

Nitrogen Productivity and Supply - HLY0701

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NSF grant# 0612427: Collaborative Research: BEST: Nitrogen supply for new production and its relation to climatic conditions on the eastern Bering Sea shelf

Data set Overview :

This project is measuring new (nitrate) and regenerated nitrogen production directly with tracer incubation measurements in ice-impacted and ice-free regions of the eastern Bering Sea. New production is indicative of the total amount of organic material available for higher trophic levels and the ratio of new to total nitrogen production (the *f*-ratio) indicates the degree to which production is linked to pelagic grazing. This ecological information will be used to characterize the partitioning of primary production between pelagic and benthic consumers and how this changes with conditions on the shelf. We hypothesize that the seasonal development of regenerated production will be closely associated with that of the zooplankton populations; thus, the nitrogen productivity data will test a key component of the link between climate factors and trophic flow. These data will be used to test the hypothesis that variations in physical and biological processes may influence upper trophic level productivity by controlling the amount of combined nitrogen available on the shelf for growth.

Instrument Description :

Measurements of particulate organic carbon (POC) and particulate nitrogen (PN), as well as nitrate and ammonium productivity (ρNO_3 & ρNH_4) were made using an ANCA elemental combustion unit and a Europa 20-20 mass spectrometer at Lamont-Doherty. The instrument was run in continuous flow mode so that POC, PN, and the isotopic enrichment of nitrogen and carbon were measured on the same sample. All samples were analyzed against internal standards for all variables.

Table of specifications

Variable	Precision
$\delta^{13}\text{C}$	0.2 per mil
$\delta^{15}\text{N}$	0.3 per mil
total C	1.5%
total N	2%

Data Collection and Processing :

The data collection consists of measurements made on particles filtered from seawater during cruise 0701 of the USCGC Healy during the first cruise of the NSF sponsored Bering Ecosystem Study Program (BEST). Samples were collected on precombusted

Whatman GFF filters after first removing the larger zooplankton with a 250 micron sieve. Care was taken to segregate the samples for natural isotopic abundance measurements from the isotopically enriched samples. The samples were preserved by drying on the ship and were kept dry during their transport back to the laboratory. When particulate levels were sufficient, filters were subdivided so that replicates could be done. The POC pool is defined as the carbon remaining after the sample has been exposed to acid fumes for 24 hours (Knap et al., 1996). The nitrogen and carbon rate measurements reflect the results of on-board incubation experiments of surface seawater. (Dugdale and Goering, 1967; Sambrotto et al., 1986; Sambrotto and Mace, 2000). The rates are based on the measured isotopic enrichment of the particulate material, the ambient and added concentrations of nutrient and the incubation period.

Quality control of the data was done by several means. For the particulate carbon and nitrogen levels, the elemental ratios were examined and those well outside the typical C/N range of 4-14 were excluded (1 sample). Particulate carbon and nitrogen were also compared to chlorophyll α values for this purpose. For the rate measurements, the specific rates (hr^{-1}) were assessed and physiologically improbable growth rates ($> 1 \text{ d}^{-1}$ at the ambient temperatures) were excluded (0 samples).

Data Format :

Data file structure: tab delimited ASCII

Naming convention: PI name + cruise (Sambrotto_HLY0701)

Data format and layout: 2 header rows, 400 data rows, 14 columns

List of parameters, units, etc.

Parameter	Units	Sampling intervals	Frequency	Range
Cruise_ID	CHAR	various	various	n.a.
Station_Name	CHAR	various	various	1-215
Station_Mooring	CHAR	various	various	n.a.
Event(Cast)	INT	various	various	1-230
Date	YYYYMMDD	various	various	n.a.
Time	GMT	various	various	n.a.
Latitude	dec. degrees	various	various	54.24-62.64
Longitude	dec. degrees	various	various	180.56-195.91
Depth	m	various	various	0-3340
POC	ug/L	various	various	1.63-175.4
PN	ug/L	various	various	10.1-1646
Rho_NO3	mmol/m ³ /d	various	various	0-3.12
Rho_NH4	mmol/m ³ /d	various	various	0.01-1.75
Rho_C	mg/m ³ /d	various	various	0-846.2

Descriptions of flags or codes used: none

Data version number and data: V1.0; Feb. 20, 2008.

Data Remarks :

Data collection and analysis proceeded without major problems. ASCII data file can be opened with most software titles.

References :

- Dugdale, R.C. and Goering, J.J., 1967. Uptake of new and regenerated forms of nitrogen in primary productivity. *Limnology and Oceanography*, 12: 196- 206.
- Knap, A., A. Michaels, A. Close, H. Ducklow and A. Dickson (eds.). 1996. Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements. JGOFS Report Nr. 19, vi+170 pp. Reprint of the IOC Manuals and Guides No. 29, UNESCO 1994.
- Sambrotto, R.N., Niebauer, H.J., Goering, J.J. and Iverson, R.L., 1986. The relationship among vertical mixing, nitrate uptake, and growth during the spring phytoplankton bloom in the southeast Bering Sea middle shelf. *Continental Shelf Research*, 5(1/2): 161-198.
- Sambrotto, R.N. and Mace, B.J., 2000. Coupling of biological and physical regimes across the Antarctic Polar Front as reflected by nitrogen production and recycling. *Deep-Sea Research Part II-Topical Studies in Oceanography*, 47(15-16): 3339-3367.