Seawater and filter sample nitrogen and carbon isotopes from coastal and off-shore sites from multiple cruises in the coastal Washington, 2009-2012 (Regenerated Nitrogen project)

Website: https://www.bco-dmo.org/dataset/489045
Version: 2014-03-20

Project
» The Role of Regenerated Nitrogen for Rocky Shore Productivity (Regenerated Nitrogen)

Contributors	Affiliation	Role
Pfister, Catherine	University of Chicago	Principal Investigator
Altabet, Mark A.	University of Massachusetts Dartmouth (UMASSD-SMAST)	Co-Principal Investigator
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Data Processing Description

See the other datasets associated with this project for methodology.

Seawater and filter sample isotope methodology is described in references cited below:
2014. Pather, S., C. A. Pfister, M. Altabet, D. M. Post. Ammonium cycling in the rocky intertidal: remineralization, removal and retention. Limnology and Oceanography 59:361-372. http://aslo.org/lo/toc/vol_59/issue_2/0361.html

in review (March 2014). Pfister, C. A., M. Altabet, D. Post.

Carbon system measurements are described in:
2012. Wootton, J. T. & C. A. Pfister. Carbon system measurements and potential climatic drivers at a site of rapidly declining ocean pH. PLoS ONE 7(12): e53396. doi:10.1371/journal.pone.0053396. Data associated with this paper are uploaded to the World Ocean DataBase, www.nodc.noaa.gov

Related files and references:
2010. Pfister, C. A., F. Meyer, D. A. Antonopoulos. Metagenomic profiling of a microbial assemblage associated with the California mussel, Mytilus californianus: a node in networks of carbon and nitrogen cycling. PLoS ONE 5(5): e10518. doi:10.1371/ journal.pone.0010518. Metagenome data associated with this paper are uploaded to MGRAST server at metagenomics.anl.gov

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Data Files

File
N_regen_v3.csv (Comma Separated Values (.csv), 205.35 KB) MD5:2ca6c08a416b35a9efe78b8d99ca2c7a Primary data file for dataset ID 489045

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Parameters

Parameter	Description	Units
year	year	yyyy
shore_offshore	close to shore or off-shore	text
cruise_id	cruise identification	unitless
month_local	day of month	1-12
day_local	day; local time	1-31
date_local	date; local time	MM/DD/YYYY
time_local	local time; Pacific time zone	HH:MM:SS
yrday_local	day and decimal time. eg. 326.5 for the 326th day of the year (November 22) at 1200 hours (noon).	unitless
ISO_DateTime_Local	Date/Time (UTC) ISO formatted	YYYY-MM-DDThh:mm:ss[.xx]Z
latitude	latitude; north is positive	decimal degrees
longitude	longitude; east is positive	decimal degrees
station	locale of station	text
site	site code; may be same as station code	text
depth_nom	nominal depth	meters
depth	depth	meters
vol_filt	volume filtered	liters
filterpacket	filter packet id	unitless
del15N	total nitrogen isotopic composition (delta 15N:N14)	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)

del13C	total carbon isotopic composition (delta C13: 13C/12C)	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
N_pct	percent total nitrogen	percent
C_pct	percent total carbon	percent
comment_filter	comments pertaining to the filter	text
bottle_isoN	nitrogen isotope bottle number	integer
dN15_NO3	nitrogen isotopic composition (delta 15N:N14) of nitrate	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
d18O_NO3	oxygen isotopic composition (delta O18: 18O/16O) of nitrate	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
d15N_NH4	nitrogen isotopic composition (delta 15N:N14) of ammonium	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
d15N_NO2	nitrogen isotopic composition (delta 15N:N14) of nitrite	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
bottle_nut	nutrient bottle number	integer
PO4	phosphate concentration	microMolar
Si	silicate concentration	microMolar
NO3	nitrate concentration	microMolar
NO2	nitrite concentration	microMolar
NH4	ammonium concentration	microMolar
sstemp	sea surface temperature?? This value is given for depths within a profile so it may actually be temperature, not sea surface temperature.	degrees Celsius
salinity	salinity	parts per thousand
pH	pH: The measure of the acidity or basicity of an aqueous solution	unitless; pH scale

O2_umol_kg	dissolved oxygen concentration	micromoles/kilogram
O2_ml_L	dissolved oxygen concentration	milliliters/liter
O2_mg_L	dissolved oxygen concentration	milligrams/liter
O2_sat_pcnt	dissolved oxygen concentration	percent
chl	chlorophyll-a concentration	milligrams/liter
upwelling_day	daily average coastal upwelling index for 48 deg N; from http://www.pfeg.noaa.gov/products/pfel/modeled/indices/upwelling/upwelli...	meters^3/second/100 meters cosastline
upwelling_mon	monthly average coastal upwelling index for 48 deg N; from http://www.pfeg.noaa.gov/products/pfel/modeled/indices/upwelling/upwelli...	meters^3/second/100 meters cosastline
cond	specific conductance	milliSiemens/centimeter
TDS	total dissolved solids	grams/liter
LDO	luminescent/optical dissolved oxygen	milligrams/liter
LDO_pcent	luminescent/optical dissolved oxygen saturation	percent saturation
time_of_day	day = sample taken during day	text
instrument	instrument used for measurement	text
d18O_vial	oxygen isotopic composition (delta O18: 18O/16O) of seawater	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
d13C_seawater	carbon isotopic composition (delta C13: 13C/12C) of seawater	parts per thousand vs. VSMOW (Vienna Standard Mean Ocean Water)
bottle_dickson	Dickson bottle number	integer
sal	salinity	unitless
TALK	total alkalinity	micromoles/kilogram
DIC	dissolved inorganic carbon concentration	micromoles/kilogram

bottle_niskin	Niskin bottle number	integer
comment	comments	text

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Deployments

CB946

Website	https://www.bco-dmo.org/deployment/475033
Platform	R/V Clifford A. Barnes
Start Date	2010-07-21
End Date	2010-07-23
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes

