sensors: learning from the past. Applied Optics, 51(25), 6045-6062.
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- Hu, C., L. Feng, and Z. Lee (2013). Uncertainties of SeaWiFS and MODIS remote sensing reflectance: Implications from clear water measurements. Remote Sens. Environ., 133:168-182.
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Recent Presentations on GEO-CAPE

- NASA Carbon Cycle & Ecosystem Science Meeting - Nov. 2011
- AGU 2012 Dec. 2012
- GOCI-II Workshop, Ansan, Korea - Jan. 2012
- NASA OCRT Meeting - April 2012
- 44th International Liege Consortium, Liege, Belgium - May, 2012
- International Ocean Color Science Meeting - May 2013

Future Plans

- Activities to promote mission launch by 2022
- Expand dialogue with international community
  - Continue collaboration with KIOST on GOCI and discuss plans for GOCI-II collaboration
  - Discussions with Europeans on geo OC plans
  - personnel in South America and North America
- Plans for vicarious calibration and validation
- Address issues such as:
  - atmospheric correction above AMF=4 and high SZA
  - BRDF
  - detection and correction for absorbing aerosols
  - retrievals of ocean reflectances in the UV
- Continue refining STM based on science & engineering study results annually
- Recommend engineering studies to affirm that existing technology can meet the requirements

Proposed Joint Field Campaign with KIOST

- Ocean field study off Korean coast leveraging GOCI observations and Korean collaboration in spring/summer 2014
  - *2-week field experiment within Sea of Japan and East China Sea to collect and analyze high temporal, spatial, spectral measurements of ocean optics, biology and biogeochemistry and atmospheric properties necessary to address GEO-CAPE coastal ecosystem requirements.*
    - Shared science and technical goals between the GEO-CAPE and GOCI science teams provides tremendous leverage in terms of $ and expertise.
    - GOCI is the only ocean color satellite sensor presently operating, providing first-hand, in-situ and satellite matching datasets.
    - Hourly observations at 500m local GSD
    - Highly dynamic processes in the Sea of Japan and East China Sea (tidal, fresh water flux, productivity, eddies) enable research focused on all five GEO-CAPE science questions.
- FY14 overguide funds requested at Nov. 2012 HQ Review
- Funds to cover ship-based water & atmospheric measurements and data analysis
- Koreans would contribute half the ship time as well as field measurements and analysis.