Carbon and Nitrogen values for low to high pCO2 acclimated Emiliania huxleyi (E Hux Response to pCO2 project)

Website: https://www.bco-dmo.org/dataset/661354
Data Type: experimental
Version:
Version Date: 2016-10-11

Project
» Planktonic interactions in a changing ocean: Biological responses of Emiliania huxleyi to elevated pCO2 and their effects on microzooplankton (E Hux Response to pCO2)

Contributors	Affiliation	Role
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Dataset Description

Related Datasets:
Grazing experiments 2 and 3: cell volume
Grazing experiments 2 and 3: daily cell counts
Grazing experiments 2 and 3: ingestion
Grazing experiments 2 and 3: pCO2

Related Reference:
Kendall, K., Marine Microzooplankton are Indirectly Affected by Ocean Acidification Through Direct Effects on Their Phytoplankton Prey. (Masters Thesis) Western Washington University.
http://cedar.wwu.edu/wwuet/448/

Methods & Sampling

The phytoplankton Emiliania huxleyi CCMP 2668 was grown semi-continuously in atmosphere controlled chambers at three different CO2 treatment concentrations; Ambient (400ppmv), Moderate (750ppmv), and High (1000ppmv). Cultures were diluted daily starting day 4 with pre-equilibrated media containing f/50 nutrients.

Expt. 2: On day 8, after ~ 16 generations, 200 mls of E. huxleyi cells from each of the treatment replicates was divided in to two 100 ml samples which were each filtered onto 20mm muffled glass fiber filters (GFF).

Expt. 3: On day 10, after ~ 20 generations, 200 mls of E. huxleyi cells from each of the treatment replicates

was divided in to two 100 ml samples which were each filtered onto 20mm muffled glass fiber filters (GFF).

During this sampling, 5 mls of each treatment was fixed in alkaline Lugol's for counting cells. One filter was used for TPC (total particulate carbon) and placed in a tin capsule the other was used for TOC and placed in a silver capsule. All samples were dried for 24 hours at 60°C. The tin capsules and filters were then folded and held in a desiccator until analysis. The silver capsules and filters were fumed in a closed container with concentrated sulfuric acid for 24 hours to remove the PIC contained in E. huxleyi's coccoliths. The silver capsules and filters were then dried again at 60°C for 24 hrs, folded, and put in a tin capsule which was folded, then they were held in a desiccator until analysis. For analysis, folded capsules were combusted in a CE Elantech Flash EA 1112 elemental analyzer. Standard curves were made using known weights of Acetanilide wrapped in tin capsules. Media blanks, filter blanks and capsule blanks were included as controls for background signals. Cells were counted with a Hemocytometer or gridded Sedgewick Rafter Chamber, depending on cell density.

Data Processing Description

Peak areas are raw data from the elemental analyzer (EA). The values for mg C and mg N are calculated by the EA software based on the values from the standard curve. C and N mg values were then adjusted to remove the respective values from the filter blank samples.

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- column names reformatted to comply with BCO-DMO standards
- added column 'expt' for experiment number
- reduced digits to right of decimal from 9 to 3 for expt3 values of: pg_N_cell, pg_TC_cell, pg_PON_cell, TC_N_, pg_POC_cell, pg_PIC_cell, PIC_POC, POC_PON, PIC_PON
- nd (no data) was entered into all blank cells

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Data Files

File
expt2_3_CN.csv (Comma Separated Values (.csv), 6.18 KB) MD5:92755b0c7683b9d173a6abe4f74ba1d5 Primary data file for dataset ID 661354

