

Biology and chemistry in Arctic surface microlayer and subsurface waters from R/V Oden cruise ASCOS2008 from the High Arctic Ocean in 2008 (87degs N, 1-6degs E) (Marine Microgels project)

Website: <https://www.bco-dmo.org/dataset/3593>

Version: 04 January 2012

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Project

» [Marine microgels: A microlayer source of summer CCN in high Arctic open lead](#) (Marine Microgels)

Program

» [Arctic Summer Cloud Ocean Study](#) (ASCOS)

Contributors	Affiliation	Role
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Dataset Description

Biology and chemistry in Arctic surface microlayer and subsurface waters: DMSP, amino acids, chlorophyll-a, carbon, nitrogen, sugars, proteins, concentrations of phytoplankton and bacteria.

Related files and references:

Matrai, P. A., Tranvik, L., Leck, C. & Knulst, J. Are high Arctic microlayers a potential source of aerosol organic precursors? *Mar. Chem.* 108, 109-122 (2008).

Orellana M.V., P.A. Matrai, C. Leck, C.D. Rauschenberg, Allison M. Lee and E. Coz. Marine microgels as cloud condensation nuclei in the high Arctic. *PNAS* 108 (33) 13612-13617; published ahead of print August 8, 2011, doi:10.1073/pnas.1102457108 (2011).

Gao, Q., C. Leck, C. Rauschenberg, and P. Matrai. On the chemical dynamics of extracellular polysaccharides in the high Arctic surface microlayer." *Atmospheric Chemistry and Physics*, ASCOS Special Issue, subm. (2012).

Methods & Sampling

Sampling and Analytical Methodology:

Samples were obtained during the drift phase (13 August- 1 September 2008) of the international ASCOS field campaign to the high Arctic Ocean. Surface microlayer samples were obtained with battery-operated

catamaran-type vessels fitted with a rotating drum covered with a thin sheet of sodium-in-liquid-ammonia-edged (hydrophilic) Teflon film (Matrai et al. 2008). The depth of the SML sampled ranged from 2 to 41 μm . We performed SSWW sampling with acid-cleaned bottles rinsed in distilled deionised water (18 M Ω) at < 30 cm below the surface microlayer.

DMS and DMSP were measured with cryotrapping and gas chromatography with flame photometric detection. The dissolved fraction was obtained by gravity filtration and low volume sampling, through a Whatman GF/F filter that retained the particulate fraction (Matrai and Keller 1993).

Chlorophylls were determined according to Holm-Hansen et al. (1965).

Bulk carbohydrates (d-MCHO, d-PCHO) were quantified with the TPTZ protocol (Hung et al. 2001, 2003). Total organic carbon samples were collected in acid-cleaned containers and stored frozen, until analysis by high temperature combustion (Knap et al. 1996), calibrated with DOC Certified Reference standards.

Particulate organic carbon and nitrogen were quantified in material collected on Whatman GF/F glass fiber filters stored frozen until laboratory analysis (Knap et al. 1996).

Individual amino acids were determined on 0.2 μm -filtered samples, with acid hydrolysis and separation achieved by using reverse phase HPLC with precolumn OPA derivitization (Mopper & Dawson 1986, Keil and Kirchman 1991).

Proteins were determined in the particulate phase, after filtration with a Whatman GF/F glass fiber filter (Dortch et al. 1984, Clayton et al. 1988).

Phytoplankton and bacterioplankton were enumerated with flow cytometry (Sieracki et al. 1999), after fixation with 0.5% paraformaldehyde, flash-freezing in liquid nitrogen, and storage at -80°C.

Clayton J J, Dortch Q, Thoresen S, Ahmed S (1988) Evaluation of methods for the separation and analysis of proteins and free amino acids in phytoplankton samples. *J Plankton Res* 10: 341-358. [proteins]

Dortch Q, Clayton J R J, Thoresen S S, Ahmed S I (1984) Species differences in accumulation of nitrogen pools in phytoplankton. *Mar Biol* 81: 237-250. [proteins]

Holm-Hansen O, C J Lorenzen, RW Holmes and JDH. Strickland. 1965. Fluorometric determination of chlorophyll. *Journal du Conseil. Conseil International pour l'Exploration de la Mer* 30 : 3-15.

Hung C-C et al. (2003) Distributions of carbohydrate species in the Gulf of Mexico. *Mar Chem* 81: 119-135. [polysaccharides]

Hung C-C, Tang D, Warnken K, Santschi P H (2001) Distributions of carbohydrates, including uronic acids, in estuarine waters of Galveston Bay. *Mar Chem* 73: 305- 318. [mono, polysaccharides]

Keil R, Kirchman D (1991) Dissolved combined aminoacids in marine waters as determined by a vapor-phase hydrolysis method. *Mar Chem* 33: 243-259. [aminoacids]

Knap A et al. (1996) Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements. [POC, PON, TOC, TN]

Matrai P A, Keller M D (1993) Dimethylsulfide in a large-scale coccolithophore bloom in the Gulf of Maine. *Cont Shelf Res* 13: 831-843. [DMS, DMSP]

Matrai, P. A., Tranvik, L., Leck, C. & Knulst, J. Are high Arctic microlayers a potential source of aerosol organic precursors? *Mar. Chem.* 108, 109-122 (2008). [microlayer sampling]

Mopper K, Dawson R (1986) Determination of amino acids in seawater - Recent chromatographic developments and future directions. *Sci Total Environ* 49: 115-131. [amino acids]

Sieracki, M., T. Cucci, and J. Nicinski <http://aem.asm.org/content/65/6/2409.abstract> - aff-1 (1999). "Flow cytometric analysis of 5-cyano-2,3-ditoyl tetrazolium chloride activity of marine bacterioplankton in dilution cultures." *Applied and Environmental Microbiology* 65(6): 2409-2417. [phytoplankton and bacterial counts]

Data Processing Description

Data Processing:

These are the original data, derived from calibration curves, as described in the methods.

