A compilation of newly measured as well as compiled d13C and d18O of carbonates for various types of samples

Website: https://www.bco-dmo.org/dataset/960397
Data Type: Cruise Results, Other Field Results
Version: 1
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Project
» OCE-PRF: Towards Quantifying Calcium Carbonate Sediment Dissolution During Marine Diagenesis (Marine CaCO3 and ocean chemistry)

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Abstract

This dataset contains a compilation of newly measured as well as compiled d13C and d18O of carbonates for various types of samples including bulk Oceanic Flux Program (OFP) sediment trap samples, fish carbonates, blue particles, picked foraminifera from the OFP traps, picked pteropods from the OFP traps, coccolithophores from culturing experiments, bryozoan and serpulid attached to sargassum seaweed, and red algae.

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Coverage

Spatial Extent: **N**:31.9167 **E**:-64.0833 **S**:24.8307 **W**:-76.3272

Methods & Sampling

Samples were either measured or compiled in the literature (references are provided in the dataset). Newly measured data were collected using either an IRMS or a Picarro. All sample analyses were calibrated with respect to VPDB via contiguous measurement of local secondary laboratory reference materials.

BCO-DMO Processing Description

- Imported original file "Stable isotope data.xlsx" into the BCO-DMO system.
- Flagged "N/A" and "NA" as missing data identifiers (missing data are blank/empty in the final CSV file).
- Made west longitude values negative.
- Renamed fields to comply with BCO-DMO naming conventions.
- Changed spelling from "Staiger" to "Steiger" in the "Source" column.
- Saved the final file as "960397_v1_ofp_carbo_and_oxygen_isotopes.csv".

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Data Files

File
960397_v1_ofp_carbo_and_oxygen_isotopes.csv(Comma Separated Values (.csv), 48.21 KB) MD5:d484c13cf06c4b9d35295f3cb624206c Primary data file for dataset ID 960397, version 1

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Related Publications

Babila, T. L., Rosenthal, Y., & Conte, M. H. (2014). Evaluation of the biogeochemical controls on B/Ca of Globigerinoides ruber white from the Oceanic Flux Program, Bermuda. Earth and Planetary Science Letters, 404, 67–76. https://doi.org/10.1016/j.epsl.2014.05.053
IsDerivedFrom

Deuser, W. G., & Ross, E. H. (1989). Seasonally abundant planktonic foraminifera of the Sargasso Sea; succession, deep-water fluxes, isotopic compositions, and paleoceanographic implications. The Journal of Foraminiferal Research, 19(4), 268–293. https://doi.org/10.2113/gsjfr.19.4.268
IsDerivedFrom

Deuser, W. G., Ross, E. H., Hemleben, C., & Spindler, M. (1981). Seasonal changes in species composition, numbers, mass, size, and isotopic composition of planktonic foraminifera settling into the deep sargasso sea. Palaeogeography, Palaeoclimatology, Palaeoecology, 33(1–3), 103–127. https://doi.org/10.1016/0031-0182(81)90034-1
IsDerivedFrom

Fabry, V. J., & Deuser, W. G. (1991). Aragonite and magnesian calcite fluxes to the deep Sargasso Sea. Deep Sea Research Part A. Oceanographic Research Papers, 38(6), 713–728. https://doi.org/10.1016/0198-0149(91)90008-4
IsDerivedFrom

Gray. (2019). Environmental Controls on Helicondoides Sp. and Styliola Sp. Pteropod Shell Flux and Isotopic Composition in the Sargasso Sea. University of Massachusetts Dartmouth.
IsDerivedFrom

Hashim, M., Conte, M., Salter, M., A., Pedrosa-Pamies, R. Weber, J. C., Hayden M., Wilson R., Perry, C., Crowley, S.F., Dennis, P.F., Bish, D., and Subhas, A.V. 2025. Fish Carbonates in the Open Ocean and Their Role in the Carbon Cycle. In revision at Global Biogeochemical Cycles.
Results

Hermoso, M., Horner, T. J., Minoletti, F., & Rickaby, R. E. M. (2014). Constraints on the vital effect in coccolithophore and dinoflagellate calcite by oxygen isotopic modification of seawater. Geochimica et

Cosmochimica Acta, 141, 612–627. https://doi.org/10.1016/j.gca.2014.05.002
IsDerivedFrom

Jasper, J. P., & Deuser, W. G. (1993). Annual cycles of mass flux and isotopic composition of pteropod shells settling into the deep Sargasso sea. Deep Sea Research Part I: Oceanographic Research Papers, 40(4), 653–669. https://doi.org/10.1016/0967-0637(93)90064-a https://doi.org/10.1016/0967-0637(93)90064-A
IsDerivedFrom

Pedrosa-Pamies, R., Conte, M. H., Weber, J. C., & Andersson, A. J. (2025). Hurricane-Driven Transport of Bermuda Reef Carbonate Platform Sediments to the Deep Ocean. Journal of Geophysical Research: Oceans, 130(3). Portico. https://doi.org/10.1029/2023jc020500
IsDerivedFrom

Steiger. (2019). Seasonal and intra-annual variability in shell chemistry of planktonic foraminifera Globigerinoides ruber (white) morphotypes in the Sargasso Sea: 1998-2010. UMass Dartmouth.
IsDerivedFrom