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Parameters

Parameter	Description	Units
expt	experiment identification	unitless
treatment	sample name; includes information on capsule material; pCO2 level; replicate id	unitless
N_Peak_Area	raw Nitrogen (N) peak area	relative units
C_peak_area	raw Carbon (C) peak area	relative units
N_area_adj	mg total particulate nitrogen N calculated from calibration	milligrams
C_area_adj	mg total particulate nitrogen C calculated from calibration	milligrams
mg_N	mg total particulate nitrogen N adjusted (filter blank subtracted from value)	milligrams
mg_C	mg total particulate nitrogen C adjusted (filter blank subtracted from value)	milligrams
cells_ml	cells/ml in culture	cells/milliliter
cells_filter	cells/ml in culture multiplied by the mls filtered per sample	cells
mg_N_cell	total particulate nitrogen	milligrams/cell
mg_C_cell	total particulate carbon	milligrams/cell
pg_N_cell	picograms (pg) N/cell is total N from tin capsule sample	picograms/cell
pg_TC_cell	pg TC/cell is total C from tin capsule sample	picograms/cell
pg_PON_cell	pg PON/cell is particulate organic N from acidified silver capsule	picograms
TC_N	TC:N is Total C per N both from tin capsule sample	dimensionless
pg_POC_cell	pg POC/cell is particulate organic C from acidified silver capsule	picograms/cell
pg_PIC_cell	pg PIC/cell is total C minus organic C; particulate inorganic carbon	picograms/cell
PIC_POC	PIC:POC is the ratio of inorganic C to organic C	dimensionless
POC_PON	POC:PON is the ratio of organic C to either N or PON depending on whether the row is the tin capsule sample or the acidified silver capsule sample	dimensionless
PIC_PON	PIC:PON is the ratio of inorganic C to total N.	dimensionless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CHN Elemental Analyzer
Dataset-specific Description	CE Elantech Flash EA 1112 elemental analyzer
Generic Instrument Description	A CHN Elemental Analyzer is used for the determination of carbon, hydrogen, and nitrogen content in organic and other types of materials, including solids, liquids, volatile, and viscous samples.

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Deployments

Lab_Olson_B

Website	https://www.bco-dmo.org/deployment/521277
Platform	WWU
Start Date	2011-03-31
End Date	2016-09-15
Description	laboratory experiments

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Project Information

Planktonic interactions in a changing ocean: Biological responses of Emiliania huxleyi to elevated pCO2 and their effects on microzooplankton (E Hux Response to pCO2)

Description from NSF award abstract:
The calcifying Haptophyte *Emiliania huxleyi* appears to be acutely sensitive to the rising concentration of ocean pCO2. Documented responses by *E. huxleyi* to elevated pCO2 include modifications to their calcification rate and cell size, malformation of coccoliths, elevated growth rates, increased organic carbon production, lowering of PIC:POC ratios, and elevated production of the active climate gas DMS. Changes in these parameters are mechanisms known to elicit alterations in grazing behavior by microzooplankton, the oceans dominant grazer functional group. The investigators hypothesize that modifications to the physiology and biochemistry of calcifying and non-calcifying Haptophyte *Emiliania huxleyi* in response to elevated pCO2 will precipitate alterations in microzooplankton grazing dynamics. To test this hypothesis, they will conduct controlled laboratory experiments where several strains of *E. huxleyi* are grown at several CO2 concentrations. After careful characterization of the biochemical and physiological responses of the *E. huxleyi* strains to elevated pCO2, they will provide these strains as food to several ecologically-important microzooplankton and document grazing dynamics. *E. huxleyi* is an ideal organism for the study of phytoplankton and microzooplankton responses to rising anthropogenic CO2, the effects of which in the marine environment are called ocean acidification; *E. huxleyi* is biogeochemically important, is well studied, numerous strains are in culture that exhibit variation in the parameters described above, and they are readily fed upon by ecologically important microzooplankton.

The implications of changes in microzooplankton grazing for carbon cycling, specifically CaCO3 export, DMS production, nutrient regeneration in surface waters, and carbon transfer between trophic levels are profound, as this grazing, to a large degree, regulates all these processes. *E. huxleyi* is a model prey organism because it is one of the most biogeochemically influential global phytoplankton. It forms massive seasonal blooms, contributes significantly to marine inorganic and organic carbon cycles, is a large producer of the climatically active gas DMS, and is a source of organic matter for trophic levels both above and below itself. The planned controlled study will increase our knowledge of the mechanisms that drive patterns of change between trophic levels, thus providing a wider array of tools necessary to understand the complex nature of ocean acidification field studies, where competing variables can confound precise interpretation.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0961229

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