BCO-DMO Processing Notes

Generated from original .xlsx file "ASCOS-Biology_data-for BCO-DMO2.csv" contributed by Paty Matrai

BCO-DMO Edits

- Date reformatted to "YYYYMMDD"
- "NaN" replaced with "nd" for no data value

- "nd" (no data value) inserted in blank cells
- Commas in Station type converted to semicolons
- Parameter names modified to conform to BCO-DMO convention(spaces eliminated, underscores inserted, etc)
- Data values standardized to common number of decimal places reorted for data/parameter type

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Data Files

File
Biology.csv (Comma Separated Values (.csv), 7.80 KB) MD5:f3344da9d9563e5db9f2c9e15219edd5 Primary data file for dataset ID 3593

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Parameters

Parameter	Description	Units
Date	Date	YYYYMMDD
DOY	Day of Year	ddd.dd
Station_type	Station type description	text
Lat	Station latitude (South is negative)	Decimal degrees
Lon	Station longitude (West is negative)	Decimal degrees
true_wind_direction	True wind direction	degrees
true_wind_speed	True wind speed	m/s
depth	Depth	m
DMS	dimethyl sulfide	nM
DMS_sd	dimethyl sulfide sdev	nM
DMSPp	particulate dimethylsulfoniopropionate	nM
DMSPp_sd	particulate dimethylsulfoniopropionate sdev	nM
DMSPd	dissolved dimethylsulfoniopropionate	nM
DMSPd_sd	dissolved dimethylsulfoniopropionate sdev	nM
AA_diss	total dissolved aminoacids	nM
AA_sd	total dissolved aminoacids sdev	nM
Chl	chlorophyll a	ug/l
Chl_sd	chlorophyll a sdev	ug/l
POC	particulate organic carbon	ug/l
POC_sd	particulate organic carbon sdev	ug/l
PON	particulate organic nitrogen	ug/l
PON_sd	particulate organic nitrogen sdev	ug/l
Tot_ndo_phyto_conc	Total nano phytoplankton concentration	Number of cells/ml
Tot_Bact_conc	Total bacterial concentration	Number of cells/ml
polysaccharides_acid	Polysaccharides acid	ug C/L
polysaccharides_acid_sd	Polysaccharides acid sdev	ug C/L
monosaccharides_dissolved	Monosaccharides	uM C
monosaccharides_sd	Monosaccharides sdev	uM C
polysaccharides_dissolved	Polysaccharides total	uM C
Proteins_particulate	Proteins particulate	ug/l
proteins_sd	Proteins particulate sdev	ug/l
TOC	total organic carbon	uM
TN	total nitrogen	uM

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Deployments

ASCOS2008

Website	https://www.bco-dmo.org/deployment/58764
Platform	R/V Oden
Report	http://articascos.blogspot.com/
Start Date	2008-08-01
End Date	2008-09-08
Description	The Arctic Summer Cloud Ocean Study is a scientific ice-breaker borne mission to the high Arctic Ocean. The focus is on the physical and chemical processes leading to cloud formation, and scientists ranging from chemists and biologists to oceanographers and meteorologists will contribute. Arctic Summer Cloud Ocean Study (ASCOS) ARCTIC ASCOS blog */ ASCOS Special Issue in Atmospheric Chemistry and Physics

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Project Information

Marine microgels: A microlayer source of summer CCN in high Arctic open lead (Marine Microgels)

Website: <http://www.ascos.se/>

Coverage: High Arctic Ocean (87degs N, 1-6degs E)

Investigators from the Bigelow Laboratory for Ocean Sciences and the Institute for Systems Biology received funding to identify and quantify organic molecules in the Arctic Ocean that serve as cloud condensation nuclei. They investigated the possibility that organic particles on the surface of the Arctic ocean form microgels which become airborne and play a significant role in cloud formation. They will determine the origins of the gels through a variety of chemical analyses. The project will help understand the dynamics of stratocumulus clouds and their effects on Arctic climate. Data will be collected in collaboration with Swedish scientists as part of the Arctic Summer Cloud Ocean Study (ASCOS).

[Arctic Summer Cloud Ocean Study \(ASCOS\)](#)

[ARCTIC ASCOS blog](#)

[ASCOS Special Issue in Atmospheric Chemistry and Physics](#)

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Program Information

Arctic Summer Cloud Ocean Study (ASCOS)

Website: <http://www.ascos.se/>

Coverage: High Arctic Ocean (87degs N, 1-6degs E)

The Arctic Summer Cloud Ocean Study is a scientific ice-breaker borne mission to the high Arctic Ocean. The focus is on the physical and chemical processes leading to cloud formation, and scientists ranging from chemists and biologists to oceanographers and meteorologists will contribute.

[Arctic Summer Cloud Ocean Study \(ASCOS\)](#)

[ARCTIC ASCOS blog](#)

[ASCOS Special Issue in Atmospheric Chemistry and Physics](#)

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Funding

Funding Source	Award
NSF Arctic Sciences (NSF ARC)	ARC-0707555
NSF Arctic Sciences (NSF ARC)	ARC-0707513

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