Shifts in the Source and Composition of Dissolved Organic Matter in Southwest Greenland Lakes Along a Regional Hydro-climatic Gradient

Dissolved organic matter (DOM) concentration and quality were examined from Arctic lakes located in three clusters across south-west (SW) Greenland, covering the regional climatic gradient: cool, wet coastal zone; dry inland interior; and cool, dry ice-marginal areas. We hypothesized that differences in mean annual precipitation between sites would result in a reduced hydrological connectivity between lakes and their catchments and that this concentrates degraded DOM. The DOM in the inland lake group was characterized by a lower aromaticity and molecular weight, a low soil-like fluorescence, and carbon stable isotope ($\delta^{13}$C-DOC) values enriched by ~2‰ relative to the coastal group. DOC-specific absorbance (SUVA$_{254}$) and DOC-specific soil-like fluorescence (SUVF$_{C1}$) revealed seasonal and climatic gradients across which DOM exhibited a dynamic we term "pulse-process": Pulses of DOM exported from soils to lakes during snow and ice melt were followed by pulses of autochthonous DOM inputs (possibly from macrophytes), and their subsequent photochemical and microbial processing. These effects regulated the dynamics of DOM in the inland lakes and suggested that if circumpolar lakes currently situated in cool wetter climatic regimes with strong hydrological connectivity have reduced connectivity under a drier future climate, they may evolve toward an end-point of large stocks of highly degraded DOC, equivalent to the inland lakes in the present study. The regional climatic gradient across SW Greenland and its influence on DOM properties in these lakes provide a model of possible future changes to lake C cycling in high-latitude systems where climatic changes are most pronounced.
Assessment of drinking water quality at the tap using fluorescence spectroscopy

Treated drinking water may become contaminated while travelling in the distribution system on the way to consumers. Elevated dissolved organic matter (DOM) at the tap relative to the water leaving the treatment plant is a potential indicator of contamination, and can be measured sensitively, inexpensively and potentially on-line via fluorescence and absorbance spectroscopy. Detecting elevated DOM requires potential contamination events to be distinguished from natural fluctuations in the system, but how much natural variation to expect in a stable distribution system is unknown. In this study, relationships between DOM optical properties, microbial indicator organisms and trace elements were investigated for households connected to a biologically-stable drinking water distribution system. Across the network, humic-like fluorescence intensities showed limited variation (RSD = 3.5-4.4%), with half of measured variation explained by interactions with copper. After accounting for quenching by copper, fluorescence provided a very stable background signal (RSD...
Calibration, standardization, and quantitative analysis of multidimensional fluorescence (MDF) measurements on complex mixtures (IUPAC Technical Report)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, National University of Ireland, University of Copenhagen
Authors: Ryder, A. G. (Ekstern), Stedmon, C. (Intern), Harrit, N. (Ekstern), Bro, R. (Ekstern)
Pages: 1849-1870
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
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BFI (2017): BFI-level 1
The land-to-ocean flux of organic carbon is increasing in glacierized regions in response to increasing temperatures in the Arctic (Hood et al., 2015). In order to understand the response of the coastal ecosystem metabolism to the organic carbon input it is essential to determine the bioavailability of the different carbon sources in the system. We quantified the bacterial turnover of organic carbon in a high Arctic fjord system (Young Sound, NE Greenland) during the ice-free period (July-October 2014) and assessed the quality and quantity of the 3 major organic carbon sources; (1) local phytoplankton production (2) runoff from land-terminating glaciers and a lowland river and (3) inflow from the ocean shelf. We found that despite relatively low concentrations of DOC in the rivers, the bioavailability of the river–DOC was significantly higher than in the fjord, and characterized by high cell-specific bacterial production and low C:N ratios. In contrast, the DOC source entering via inflow of coastal shelf waters had high DOC concentrations with high C:N and low specific bacterial production. The phytoplankton production in the fjord could not sustain the bacterial carbon demand, but was still the major source of organic carbon for bacterial growth. We assessed the bacterial community composition and found that communities were specific for the different water types i.e., the bacterial community of the coastal inflow water could be traced mainly in the subsurface water, while the glacial river community strongly dominated the surface water in the fjord.
Changes in distributional patterns of plaice Pleuronectes platessa in the central and eastern North Sea; do declining nutrient loadings play a role?

