Nitrate plus raw spectral profiles from a Satlantic Nitrate Sensor on Biofloat 48 in the subpolar North Atlantic and Iceland Basin in 2008 (NAB 2008 project)

Website: https://www.bco-dmo.org/dataset/3442
Version: 14 March 2011
Version Date: 2011-03-15

Project
» North Atlantic Bloom Experiment 2008 (NAB 2008)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Data Processing Description

Nitrate (parameter names nitrate): The Satlantic in situ ultraviolet spectrophometer ISUS V3 sensor was deployed on Float 48. Post calibration of the ISUS instrument and subsequent processing of the spectrophotometric data acquired by the ISUS incorporating in situ temperature and salinity measurements to correct for the temperature-dependent, ultraviolet absorbance by the bromide ion results in a precision of duplicate nitrate measurements of 0.1µM. These nitrate concentrations were then calibrated against bottle measurements collected during the R/V Knorr process cruise (April 17 through May16) and subsequently analyzed for nitrate plus nitrite (NO3-+ NO2-) concentration. A simple linear regression was sufficient to make the ISUS nitrate concentrations (NO3ISUS) fit the bottle for nitrate plus nitrite measurements with a standard deviation of 0.6µM:

nitrate = 1.1536 x NO3ISUS + 2.6227 (r2 = 0.927, n = 53)

Comparisons with water samples taken on the R/V Bjarni Saemundsson deployment cruise are inconclusive due to high spatial variability. No obvious drift of the ISUS response with time or depth was apparent. For more details, see ISUS_Nitrate_Calibration-NAB08.pdf.

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Data Files

File
Biofloat_48_ISUS.csv (Comma Separated Values (.csv), 154.63 MB) MD5:ca900ebff48d0d1478840d5c22569cd2 Primary data file for dataset ID 3442

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Parameters

Parameter	Description	Units
Cruise_ID	Cruise identifier	dimensionless
float_cycle	index counting float cycles	dimensionless
julian_day_yr0	time when sample was taken in decimal days since Jan-0-0000 (Matlab)	dimensionless
latitude	latitude	decimal degrees
longitude	longitude	decimal degrees
start_date	date sampling begins	YYYYMMDD
start_time	time sampling begins	HHMM
end_date	date sampling ends	YYYYMMDD
end_time	time sampling ends	HHMM
press	water pressure at measurement	decibars
depth	depth at which sample was taken	meters
temp	Temperature	degrees Celsius
potemp	Potential Temperature	degrees Celsius
sal	Salinity	dimensionless
sigma_0	water potential density minus 1000	kilograms/meter^3
yrday	Yearday 2008. Yearday 1 is 2008-01-01:00:00:00Z	dimensionless
wavelength	Calibrated wavelength (256 channels), with measurements valid from 320-950 nm. Wavelengths outside this range contain dark pixel data for measuring dark current. Spectral resolution is ~3.3 nanometers (instrument: TriOS ACC)	nanometers
spectrum_light	Raw UV absorbance spectrum (light samples only, 256 channels.)	counts
spectrum_dark	Raw UV absorbance spectrum (dark samples only, 256 channels.)	counts
spectrum_ref	Reference spectrum: post-cruise measurement of raw UV absorbance spectrum in de-ionized water - reverse osmosis (17.5 megohm-centimeter resistivity) at ambient atmospheric pressure.	counts
NO3_NO2	Nitrate concentration, calibrated against bottle nutrient samples that were analyzed for nitrate plus nitrite (NO3+ NO2).	micromol/liter
mode	0 = down profile 1 = settle 2 = up profile 3 = drift_iso 5 = drift_ml	dimensionless

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Instruments

Dataset-specific Instrument Name	ISUS Nitrate sensor
Generic Instrument Name	ISUS Nitrate sensor
Generic Instrument Description	The Satlantic ISUS nitrate sensor is an in-situ UV absorption sensor which calculates nitrate concentration from the seawater spectrum. The ISUS V2 has a 1cm path length, a 200-400 nm wavelength range., and is depth rated to 1000 m. Satlantic's ISUS V3 nitrate sensor uses advanced UV absorption technology to measure nitrate concentration in real-time.

