



Science Focus	Science Questions	Approach	Measurement Requirements	Instrument Requirements	Platform Requirement.	Ancillary Data Requirement.
<p><b>Short-Term Processes</b></p>	<p><b>1</b> How do short-term coastal and open ocean processes interact with and influence larger scale physical, biogeochemical and ecosystem dynamics? (OBB1)</p>	<p><b>PRODUCTS</b>  <i>Standing Stocks:</i> Aquatic chlorophyll a, POC, DOC, PIC, DIC*, inherent &amp; apparent optical properties, total suspended matter, phytoplankton biomass*, pigments* and key functional groups, terrigenous DOC*, &amp; black carbon*.  <i>Rate Measurements:</i> Aquatic primary productivity, respiration*, air-sea CO2 fluxes*, photooxidation, phytoplankton fluorescence responses*, phytoplankton vertical migration*, net community production of DOC* and POC*, and other associated trophic responses*  <i>Hazards:</i> Aquatic HABs, petroleum-derived hydrocarbons, and other pollutants*.            *Products not currently derived from ocean color observations.</p>	<p>Water-leaving radiances in the near-UV, visible &amp; NIR for separating absorbing &amp; scattering constituents &amp; chlorophyll fluorescence            Product uncertainty TBD</p>	<p><b>Spectral Range:</b>            Hyperspectral UV-VIS-NIR            • Threshold: 345-900 nm; 3 SWIR bands 1245, 1640, 2135 nm            • Goal: 340-1100 nm; 3 SWIR bands 1245, 1640, 2135 nm  <b>Spectral Resolution:</b>            • Threshold: UV-VIS: 0.5 nm FWHM; NIR: 1 nm; SWIR: 20-50 nm            • Goal: UV-VIS: 0.25 nm FWHM; NIR: 0.5 nm; SWIR: 20-50 nm - Retrieval of NO<sub>2</sub> and O<sub>2</sub> A-band for atm. corrections? (TBD)</p>	<p>Geostationary orbit to permit sub-hourly observations of coastal waters adjacent to the continental U.S., Central and South America</p>	<p>Western hemisphere data sets from models, missions, or field observations:  <b>Measurement Requirements</b>            (1) Ozone            (2) Total water vapor            (3) Surface wind velocity            (4) Surface barometric pressure            (5) NO<sub>2</sub> concentration            (6) Vicarious calibration &amp; validation - coastal            (7) Full prelaunch characterization</p>
<p><b>Land-Ocean Exchange</b></p>	<p><b>2</b> 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? ‡ (OBB1 &amp; 2)</p>	<p>Targeted, high-frequency, episodic event-based monitoring and evaluation of tidal and diurnal variability of Standing Stocks, Rate Measurements and Hazards from river mouths to the coastal ocean (and lakes).</p>	<p><b>Temporal Resolution:</b>  <i>Targeted Events:</i>            • Threshold: 1 hour            • Goal: 0.5 hour  <i>Routine Coastal U.S.:</i>            • Threshold: ≤3 hours            • Goal: 0.5 hour  <i>Regions of Special Interest (RSI):</i> Threshold: 1 RSI 3 scans/day            • Goal: multiple RSI 3 scans/day  <i>Other Coastal N. &amp; S. America 50°N to 45°S:</i>            • Threshold: 4 times/yr            • Goal: ≤3 hours</p>	<p><b>Signal-to-Noise Ratio (SNR):</b>            • Threshold: 1000:1 for 10 nm FWHM (380-800 nm); 600:1 for 40 nm FWHM in NIR; 300:1 to 100:1 for SWIR bands (20-50nm FWHM)            • Goal: 1500:1 for 10 nm (380-800 nm); 600:1 for 40 nm FWHM in NIR; 300:1 to 200:1 for SWIR bands (20-50nm FWHM); 400:1 NO<sub>2</sub> band (TBD)</p> <p>see Measurement Requirements for Temporal &amp; Spatial Resolutions and Field of View.</p>	<p>Storage and download of full spatial data and spectral data.</p>	<p>Science Requirements            (1) SST            (2) SSH            (3) PAR            (4) UV            (5) MLD            (6) CO<sub>2</sub>            (7) pH            (8) Ocean circulation            (9) Tidal &amp; other coastal currents            (10) Aerosol &amp; dust deposition            (11) run-off loading in coastal zone            (12) Wet deposition in coastal zone</p>