Since the beginning of the 1990s, there has been a change in the relative distribution of smaller age-classes of plaice Pleuronectes platessa (age 1–3) in the North Sea. The abundances have increased in deeper, more offshore areas, while coastal abundances have been stagnant or declining. For the same time period available time series data on nutrient conditions in the coastal North Sea area show what the freshwater nitrogen loading has decreased by about 50%. While nutrient concentrations in the ambient environment have been shown to influence growth in juvenile plaice through influence on their prey, we here inspect the potential linkage between distributional changes in plaice and the decline in nutrient loading. We compare plaice observations in coastal areas in the eastern North Sea, which have experienced large changes in eutrophication, with observations for the Dogger Bank, a large sandbank in a shallow offshore area of the North Sea. The Dogger Bank, was used as a reference location assuming this area has been less influenced from coastal eutrophication but similar regional climate conditions, and here we found no changes in the abundances of juvenile plaice. The increase in the use of offshore habitats as nursery areas by juvenile plaice in the North Sea appears not related to water depth per se but driven by specific processes dominating in near-shore areas and may be related to changes in nutrient loadings. This point to the importance of separating more general depth-related factors from conditions specific for near-shore areas, such as nutrient loadings in coastal waters and export offshore. The concurrent changes in environment and in distribution of juvenile plaice may have implications for environmental and fisheries management.
Correlation analyses, Eutrophication, Nitrogen, Plaice abundance
Distributions of dissolved organic matter in the central Arctic Ocean

General information
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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Reader, H. (Intern), Stedmon, C. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod Acartia tonsa

To meet the oncoming requirements for lower sulphur emissions, shipping companies can install scrubbers where the exhaust is sprayed with seawater and subsequently discharged to the sea. The discharge water has a pH around 3 and contains elevated concentrations of vanadium, nickel, lead and hydrocarbons. We investigated 1) the threshold concentrations of scrubber discharge water for survival, feeding and reproduction of the copepod Acartia tonsa, 2) whether the effects depend on the exposure route and 3) whether exposure to discharge water can be detected in field-collected organisms. A direct exposure to discharge water increased adult copepod mortality and reduced feeding at metal concentrations which were orders of magnitude lower than the lethal concentrations in previous single-metal studies. In contrast, reproduction was not influenced by dietary uptake of contaminants. Scrubber water constituents could have synergistic effects on plankton productivity and bioaccumulation of metals, although the effects will depend on their dilution in the marine environment.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry
Authors: Koski, M. (Intern), Stedmon, C. (Intern), Trapp, S. (Intern)
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
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BFI (2013): BFI-level 2
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Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod *Acartia tonsa*

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry
Authors: Koski, M. (Intern), Stedmon, C. (Intern), Trapp, S. (Intern)
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**Evidence of local and regional freshening of Northeast Greenland coastal waters**
The supply of freshwater to fjord systems in Greenland is increasing as a result of climate change-induced acceleration in ice sheet melt. However, insight into the marine implications of the melt water is impaired by lack of observations demonstrating the fate of freshwater along the Greenland coast and providing evaluation basis for ocean models. Here we present 13 years of summer measurements along a 120km transect in Young Sound, Northeast Greenland and show that sub-surface coastal waters are decreasing in salinity with an average rate of 0.12±0.05 per year. This is the first observational evidence of a significant freshening on decadal scale of the waters surrounding the ice sheet and comes from a region where ice sheet melt has been less significant. It implies that ice sheet dynamics in Northeast Greenland could be of key importance as freshwater is retained in southward flowing coastal currents thus reducing density of water masses influencing major deep water formation areas in the Subarctic Atlantic Ocean. Ultimately, the observed freshening
could have implications for the Atlantic meridional overturning circulation.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Aarhus University, ClimateLab, ASIAQ Greenland Survey, Greenland Institute of Natural Resources
Authors: Sejr, M. K. (Ekstern), Stedmon, C. A. (Intern), Bendtsen, J. (Ekstern), Abermann, J. (Ekstern), Juul-Pedersen, T. (Ekstern), Mortensen, J. (Ekstern), Rysgaard, S. (Ekstern)
Publication date: 2017
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- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2016): CiteScore 4.63 SJR 1.625 SNIP 1.401
- Web of Science (2015): Indexed yes
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- Scopus rating (2014): SJR 2.103 SNIP 1.544 CiteScore 4.75
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 1.886 SNIP 1.51 CiteScore 4.06
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 1.458 SNIP 0.896 CiteScore 2.44
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**Extraction of microplastic from biota: recommended acidic digestion destroys common plastic polymers**