Dataset-specific Instrument Name	Lagrangian Float
Generic Instrument Name	Lagrangian Float
Dataset-specific Description	The 2008 North Atlantic Bloom Experiment (NAB08) employed a “Lagrangian float”, custom built at the University of Washington Applied Physics Laboratory. (D’Asaro, 2003, Performance of Lagrangian Floats, Journal of Atmospheric and Oceanic Technology, Vol. 20, 896-911).
Generic Instrument Description	Built at the University of Washington Applied Physics Laboratory, the Lagrangian Float is not an ARGO float. It is primarily designed to accurately follow the three-dimensional motion of water parcels within the mixed layer, through a combination of neutral buoyancy and high drag provided by a one meter diameter black drogue. Typical buoyancies of a few grams result in vertical velocities relative to the water of a few mm/s, small compared to the cm/s turbulent velocities in the mixed layer. The float’s motion within the mixed layer thus closely imitates that of a planktonic organism. The float can also profile vertically. It sends data and receives commands using the Iridium satellite system. The float is designed to accommodate a wide variety of sensors.

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Deployments

Biofloat_48

Website	https://www.bco-dmo.org/deployment/58147
Platform	Biofloat 48
Start Date	2008-04-04
End Date	2008-05-25
Description	See document NAB08Float48SamplingMethodologyV1.pdf for complete information on Biofloat 48's modes, cycles, and sampling intervals for each sensor. BioFloat 48 was a Lagrangian float deployed during cruise B4-2008 of the vessel R/S Bjarni Saemundsson.

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Project Information

North Atlantic Bloom Experiment 2008 (NAB 2008)

Coverage: North Atlantic, 60 ° North

NAB2008 was a process experiment designed to study an important component of the oceanic carbon system - the North Atlantic spring bloom. The phytoplankton bloom occurring each spring in the North Atlantic, drives the uptake of carbon dioxide and is an important component of the biological pump (Bagniewski et al., 2010). Previous studies in this region have shown the importance of small temporal and spatial scales, i.e. ecosystem patchiness, during the bloom, but were restricted by the limitations of ship-based sampling. Recent advances in autonomous platforms and sensors presented an opportunity to study this important event in a new way. In addition to deployment of a diverse suite of *in situ* sampling devices, NAB2008 was also a test-bed for developing the strategies and knowledge needed to successfully use new methods to drive the next generation of ocean observations.

In 2008, a coordinated deployment of 1 float, 4 Seagliders and 2 research vessels sampled the evolution of the North Atlantic spring bloom along and surrounding the nearly Lagrangian path followed by the float. The autonomous measurements were continuous through the experimental period, and included CTD, chlorophyll fluorescence, optical backscatter, and oxygen on all platforms; and nitrate, optical attenuation, and various radiance measurements on the float. Velocities were determined from the vehicle motion, with the float extending to a depth of 230 meters and gliders to 1,000 meters. The autonomous vehicles were deployed, rescued, and recovered on three cruises of the Icelandic vessel Bjarni Saemundsson. A 21-day cruise of the R/V Knorr conducted more detailed measurements during the peak of the bloom in May. The R/V Knorr sampling program included optical profiles, ADCP data and analysis of water samples for nutrients, particulate organic carbon, pigments, micro-plankton composition, complemented by guest investigator analyses. Data from both ships were used to calibrate and validate the autonomous measurements.

