**Study Objectives**

- Develop an empirical surface ocean pCO₂ algorithm based on physical and biological proxy parameters (SST, SSS, ML-D, Chl-a, CDOM, POC).
- Construct maps of pCO₂ and sea-air CO₂ flux for the MAB.
- Analyze the physical biogeochemical interactions that control phytoplankton blooms and how they affect the uptake of atmospheric CO₂.
- Analyze the effects of the solubility and biological pumps on the surface-ocean pCO₂ variability.

**Data Sources and Methodology**

- MODISA (SST, Chl-a, POC, CDOM) and SeaWiFS (Chl-a, POC, CDOM) products.
- 3D Ocean model products (SST, SSS, ML-D) and NCEP-2 Reanalysis data.
- In situ carbon data from available sources (underway pCO₂ and station data).
- Multiple regression of observed pCO₂ vs. proxy in situ parameters.
- Algorithm application using satellite-based and numerical model products.

**Algorithm Development and Application Strategy**

- Use satellite ocean color imagery to expand algorithm development data base (e.g., Chl-a matchups).
- Derivation of surface water CO₂ equations as a function of proxy physical and biological variables using multiple regression approach (for example, Chierici et al., 2009, Chierici et al., 2011, Olsen et al., 2004).
- Algorithmic development: a first attempt using in situ GOMECO CO₂, SST and Chl-a resulted in the following expression for July:

  \[ a \text{CO}_2 = b + c \text{Chl-a} + d \text{SST} + e \text{SST}^2 + f \text{Chl-a} \times g \text{SST}^2 \]

- pCO₂ was above 2000 ppm during the cold phase of the SST cycle when vertical mixing increased and contributed to the drawdown of CO₂.

**Available Carbon Data Sets**

- Gulf of Mexico and East Coast Carbon Cruise (GOMECO) Data:
  - Cruise onboard R/V Ronald H. Brown, RB-07-05, 10 July to 8 August 2007: Galveston, TX to Boston, MA.
  - Project in support of the NACP with multi-institutional collaboration: NOAA, ESRL, FERSAAM, USF, UNH, Texas-AM, U. Georgia, Colorado, U. Southern Miss., Loyola College MD, and LDEO.
  - Underway measurements of CO₂, pH, DIC, DOC, SST, SSS, Chl-a, CDOM.
  - CTD and Bottle dataset: T, O₂, Nutrients, DIC, TA, DOC, pH, Pigments.

**REFERENCES**