The chemical digestion of tissue from marine biota for microplastic analysis is currently conducted following a variety of protocols published in scientific literature. Often there is a lack of information on whether and to which degree the applied chemicals are destructive to microplastic particles of various polymer types. In the present study we report that a digestion protocol recently recommended by ICES using nitric and perchloric acid has strong detrimental effects on several common plastic polymers, in particular polyamide and polyurethane and to a lesser degree acrylonitrile butadiene styrene, polymethyl methacrylate and polyvinylchloride. Raman spectroscopic measurements revealed changes in peak occurrence and intensity for several polymers that did not otherwise show visual macroscopic changes. We developed and tested an alkaline digestion protocol in order to preserve small microplastic particles while removing organic tissue material. We recommend this method for the development of guidelines for plastic microplastic monitoring in biota.
Global distribution of dissolved organic matter along the aquatic continuum: Across rivers, lakes and oceans

Based on an extensive literature survey containing more than 12,000 paired measurements of dissolved organic carbon (DOC) concentrations and absorption of chromophoric dissolved organic matter (CDOM) distributed over four continents and seven oceans, we described the global distribution and transformation of dissolved organic matter (DOM) along the aquatic continuum across rivers and lakes to oceans. A strong log-linear relationship ($R^2 = 0.92$) between DOC concentration and CDOM absorption at 350 Å nm was observed at a global scale, but was found to be ecosystem-dependent at local and regional scales. Our results reveal that as DOM is transported towards the oceans, the robustness of the observed relation decreases rapidly ($R^2$ from 0.94 to 0.44) indicating a gradual decoupling between DOC and CDOM. This likely reflects the decreased connectivity between the landscape and DOM along the aquatic continuum. To support this hypothesis, we used the DOC-specific UV absorbance (SUVA) to characterize the reactivity of the DOM pool which decreased from 4.9 to 1.7 $\text{m}^2 \text{g}^{-1}$ along the aquatic continuum. Across the continuum, a piecewise linear regression showed that the observed decrease of SUVA occurred more rapidly in freshwater ecosystems compared to marine water ecosystems, suggesting that the different degradation processes act preferentially on CDOM rather than carbon content. The observed change in the DOM characteristics along the aquatic continuum also suggests that the terrestrial DOM pool is gradually becoming less reactive, which has profound consequences on cycling of organic carbon in aquatic ecosystems.

General information

State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Section for Oceans and Arctic, Aarhus University
Authors: Massicotte, P. (Ekstern), Asmala, E. (Ekstern), Stedmon, C. (Intern), Markager, S. (Ekstern)
Pages: 180-191
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Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 1.674 SNIP 1.642 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.635 SNIP 1.847 CiteScore 4.2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.527 SNIP 1.759 CiteScore 3.73
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.773 SNIP 1.811 CiteScore 3.7
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.798 SNIP 1.681 CiteScore 3.61
ISI indexed (2011): ISI indexed yes
Insight into understanding water mass circulation and origins in the central Arctic Ocean using dissolved organic matter as a tracer

