# 105. Linking carbon exchange between coastal wetland and shelf environments


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**ABSTRACT.** The focus of this project is to optimize algorithms that integrate optical and chemical data of dissolved organic matter (DOM) based on proxies of predicted flux from marshes to coastal waters through estuaries. Many studies of DOM in coastal waters have documented focus on rivers, where is discharge ca. 0.25 Pg C $y^{-1}$; however, coastal wetlands (including marshes) are important sources of DOM and CDOM, both of which originate as 'blue carbon' – carbon derived from primary production in vegetated coastal wetlands. The position of these wetlands in the global landscape represents a key interface between terrestrial and marine ecosystems.

The proposed study will investigate two estuarine complexes in the Gulf of Mexico (Apalachicola and Barataria Bays) for the quality and quantity of exported DOM and relationships between optical parameters and geochemical properties. DOM absorbance and fluorescence will be correlated to water leaving radiances and synoptic observations of ocean color. Further, these optical properties will be related to isotopic measurements and organic biomarkers representative of terrestrial and marine endmembers.


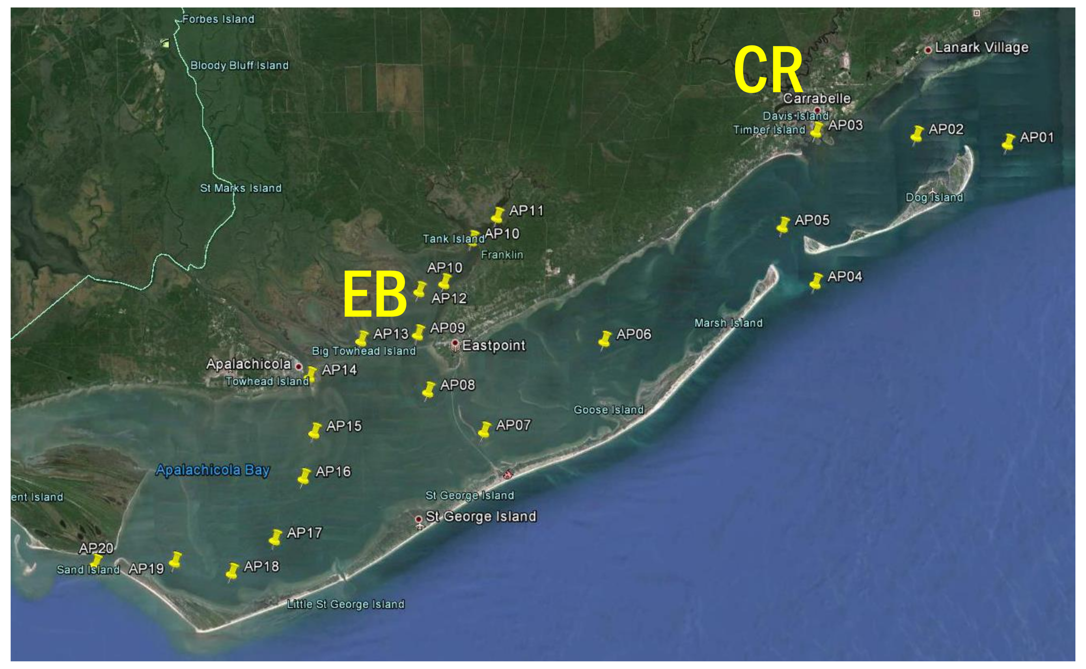


**FIGURE 1.** Apalachicola Bay sampling stations. Stations were located across the bay to capture riverine and marsh outflow into the bay.