References:
Bagniewski, W., Fennel, K., Perry, M. J., and D'Asaro, E. A. (2010) Optimizing models of the North Atlantic spring bloom using physical, chemical and bio-optical observations from a Lagrangian float, Biogeosciences Discuss., 7, pp. 8477-8520, doi:10.5194/bgd-7-8477-2010

NAB08 preprints

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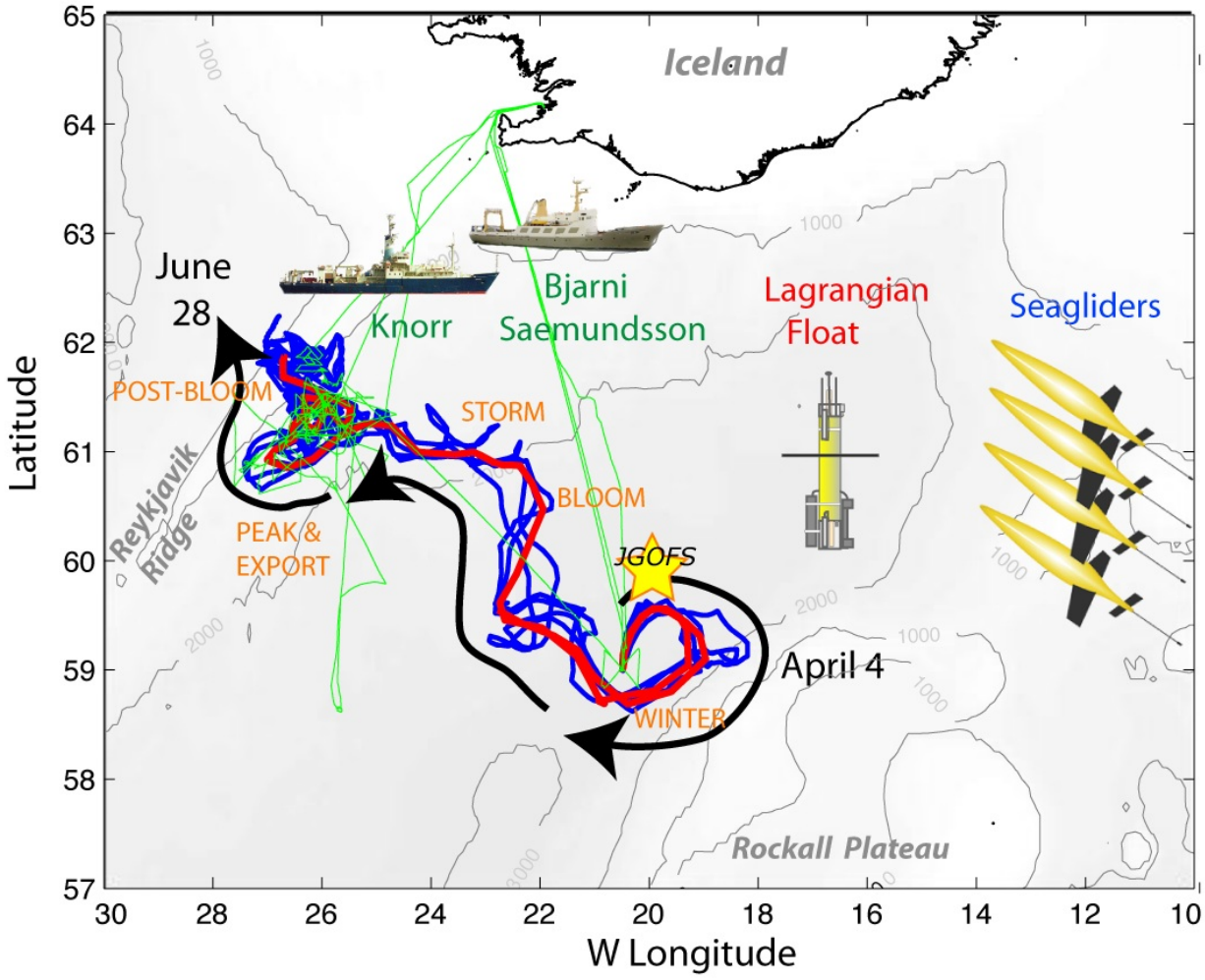

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Program Information

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0628107
NSF Division of Ocean Sciences (NSF OCE)	OCE-0628379

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