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Woods Hole Oceanographic Institution, Alfred Wegener Institute for Polar and Marine Research, Norwegian Polar Institute
Authors: Stedmon, C. (Intern), Reader, H. (Intern), Laney, S. (Ekstern), Rabe, B. (Ekstern), Granskog, M. A. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences

Spectral signature of suspended fine particulate material on light absorption properties of CDOM
Fine submicron organic particles can represent an important fraction of the dissolved organic matter (DOM) pool in aquatic ecosystems and their optical properties differ from those normally considered dissolved (< 0.2 μm), which means that the choice of filter type/pore size can influence the light absorption characteristics. In this study, a total of 867 paired CDOM absorption spectra (n =1734) from different ecosystems (lakes, streams, sewages and estuaries) were measured on 0.2
μm and GF/F (nominal pore size 0.7 μm) filters. The aims were to evaluate how fine organic particles influence the spectral signature of the DOM pool and to quantify the effects of choice of filter type. In aquatic ecosystems influenced by terrestrial DOM (rivers and lakes), the dissolved fraction (here defined as< 0.2 μm) overwhelmed the fine particulate signal (0.2–0.7 μm) which did not contribute significantly to the absorption signal. In contrast, freshly-produced fine particles released by phytoplankton significantly increased measured CDOM absorption in productive environments with low terrestrial background. Our results demonstrate that the choice of filter pore size can have a significant impact on the outcome of spectral metrics often used to characterise CDOM such as the spectral slope (S) or the slope ratio (SR). Hence, this may complicate the combining of CDOM absorption measurements from different studies where different pore sizes were used as fine particulate material may significantly influence the spectral signature, particularly in situations where phytoplankton is the dominating source of DOM.
The effect of increased loads of dissolved organic matter on estuarine microbial communities and functions

**General information**
State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Umeå University, University of Copenhagen, Umea University, Københavns Universitet
Authors: Traving, S. J. (Ekstern), Rowe, O. (Ekstern), Jakobsen, N. M. (Ekstern), Sørensen, H. (Ekstern), Dinasquet, J. V. (Forskerdatabase), Stedmon, C. (Intern), Andersson, A. (Ekstern), Riemann, L. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication information
Journal: Frontiers in Microbiology
Volume: 8

Increased river loads are projected as one of the major consequences of climate change in the northern hemisphere, leading to elevated inputs of riverine dissolved organic matter (DOM) and inorganic nutrients to coastal ecosystems. The objective of this study was to investigate the effects of elevated DOM on a coastal pelagic food web from the coastal northern Baltic Sea, in a 32-day mesocosm experiment. In particular, the study addresses the response of bacterioplankton to differences in character and composition of supplied DOM. The supplied DOM differed in stoichiometry and quality and had pronounced effects on the recipient bacterioplankton, driving compositional changes in response to DOM type. The shifts in bacterioplankton community composition were especially driven by the proliferation of Bacteroidetes, Gemmatimonadetes, Planctomycetes, and Alpha- and Betaproteobacteria populations. The DOM additions stimulated protease activity and a release of inorganic nutrients, suggesting that DOM was actively processed. However, no difference between DOM types was detected in these functions despite different community compositions. Extensive release of re-mineralized carbon, nitrogen and phosphorus was associated with the bacterial processing, corresponding to 25-85% of the supplied DOM. The DOM additions had a negative effect on phytoplankton with decreased Chl a and biomass, particularly during the first half of the experiment. However, the accumulating nutrients likely stimulated phytoplankton biomass which was observed to increase towards the end of the experiment. This suggests that the nutrient access partially outweighed the negative effect of increased light attenuation by accumulating DOM. Taken together, our experimental data suggest that parts of the future elevated riverine DOM supply to the Baltic Sea will be efficiently mineralized by microbes. This will have consequences for bacterioplankton and phytoplankton community composition and function, and significantly affect nutrient biogeochemistry.
The one-sample PARAFAC approach reveals molecular size distributions of fluorescent components in dissolved organic matter

