Nutrient concentrations from Barbados incubation experiment, from February 2012 (ADIMA project)

Website: https://www.bco-dmo.org/dataset/552902
Data Type: Other Field Results
Version: 1
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Project
» Atmospheric Deposition Impacts on Marine Ecosystems (ADIMA)

Contributors	Affiliation	Role
Paytan, Adina	University of California-Santa Cruz (UC Santa Cruz)	Principal Investigator, Contact
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Seawater nutrient concentrations, including Soluble reactive phosphate (SPR), nitrite plus nitrate, and ammonium, from an incubation experiment from water offshore West Barbados (13.191912, -59.640579), collected February, 2012.

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Coverage

Spatial Extent: **Lat**:13.1919 **Lon**:-59.6406
Temporal Extent: 2012-02 - 2012-02

Acquisition Description

Sampling and Analytical Methodology:
Nutrient and aerosol addition bioassay experiments were carried out over 3 days in February 2012. Seawater was collected from offshore (water depth >700 m) outside the Bellairs Research Institute at West Barbados (13^{o} 11.309'N, 59^{o} 38.267'W). Surface water was pumped into acid cleaned sample rinsed carboys using a peristaltic pump with acid washed Teflon tubing and pre filtered through a 50 um mesh acid washed Nitex© net to remove grazers. The seawater was stored in the dark until transport to the lab (within <2 hours). Seawater was dispensed into acid washed and sample rinsed polycarbonate bottles (500 mL each), pre-labeled with treatment type (12-20 bottles per treatment). Treatments included single nutrient (N, P, Fe) additions as well as a combination of N and P and a combination of N and Fe at concentrations representative of deep water in this area. Three aerosol treatments were used in this study

representing aerosols deposited in three seasons, winter, spring and summer. Aerosols representing each of the seasons were added at concentrations simulating high and low deposition rates. High deposition was calculated to represent the cumulative deposition flux over 10 days of a strong dust storm event over the North Atlantic (300 g m^{-2} yr^{-1}) to the upper 10 m mixed layer. Low deposition treatments were equivalent to the normal average deposition rate for Barbados (10 g m^{-2} yr^{-1}) during spring and summer. A control (no addition, blank filter) treatment and procedural blanks (Milli-Q water) were also included. All bottles were incubated in a pool filled with circulating seawater to maintain local surface ocean temperature. The pool was covered with a neutral density shading screen to reduce light intensity by 50%. Water samples used for the experiment (pre additions) was collected to characterize the baseline conditions (baseline, 5 replicates) and 3 replicate bottles for each treatment were also collected immediately after the additions were administered (time zero, t0). The experiment took place over 3 days, and each day 3 (for nutrients) or 5 (for aerosols) randomly selected bottles for each treatment were collected at 4pm in the afternoon (e.g. time points t1-t3). Immediately upon collection each bottle was sampled for chlorophyll *a*, flow cytometry, nutrients, and trace metal concentrations.

Water from each of the retrieved incubation bottles was filtered through a 0.2 um filter tower, collected in acid washed 50 mL falcon tubes and frozen until nutrients were analyzed. Phosphate and ammonium were measured by continuous flow autoanalyzer (TechniconAutoAnalyzer II™). Soluble reactive phosphate (SRP) measurements followed a modification of the molybdenum blue procedure (Bernhardt & Wilhelms, 1967) and ammonium (NH_4) analysis was done using a method modified from ALPKEM RFA methodology. Nitrate plus nitrite (N+N) were analyzed by Alpkem RFA 300 following methods from Armstrong et al. (1967) (Armstrong, Stearns, & Strickland, 1967). Detection limits for SRP, N+N and NH_4 are 0.012 uM, 0.30 uM and 0.05 uM, respectively.

