

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: 2025-04-01

Project

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

Contributors	Affiliation	Role
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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.

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Coverage

Spatial Extent: N:39.5479 E:-75.7913 S:36.9474 W:-76.5022

Temporal Extent: 2016-06-06 - 2018-06-28

Dataset Description

* Dataset is copy from dataset in related publications. Dataset was not validated by submitter. Outstanding questions can be found in BCO-DMO processing section.

BCO-DMO Processing Description

- * merged all data files into 1 file
- * Unclear if date/time is in UTC timezone or local time
- * Methodology not provided by submitter
- * Parameter descriptions not provided by submitter

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Data Files

File
890864_v1_discretco2.csv (Comma Separated Values (.csv), 1.03 MB) MD5:50def68b6cdc0db6687d89c980258ad5
Primary data file for dataset ID 890864, version 1

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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 CO₂ 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

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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>

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Parameters

Parameters for this dataset have not yet been identified

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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.

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Funding

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

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