Molecular size plays an important role in dissolved organic matter (DOM) biogeochemistry, but its relationship with the fluorescent fraction of DOM (FDOM) remains poorly resolved. Here high-performance size exclusion chromatography (HPSEC) was coupled to fluorescence emission-excitation (EEM) spectroscopy in full spectral (60 emission and 34 excitation wavelengths) and chromatographic resolution (<1 Hz), to enable the mathematical decomposition of fluorescence on an individual sample basis by parallel factor analysis (PARAFAC). The approach allowed cross-system comparisons of molecular size distributions for individual fluorescence components obtained from independent data sets. Spectra extracted from allochthonous DOM were highly similar. Allochthonous and autochthonous DOM shared some spectra, but included unique components. In agreement with the supramolecular assembly hypothesis, molecular size distributions of the fluorescence fractions were broad and chromatographically unresolved, possibly representing reoccurring fluorophores forming noncovalently bound assemblies of varying molecular size. Samples shared underlying fluorescence components that differed in their size distributions but not their spectral properties. Thus, in contrast to absorption measurements, bulk fluorescence is unlikely to reliably indicate the average molecular size of DOM. The one-sample approach enables robust and independent cross-site comparisons without large-scale sampling efforts and introduces new analytical opportunities for elucidating the origins and biogeochemical properties of FDOM.

General information
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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Chalmers University of Technology
Authors: Wünsch, U. (Intern), Murphy, K. R. (Ekstern), Stedmon, C. (Intern)
Pages: 11900-11908
Publication date: 2017
Main Research Area: Technical/natural sciences
Unraveling the size-dependent optical properties of dissolved organic matter

The size-dependent optical properties of dissolved organic matter (DOM) from four Swedish lakes were investigated using High Performance Size Exclusion Chromatography (HPSEC) in conjunction with online characterization of absorbance (240–600 nm) and fluorescence (excitation: 275 nm, emission: 300–600 nm). The molecular size of chromophoric DOM (CDOM) was consistently higher than that of fluorescent DOM (FDOM), with an average difference of 0.37 kDa. The relative abundance of FDOM vs. CDOM ranged from 0.3 to 0.7 across lakes, and increased with decreasing average molecular size. Across sites, the CDOM spectral slopes of the large molecular size fraction were highly similar while the low molecular size fraction differed and contributed to different bulk spectral slopes. Our results indicate structural congruence of high molecular size DOM across systems while lake trophic status determined the characteristics of the low size range. Furthermore, the combination of HPSEC and parallel factor analysis (HPSEC-PARAFAC2) allowed the decomposition of DOM fluorescence chromatograms. Three humic-like components and one protein-like component with broadly overlapping molecular size distributions were identified. This overlap provides further evidence for the supramolecular assembly hypothesis since fluorophores, as revealed by PARAFAC2, occur in aggregates of overlapping molecular size. Our results further suggest a link between the molecular size of these fluorophores and the associated supramolecular assemblies. This study demonstrates the potential for HPSEC and novel mathematical approaches to provide unprecedented insights into the relationship between optical and chemical properties of DOM in aquatic systems.

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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Universite du Quebec a Trois-Rivieres, Uppsala University
Authors: Wünsch, U. (Intern), Stedmon, C. (Intern), Tranvik, L. (Ekstern), Guillemette, F. (Ekstern)
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Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
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BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
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Anoxia-mediated release of dissolved organic matter from Baltic coastal sediments stimulate further hypoxia

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Centre for Ocean Life
Authors: Reader, H. (Intern), Stedmon, C. (Intern), Kowalczuk, P. (Ekstern), Magnusson, Å. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences

an porewater dissolved organic matter lend insight into the role of the coastal filter over time?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Reader, H. (Intern), Stedmon, C. (Intern)
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Main Research Area: Technical/natural sciences
Characterization and fate of dissolved organic matter in the Lena Delta Region, Siberia