<p><b>Impacts of Climate Change &amp; Human Activity</b></p>	<p><b>3</b> How do natural and anthropogenic changes including climate-related forcing impact coastal ecosystem biodiversity and productivity? ‡ (OBB1, 2 &amp; 3)</p>	<p>Routine sampling of seasonal and interannual variations in the Standing Stocks, Rate Measurements and Hazards for estuarine and continental shelf regions with linkages to open-ocean processes at appropriate spatial scales.</p>	<p><b>Spatial Resol. (nadir):</b>            • Threshold: 375 x 375 m            • Goal: 250 x 250 m</p>	<p><b>Field of Regard:</b>            • ±9° N to S &amp; E to W imaging capability from nadir for Lunar &amp; Solar Cals.</p>	<p>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.</p>	<p>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.</p>
<p><b>SYNERGY Impacts of Airborne-Derived Fluxes</b></p>	<p><b>4</b> How do airborne-derived fluxes from precipitation, fog and episodic events such as fires, dust storms &amp; volcanoes significantly affect the ecology and biogeochemistry of coastal and open ocean ecosystems? (OBB1 &amp; 2)</p>	<p>Observe coastal region at sufficient spatial scales to resolve near-shore processes, coastal fronts, eddies, and track carbon pools and pollutants.</p> <p>Integrate GEO-CAPE observations 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.</p>	<p><b>Field of Regard for Ocean Color Retrievals:</b>            50°N to 45°S;            162.5°W to 32.5°W</p> <p><b>Coastal Coverage:</b>            width from coast to ocean:            • Threshold: 375 km            • Goal: 500 km</p>	<p><b>Jitter</b>            • Threshold: &lt;25% pixel size during single exposure            • Goal: TBD</p> <p><b>Non-saturating detector array(s) at Lmax</b></p> <p><b>On-board Calibration:</b>            • Monthly Lunar Calibration at ≤7° phase angle            • Weekly to Bi-weekly Solar Calibration (TBD)</p> <p><b>Polarization:</b> &lt;0.5%</p> <p><b>Relative Radiometric Precision:</b>            • Threshold: 1% through mission lifetime            • Goal: 0.5% through mission lifetime</p> <p><b>Mission lifetime:</b> Threshold: 3 years; Goal: 5 years</p>	<p>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.</p>	<p>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.</p>
<p><b>Episodic Events &amp; Hazards</b></p>	<p><b>5</b> How do episodic hazards, contaminant loadings, and alterations of habitats impact the biology and ecology of the coastal zone? (OBB4)</p>	<p>3. To estimate fishery yields, extent of oxygen minimum zones, and ecosystem health (including ocean acidification).</p>	<p><b>Intelligent Payload Module:</b> Near Real-Time satellite data download from other sensors (GOES, etc.) for on-board autonomous decision making: (TBD)            • To bypass scanning mostly cloudy scenes; Targeting events (e.g., HABs)</p> <p><b>Pre-launch characterization:</b> to achieve radiometric precision above on orbit</p> <p><b>Solar Zenith Angle Sensitivity:</b> Threshold: ±70°; Goal: ±75°</p>	<p><b>Intelligent Payload Module:</b> Near Real-Time satellite data download from other sensors (GOES, etc.) for on-board autonomous decision making: (TBD)            • To bypass scanning mostly cloudy scenes; Targeting events (e.g., HABs)</p>	<p>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.</p>	<p>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.</p>

‡ Climate change-related science questions

GEO-CAPE Science Questions are traceable to NASA's OBB Advanced Planning Document ....

\* Coverage area within field-of-view (FOV) includes major estuaries and rivers such as Chesapeake Bay & Lake Pontchartrain/Mississippi River delta, 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).