## Measurements and Methods:

- Temperature, salinity, pH, dissolved oxygen
- **In water optics and surface reflectances** were sampled at near-surface (S) depths in 2015
- **CDOM light absorption (a)** quantifies CDOM while **slope ratio ($S_R$)** relates to molecular size[1].
- **CDOM fluorescence** excitation-emission matrices (EEMs) modeled by parallel factor analysis (EEM-PARAFAC)[2].
- **Dissolved organic carbon (DOC) concentration** is a measure of carbon quantity; **$SUVA_{254}$** is an index of aromaticity[3]; **Carbon stable isotope values ($\delta^{13}C$)** partition terrestrial vs. aquatic sources of DOM
- **Underway** CDOM fluorescence, Chlorophyll fluorescence, pCO2

## Results: Connecting DOM optics and chemistry

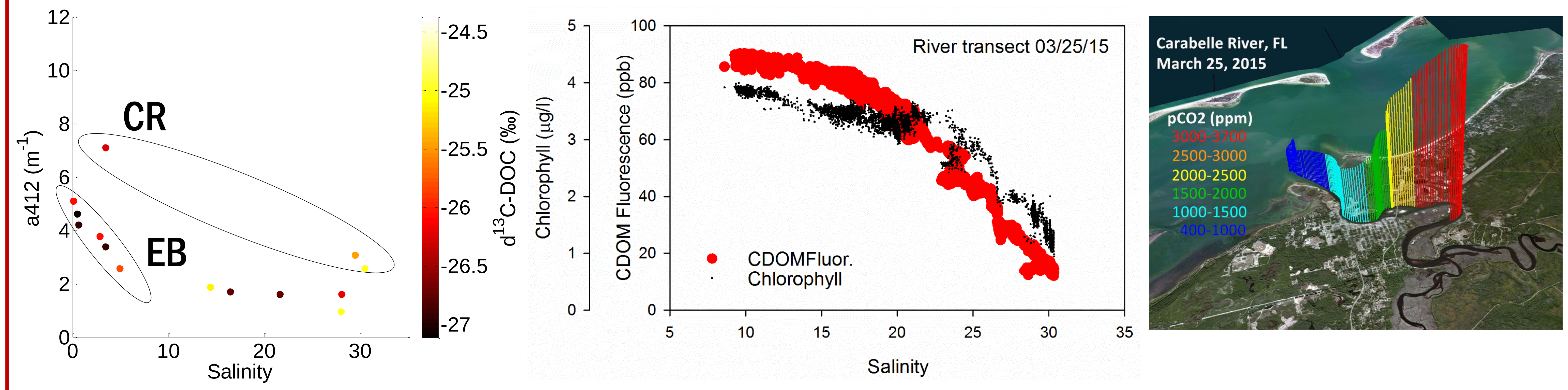


**FIGURE 2.** Measurements of (A) CDOM absorption at 412 nm vs salinity as a function of $d^{13}$C-DOC value; (B) underway CDOM and Chlorophyll fluorescence across the Carabelle River plume into the bay; (C) $CO_2$ concentrations along the Carabelle River plume into the bay.

## Discussion.

Preliminary results from Apalachicola Bay show distinct differences in the optical and biogeochemical properties of DOM within the bay. Two sources of terrestrial DOM are apparent in the bay (Fig. 2A, indicated by ovals), we initially attribute to the Carabelle River (CR) and marsh production in the East Bay (EB). These sources produce nonlinear trends of CDOM and Chlorophyll fluorescence with salinity (Fig. 2B). The Carabelle River demonstrated high $CO_2$ concentrations (ca. 3700 to 320 ppm) along the river to marine continuum, respectively, with systematic changes in the optical properties of DOM (Fig. 2C). Wind driven mixing likely influences the property vs salinity distributions across the bay proper (Fig. 2A). The cumulative results of these field measurements and remote sensing efforts will potentially help constrain carbon cycling dynamics across coastal regimes.


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## Continuing work:

- **Regional and temporal differences** in DOM quality will be investigated by incorporating dissolved lignin analyses and subsequent samplings of Barataria Bay and Apalachicola Bay (Bianchi)
- **EEM-PARAFAC** modeling will provide context for elucidating river vs wetland DOM sources (Osburn)
- **MODIS and Landsat-8** information will be used for algorithm development (D'Sa)

**References:**


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