General information
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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Alfred-Wegener-Institute für Polar und Meeresforschung, Russian Academy of Sciences
Authors: Goncalves-Araujo, R. (Ekstern), Stedmon, C. (Intern), Heim, B. (Ekstern), Dubinenkov, I. (Ekstern), Kraberg, A. (Ekstern), Moiseev, D. (Ekstern), Bracher, A. (Ekstern)
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Main Research Area: Technical/natural sciences


General information
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Authors: Wünsch, U. (Intern), Murphy, K. R. (Ekstern), Stedmon, C. (Intern)
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Coupling bacterioplankton populations and environment to community function in coastal temperate waters

Bacterioplankton play a key role in marine waters facilitating processes important for carbon cycling. However, the influence of specific bacterial populations and environmental conditions on bacterioplankton community performance remains unclear. The aim of the present study was to identify drivers of bacterioplankton community functions, taking into account the variability in community composition and environmental conditions over seasons, in two contrasting coastal systems. A Least Absolute Shrinkage and Selection Operator (LASSO) analysis of the biological and chemical data obtained from surface waters over a full year indicated that specific bacterial populations were linked to measured functions. Namely, *Synechococcus* (*Cyanobacteria*) was strongly correlated with protease activity. Both function and community composition showed seasonal variation. However, the pattern of substrate utilization capacity could not be directly linked to the community dynamics. The overall importance of dissolved organic matter (DOM) parameters in the LASSO models indicate that bacterioplankton respond to the present substrate landscape, with a particular importance of nitrogenous DOM. The identification of common drivers of bacterioplankton community functions in two different systems.
indicates that the drivers may be of broader relevance in coastal temperate waters.

**General information**

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**Authors:** Traving, S. J. (Ekstern), Bentzon-Tilia, M. (Intern), Knudsen-Leerbeck, H. (Ekstern), Mantikci, M. (Ekstern), Hansen, J. L. S. (Ekstern), Stedmon, C. (Intern), Markager, S. (Ekstern), Riemann, L. (Forskerdatabase)  
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- Web of Science (2016): Indexed yes  
- BFI (2015): BFI-level 1  
- Scopus rating (2015): SJR 1.878 SNIP 1.208 CiteScore 4.15  
- Web of Science (2015): Indexed yes  
- BFI (2014): BFI-level 1  
- Scopus rating (2014): SJR 1.861 SNIP 1.16 CiteScore 3.76  
- Web of Science (2014): Indexed yes  
- BFI (2013): BFI-level 1  
- Scopus rating (2013): SJR 1.751 SNIP 0.951 CiteScore 3.56  
- ISI indexed (2013): ISI indexed no  
- Web of Science (2013): Indexed yes  
- BFI (2012): BFI-level 1  
- Scopus rating (2012): SJR 1.415 SNIP 0.725 CiteScore 2.78  
- ISI indexed (2012): ISI indexed no  
- Scopus rating (2011): SJR 0.626 SNIP 0.187  
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**Bibliographical note**

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**Source:** FindIt  
**Source-ID:** 2345903567  
**Publication:** Research - peer-review › Journal article – Annual report year: 2016

**Drivers of fluorescent dissolved organic matter in the global epipelagic ocean**

Fluorescent dissolved organic matter (FDOM) in open surface waters (< 200 m) of the Atlantic, Pacific, and Indian oceans was analysed by excitation-emission matrix (EEM) spectroscopy and parallel factor analysis (PARAFAC). A four-component PARAFAC model was fit to the EEMs, which included two humic- (C1 and C2) and two amino acid-like (C3
and C4) components previously identified in ocean waters. Generalized additive models (GAMs) were used to explore the environmental factors that drive the global distribution of these PARAFAC components. The explained variance for the humic-like components was substantially larger (> 70%) than for the amino acid-like components (< 35%). The environmental variables exhibiting the largest effect on the global distribution of C1 and C2 were apparent oxygen utilisation followed by chlorophyll a. Positive non-linear relationships between both predictor variables and the two humic-like PARAFAC components suggest that their distribution are biologically controlled. Compared with the dark ocean (> 200 m), the relationships of C1 and C2 with AOU indicate a higher C1/AOU and C2/AOU ratios of the humic-like substances in the dark ocean than in the surface ocean where a net effect of photobleaching is also detected. C3 (tryptophan-like) and C4 (tyrosine-like) variability was mostly dictated by salinity (S), by means of positive non-linear relationships, suggesting a primary physical control of their distributions at the global surface ocean scale that could be related to the changing evaporation-precipitation regime. Remarkably, bacterial biomass (BB) only contributed to explain a minor part of the variability of C1 and C4.
Effect of arctic sea-ice melt on inherent optical properties and vertical distribution of solar radiant heating - possible feedbacks on ice melt

