Carbonate chemistry data for low-high pCO2 acclimated E. huxleyi cultures (E Hux Response to pCO2 project)

Website: https://www.bco-dmo.org/dataset/661388
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
Olson, M Brady	Western Washington University (WWU)	Principal Investigator
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Dataset Description

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

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. Some of the culture removed was used to evaluate chemical parameters. Samples for pH were filtered through a GFF to remove cells and loose coccoliths both of which increase optical scatter. Samples were warmed to 25°C in a water bath and run within three hours of sampling. pH was analyzed spectrophotometrically with m-cresol dye on an Agilent 8453A UV-VIS Diode Array Spectrophotometer. Samples for total Alkalinity were taken on growth days 5, 7 and 10. Alkalinity was measured by gran titration

using a Titrando 888, and 0.1 N HCl titrant, in a temperature controlled titration vessel (+/1 5 ueq/kg). Other parameters were calculated with CO2sys

Data Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- column names reformatted to comply with BCO-DMO standards
- nd (no data) was entered into all blank cells

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Data Files

File
expt2_3_chemistry.csv (Comma Separated Values (.csv), 2.01 KB) MD5:3c17f9878021c0daea446d721f70a577 Primary data file for dataset ID 661388

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Parameters

Parameter	Description	Units
treatment_rep_culture_day	pCO2 level (ambient; moderate; high) replicate (A;B;C) and day of semi-continuous culture	unitless
pH	pH of the culture material removed	pH scale
pCO2	Partial pressure of carbon dioxide (pCO2) of the culture material removed; computation from pH and alkalinity	parts per million by volume (ppmv)
total_alkalinity	total alkalinity of the culture material removed	micromoles per kilogram (umol/kg)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Automatic titrator
Dataset-specific Description	Titrando 888
Generic Instrument Description	Instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

Dataset-specific Instrument Name	
Generic Instrument Name	Spectrophotometer
Dataset-specific Description	Agilent 8453A UV-VIS Diode Array Spectrophotometer
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by 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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