

Optical Variability Linked to Physical Forcing in the Northern Gulf of Mexico Using Satellite, Shipboard, and CODAR Observations

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We describe the bio-optical variability in coastal and offshore waters in the northern Gulf of Mexico, from the Mississippi River eastward to Apalachicola, Florida, using satellite and shipboard measurements. Measurements include vertical profiles of temperature, salinity, beam attenuation and absorption coefficients, as well as surface measurements of total suspended sediment concentration and particle size distribution. We partition the absorption coefficient into dissolved and particulate components and the scattering coefficient into organic and inorganic components. In the coastal waters of Mississippi Sound, the horizontal and vertical optical patterns are highly variable and are tightly coupled to the physical forcing from winds, currents, and tides. Sediment resuspension events are observed in the optical profiles and are driven by surface forcing in some cases and by bottom currents in others. In the CODAR current fields, a tidal convergence front develops daily and persists for 6-8 hours near the barrier islands during ebb tide when winds are from the south. Offshore, we use SeaWiFS and MODIS satellite imagery to delineate the large-scale ocean color variability. Time series of chlorophyll concentration, absorption, and backscattering coefficients derived from the satellite imagery provide a broad context to interpret the surface optical variability. Intrusions of the Loop Current onto the shelf advect filaments of coastal water offshore and eastward toward the Florida panhandle. By coupling the forcing mechanisms and the distribution patterns of the bio-optical parameters through shipboard measurements and remote sensing, we gain a better understanding of the dominant physical processes in this area.