Processing Description

Data Processing:
BD: Below detection limit
*: Contaminated samples

BCO-DMO Processing Notes
- Generated from original file: "Data_nutrient concentrations from Barbados incubation experiment.xlsx" contributed by Chia-Te Chien
- Parameter names edited to conform to BCO-DMO naming convention found at Choosing Parameter Name
- Common parameter names standardized between the four contributed Barbados datasets
- Experiment Site Id and Lat/Lon appended to enable data discovery in MapServer
- Data fields with "*" (contaminated samples) converted to "CS"

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Related Publications

Armstrong, F. A. J., Stearns, C. R., & Strickland, J. D. H. (1967). The measurement of upwelling and subsequent biological process by means of the Technicon Autoanalyzer® and associated equipment. Deep Sea Research and Oceanographic Abstracts, 14(3), 381–389. doi:10.1016/0011-7471(67)90082-4
Methods

Bernhardt, H., & Wilhelms, A. (1967, October). The continuous determination of low level iron, soluble phosphate and total phosphate with the AutoAnalyzer. In Technicon Symposia (Vol. 1, pp. 385-389). http://polarphytoplankton.ucsd.edu/docs/protocols/literature/Bernhardt_TechniconSymposium_1967.pdf
Methods

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Parameters

Parameter	Description	Units
Experiment_Site	Identifier where experiments were conducted	text
Lat	Approximate Latitude Position of Experiment Site; South is negative	decimal degrees
Lon	Approximate Longitude Position of Experiment Site; West is negative	decimal degrees
ID	Sample Id	text
Treatment	Treatments	text
Time_Point	Experiment time point	days
PO4	PO4 (CS: Contaminated Sample)	micromoles per liter
NO2_plus_NO3	NO2+NO3 (CS: Contaminated Sample)	micromoles per liter
NH4	NH4 (CS: Contaminated Sample)	micromoles per liter

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Instruments

Dataset-specific Instrument Name	Technicon AutoAnalyzerII
Generic Instrument Name	Technicon AutoAnalyzerII
Dataset-specific Description	Phosphate and ammonium were measured by continuous flow autoanalyzer (TechniconAutoAnalyzer II™).
Generic Instrument Description	A rapid flow analyzer that may be used to measure nutrient concentrations in seawater. It is a continuous segmented flow instrument consisting of a sampler, peristaltic pump, analytical cartridge, heating bath, and colorimeter. See more information about this instrument from the manufacturer.

Dataset-specific Instrument Name	Alpkem RFA300
Generic Instrument Name	Alpkem RFA300
Dataset-specific Description	Nitrate plus nitrite (N+N) were analyzed by Alpkem RFA 300 following methods from Armstrong et al. (1967) (Armstrong, Stearns, & Strickland, 1967).
Generic Instrument Description	A rapid flow analyser (RFA) that may be used to measure nutrient concentrations in seawater. It is an air-segmented, continuous flow instrument comprising a sampler, a peristaltic pump which simultaneously pumps samples, reagents and air bubbles through the system, analytical cartridge, heating bath, colorimeter, data station, and printer. The RFA-300 was a precursor to the smaller Alpkem RFA/2 (also RFA II or RFA-2).

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Deployments

ADIMA_Barbados

Website	https://www.bco-dmo.org/deployment/552888
Platform	lab Bellairs Research Institute
Start Date	2012-02-01
End Date	2012-02-01
Description	Nutrient and aerosol addition bioassay experiments were carried out over 3 days in February 2012. Seawater was collected from offshore (water depth >700 m) outside the Bellairs Research Institute at West Barbados (13o 11.309'N, 59o 38.267'W).

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Project Information

Atmospheric Deposition Impacts on Marine Ecosystems (ADIMA)

Website: http://pmc.ucsc.edu/~apaytan/page_projects.html

Coverage: Gulf of Aqaba, Atlantic Ocean (Bermuda Time Series Station), Monterey Bay

Chemical components delivered to the surface ocean through atmospheric deposition influence ocean productivity and ecosystem structure thus are tightly related to the global carbon cycle and climate. Accordingly, the major aim of this project is to quantitatively estimate the variable impact of aerosols on marine phytoplankton and to determine the specific effects on various taxa. Such data could in the future be used to better understand the global impact of aerosols on the oceanic ecosystem. To accomplish this goal the PI will monitor aerosol dry deposition fluxes, determine aerosol sources, obtain the chemical composition and solubility of aerosols, and evaluate the contribution of aerosols to nutrient and trace metal budgets of seawater at two oceanographically different sites (Bermuda and Monterey Bay) representing open ocean and coastal setting. The effects of the different aerosol "types" (defined by source

and chemical characteristics) on specific phytoplankton taxa will also be evaluated using pure culture and natural samples bioassays. This project is particularly important in light of the role atmospheric deposition can resume in oligotrophic and coastal settings and the predicted future global conditions of increased aridity and urbanization and associated changes in dust fluxes and composition.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0850467

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