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Parameters

Parameter	Description	Units
Sample_ID_or_Common_name	The ID of the analyzed sample. Note: the sample ID of the individual foraminifera and pteropod data from OFP traps at 3200 m depth was not specified in the studies of Deuser and Ross (1989), Deuser et al. (1982), Fabry and Deuser (1992), and Deuser and Jasper (1993).	unitless
Species	Species of the sample if applicable (in case of a biogenic sample)	unitless
Sample_type	The type of sample	unitless
Latitude	Latitude of sample collection	decimal degrees
Longitude	Longitude of sample collection	decimal degrees
Diet	Description of diet, if applicable (normal diet or sardine fed)	unitless
d13C	Carbon isotope of carbonate (inorganic)	per mil with respect to VPDB
d13C_stdev	The standard deviation of carbon isotopes	per mil with respect to VPDB
d18O	Oxygen isotope of carbonate (inorganic)	per mil with respect to VPDB
O18_stdev	The standard deviation of oxygen isotopes	per mil with respect to VPDB
Source	Source of the sample. See Related Publications section of metadata for full citations.	unitless

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Instruments

Dataset-specific Instrument Name	Picarro is G-2131i
Generic Instrument Name	Gas Analyzer
Generic Instrument Description	Gas Analyzers - Instruments for determining the qualitative and quantitative composition of gas mixtures.

Dataset-specific Instrument Name	IRMS
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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Deployments

OFP_Time-Series

Website	https://www.bco-dmo.org/deployment/704779
Platform	OFP_mooring
Start Date	1978-04-06
Description	The Oceanic Flux Program (OFP) time-series began in 1978 at the Hydrostation S hydrographic time-series site (32 05N, 64 15W), located approximately 45 km southeast of Bermuda. The time-series was originally called the SCIFF (Seasonal Changes in Isotopes and Flux of Foraminifera) program. Location: 1978-1984: 31deg 10min N, 64deg 30min W, 3300m (SCIFF site) 1984-2010: 31deg 50min N, 64deg 10min W, 4500m 2011-present: 31deg 55 N, 64deg 05 W, 4550m

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Project Information

OCE-PRF: Towards Quantifying Calcium Carbonate Sediment Dissolution During Marine Diagenesis (Marine CaCO3 and ocean chemistry)

NSF Award Abstract:
OCE-PRF Towards Quantifying Calcium Carbonate Sediment Dissolution During Marine Diagenesis The goal of the project is to investigate dissolution of calcium carbonate (CaCO3) in sediments below the seafloor and determine its importance to the chemistry of seawater. This project uses sediment samples and chemical data collected from different parts of the ocean during the past five decades by scientific ocean drilling programs. Sediment dissolution of carbonate can lessen the impact of ocean acidification, the process that causes the pH of the ocean to decrease due to the uptake of carbon dioxide (CO2) from the atmosphere. Ocean acidification threatens the survival of marine organisms, such as oysters, clams, and coral reefs, which could alter marine food chains and food supply to humans. By improving understanding of carbonate dissolution in the ocean, results from this project will enable better predictions of the effects of ocean acidification on marine organisms. This will advance the progress of science and contribute to the knowledge that can inform public policy. In addition, understanding carbonate sediment dissolution serves other important purposes. For example,

dissolution can create small spaces between sediments that may get filled with groundwater once sediments convert to rocks over millions of years. Thus, understanding the occurrence and spatial distribution of spaces within rocks may help determine the volume and movement of groundwater in subsurface aquifers. This project provides support for a postdoctoral research fellow and research training opportunities for students through the Summer Student Fellowship and Woods Hole-wide Partnership Education Programs at the Woods Hole Oceanographic Institution.

Carbonate mineral dissolution is an integral part of the alkalinity and carbon cycles in the ocean and is expected to play an increasingly significant role in mediating changes in ocean chemistry as atmospheric CO2 continues to rise. The goal of this project is to provide thermodynamic constraints necessary for quantifying carbonate sediment dissolution in marine diagenetic environments. Specifically, the CaCO3 saturation state of pore fluids will be calculated in 365 globally distributed sites from previous scientific ocean drilling expeditions using a specially developed Pitzer ion activity model which is particularly useful for calculating activity coefficients in high ionic strength solutions such as those that characterize most diagenetic environments. These calculations will be substantiated with geochemical and textural analyses of sediment samples from four representative sites to identify the specific diagenetic processes (e.g., dissolution, precipitation, and recrystallization) and document the conditions responsible for their occurrence and prevalence. The immediate advantage of calculating the saturation state of pore fluids is that such data can be used to estimate carbonate sediment dissolution below the seafloor and quantify its contribution to the alkalinity and carbon cycles, which will lead to more accurate predictions of the consequences of ocean acidification. Another benefit of the global saturation state dataset is that it will improve our understanding of authigenic carbonate precipitation and its link to the carbon cycle over Earth history, which has been proposed as a significant sink for carbon. Furthermore, by complementing the thermodynamic calculations with textural and geochemical analyses, this project will parse out various diagenetic processes and identify the sedimentological and geochemical conditions responsible for their occurrence. Such knowledge is crucial for evaluating the impact of diagenesis on the carbonate-hosted paleoenvironmental proxies. Collectively, this project will pave the way towards a mechanistic understanding of carbonate diagenesis. This will provide important constraints on the oceanic alkalinity cycle, carbon burial rates, and geochemical proxies, which ultimately help us better understand the future of our ocean system in the context of climate change.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2205984

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