CB948

Website	https://www.bco-dmo.org/deployment/475041
Platform	R/V Clifford A. Barnes
Start Date	2010-08-25
End Date	2010-08-27
Description	**Methods & Sampling** cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB958

Website	https://www.bco-dmo.org/deployment/475048
Platform	R/V Clifford A. Barnes
Start Date	2011-06-21
End Date	2011-06-23
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB961

Website	https://www.bco-dmo.org/deployment/475049
Platform	R/V Clifford A. Barnes
Start Date	2011-07-25
End Date	2011-07-27
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB963

Website	https://www.bco-dmo.org/deployment/475050
Platform	R/V Clifford A. Barnes
Start Date	2011-08-16
End Date	2011-08-18
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB978

Website	https://www.bco-dmo.org/deployment/475054
Platform	R/V Clifford A. Barnes
Start Date	2012-06-29
End Date	2012-06-30
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB981

Website	https://www.bco-dmo.org/deployment/475056
Platform	R/V Clifford A. Barnes
Start Date	2012-07-26
End Date	2012-07-27
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB983

Website	https://www.bco-dmo.org/deployment/475058
Platform	R/V Clifford A. Barnes
Start Date	2012-08-14
End Date	2012-08-16
Description	**Methods & Sampling** Cruise track from http://www.rvdata.us/catalog/Clifford_A._Barnes.

CB943

Website	https://www.bco-dmo.org/deployment/490481
Platform	R/V Clifford A. Barnes
Start Date	2010-06-22
End Date	2010-06-24

Pfister_2009

Website	https://www.bco-dmo.org/deployment/505619
Platform	Pfister small boat
Start Date	2009-06-24
End Date	2009-06-24
Description	Seawater sampling in a small boat.

Pfister_shore

Website	https://www.bco-dmo.org/deployment/505621
Platform	Pfister shore
Start Date	2009-06-24
End Date	2012-08-20

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Project Information

The Role of Regenerated Nitrogen for Rocky Shore Productivity (Regenerated Nitrogen)

Website: http://pfisterlab.uchicago.edu

Coverage: coastal northeast Pacific Ocean

NSF Award Abstract:
A fundamental and persistent question in a multitude of ecosystems is the extent to which new versus regenerated nutrients support ecosystem productivity. In coastal marine systems, nitrate derived from upwelling (= new nitrogen) and ammonium regeneration in coastal waters and sediments (= regenerated nitrogen) are major nitrogen sources that fuel coastal ocean productivity. Because inorganic nitrogen availability clearly regulates production in a large number of areas, understanding nitrogen supply is essential. In open coast regions away from river mouths, nitrate inputs are determined by large-scale physical processes promoting upwelling of deep, nutrient-rich water including wind direction and intensity. In contrast, regenerated nitrogen (mainly ammonium) is generally the result of local animal and microbial processes. Along marine rocky shores, where upwelling is typically used as a proxy for productivity, we know very little about the dynamics of regenerated nutrients and their potential contribution to productivity at larger scales; only upwelling is typically used as a proxy for productivity. Associations of the abundant California mussel, Mytilus californianus, with water nutrients, algal productivity, stable isotope signatures, and microbial genetics indicate potentially strong regeneration of nitrogen by these animals and suggest an important secondary role of nitrifying microbes affiliated with these animals.

In this project, the investigators will quantify the relative contribution of regenerated nitrogen on rocky shores through censuses and experiments across a gradient of mussel abundance. They will use stable nitrogen and oxygen isotopes of ammonium, nitrite, and nitrate to disentangle the contribution of different biological processes versus upwelling to the nitrogen supply and uptake of rocky shore regions. This includes both natural abundance and tracer addition studies.

Broader Impacts. Regenerated nitrogen supply, as opposed to new nitrogen via upwelling, is a local process dependent upon an intact animal community. However, mussels and other nearshore animals may be particularly vulnerable to a changing thermal environment, toxic algal blooms, and ocean acidification. Given the dramatic changes to the coastal nitrogen cycle in recent years, and potential changes to currents, upwelling, ocean chemistry, and El Niño frequencies portended by global changes to our climate, we to know the relative effect of local versus larger scale oceanic events on the nitrogen cycle. The proposed work links biological interactions in situ with its implications for coastal productivity.

In addition to expected publications in high quality journals, educational activities will continue to focus on graduate and undergraduate education and mentoring. The proposal will fund two graduate students and two undergraduates per year. The PI's will work closely with government (Olympic Marine National Sanctuary) and tribal (Makah Tribe) representatives to communicate this research. We will also work with Makah Museum Board of Trustees and the Makah Higher Education Committee to identify Makah students as research assistants. All three PI's teach broadly across their respective campuses, instructing almost every type of undergraduate major.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0928232

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