Discrete CO2-System Measurements in the Chesapeake Bay Mainstem between 2016 and 2018

Website: https://www.bco-dmo.org/dataset/890864
Data Type: Other Field Results
Version: 1
Version Date: 2023-03-01

Project
» Collaborative Research: Multiple Stressors in the Estuarine Environment: What drives changes in the Carbon Dioxide system? (Estuarine Stressors)

Contributors	Affiliation	Role
Friedrichs, Marjorie A.M.	Virginia Institute of Marine Science (VIMS)	Principal Investigator, Contact
Shadwick, Elizabeth	Virginia Institute of Marine Science (VIMS)	Principal Investigator
De Meo, Olivia	Virginia Institute of Marine Science (VIMS)	Co-Principal Investigator
Friedman, Jaclyn R.	Virginia Institute of Marine Science (VIMS)	Co-Principal Investigator
Soenen, Karen	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
These are discrete observations of total dissolved inorganic carbon (DIC) and alkalinity (TA), and associated computed CO2-system parameters, from samples collected throughout the Chesapeake Bay mainstem between 2016 and 2018. Samples were collected on board the R/V Kerhin in Maryland and the R/V Fay Slover in Virginia at a subset of fixed stations in collaboration with the Chesapeake Bay Water Quality Monitoring Program. Samples were analyzed following standard procedures at the Virginia Institute of Marine Science. The DIC and TA data were then used to compute the remaining CO2-system parameters (pH, CO2 partial pressure (pCO2), and carbonate saturation state). A detailed description of sample collection and analytical methods is given Friedman et al., 2019.

Table of Contents

Coverage

Spatial Extent: **N**:39.5479 **E**:-75.7913 **S**:36.9474 **W**:-76.5022
Temporal Extent: 2016-06-06 - 2018-06-28

[table of contents | back to top]

Related Publications

Friedman, J. R., Shadwick, E. H., Friedrichs, M. A. M., Najjar, R. G., De Meo, O. A., Da, F., & Smith, J. L. (2020). Seasonal Variability of the CO 2 System in a Large Coastal Plain Estuary. Journal of Geophysical Research: Oceans, 125(1). Portico. https://doi.org/10.1029/2019jc015609 https://doi.org/10.1029/2019JC015609
Results

[table of contents | back to top]

Related Datasets

IsRelatedTo

Shadwick, E. A., De Meo, O. A., & Friedman, J. R. (2019). *Discrete CO2-System Measurements in the Chesapeake Bay Mainstem between 2016 and 2018* [Data set]. Virginia Institute of Marine Science, William & Mary. https://doi.org/10.25773/RNTN-EZ18 https://doi.org/10.25773/rntn-ez18

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Project Information

Collaborative Research: Multiple Stressors in the Estuarine Environment: What drives changes in the Carbon Dioxide system? (Estuarine Stressors)

NSF Award Abstract:

Understanding the vulnerability of estuarine ecosystems to anthropogenic impacts requires a quantitative assessment of the dynamic drivers of change to the estuarine carbonate system. Estuaries are currently experiencing multiple environmental stressors that have significant impacts on their carbonate chemistry, making this assessment a major challenge. Although the effects of changes in nutrient run-off (i.e. eutrophication and hypoxia) have been long-studied in many estuaries, much less attention has been given to the impacts of global change on these systems. In this study, a team of field scientists and modelers will attempt to distinguish natural interannual variability in a major US estuary from the impacts of local anthropogenic changes (e.g., nutrient inputs, changing freshwater end member characteristics) and global change (increases in atmospheric temperature, atmospheric carbon dioxide, and sea level), by using numerical models calibrated with CO2-system observations at appropriate spatial and temporal scales. If successful, this will be the first study to quantitatively distinguish between local and global anthropogenic impacts on the CO2 system in an estuary. The results are expected to have important implications for management of Chesapeake Bay because the impact of local anthropogenic stressors on the system, once isolated, may be mitigated by appropriate environmental policy implemented at the regional scale. Two of the PIs have a strong history of proven relationships with Chesapeake Bay managers and policy makers, which will insure direct infusion of these scientific results into ongoing management decisions.

In this project researchers will study the diurnal, seasonal, and interannual variability of the CO2 system in the Chesapeake Bay, a non-pristine estuary, using a combination of conventional shipboard sampling (of dissolved inorganic carbon, and alkalinity) and new high-frequency autonomous instrumentation (for observations of pH and CO2 partial pressure) to assess the impact of extreme events, like tropical storms and nor?easters on carbonate chemistry. These high-quality observations will afford a rigorous assessment of the uncertainty associated with a 30-year water-quality monitoring time series of pH and alkalinity. The team will use an estuarine-carbon-biogeochemical model evaluated and calibrated with the new and long-term observations. Sensitivity experiments will be applied to disentangle multiple impacts on the CO2 system in the estuary over the last 30 years, including increased atmospheric temperature and CO2, sea-level rise, eutrophication due to increases in nutrient run-off, and changing carbonate characteristics of riverine end-members.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1537013
NSF Division of Ocean Sciences (NSF OCE)	OCE-1536996

[table of contents | back to top]