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute
Authors: Granskog, M. A. (Ekstern), Pavlov, A. K. (Ekstern), Sagan, S. (Ekstern), Kowalczuk, P. (Ekstern), Raczkowska, A. (Ekstern), Stedmon, C. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Effects of an Arctic under-ice phytoplankton bloom on bio-optical properties of surface waters during the Norwegian Young Sea Ice Cruise (N-ICE2015)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Bergen, Norwegian Polar Institute, University of Manitoba, Alfred Wegener Institute for Polar and Marine Research
Authors: Pavlov, A. K. (Ekstern), Granskog, M. A. (Ekstern), Hudson, S. R. (Ekstern), Kauko, H. (Ekstern), Hamre, B. (Ekstern), Assmy, P. (Ekstern), Mundy, C. J. (Ekstern), Nicolaus, M. (Ekstern), Kowalczuk, P. (Ekstern), Stedmon, C. (Intern), Mendez, M. F. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016
Experimental insights into the importance of aquatic bacterial community composition to the degradation of dissolved organic matter

Bacteria play a central role in the cycling of carbon, yet our understanding of the relationship between the taxonomic composition and the degradation of dissolved organic matter (DOM) is still poor. In this experimental study, we were able to demonstrate a direct link between community composition and ecosystem functioning in that differently structured aquatic bacterial communities differed in their degradation of terrestrially derived DOM. Although the same amount of carbon was processed, both the temporal pattern of degradation and the compounds degraded differed among communities. We, moreover, uncovered that low-molecular-weight carbon was available to all communities for utilisation, whereas the ability to degrade carbon of greater molecular weight was a trait less widely distributed. Finally, whereas the degradation of either low- or high-molecular-weight carbon was not restricted to a single phylogenetic clade, our results illustrate that bacterial taxa of similar phylogenetic classification differed substantially in their association with the degradation of DOM compounds. Applying techniques that capture the diversity and complexity of both bacterial communities and DOM, our study provides new insight into how the structure of bacterial communities may affect processes of biogeochemical significance.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Lund University, Uppsala University, University of Copenhagen, KTH - Royal Institute of Technology, Swedish University of Agricultural Sciences
Authors: Logue, J. (Ekstern), Stedmon, C. (Intern), Kellerman, A. (Ekstern), Nielsen, N. (Ekstern), Andersson, A. (Ekstern), Laudon, H. (Ekstern), Lindström, E. (Ekstern), Kritzberg, E. (Ekstern)
Pages: 533-545
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: ISME Journal
Volume: 10
Issue number: 3
ISSN (Print): 1751-7362
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 8.91 SJR 4.771 SNIP 2.188
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 6.087 SNIP 2.363 CiteScore 9.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 5.056 SNIP 2.181 CiteScore 8.42
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 4.71 SNIP 2.175 CiteScore 8.62
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 4.673 SNIP 2.07 CiteScore 8.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.536 SNIP 1.777 CiteScore 6.5
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.245 SNIP 1.626
The White Sea is a semi-enclosed Arctic marginal sea receiving a significant loading of freshwater (225-231 km³ yr⁻¹ equaling an annual runoff yield of 2.5 m) and dissolved organic matter (DOM) from river runoff. We report discharge weighted values of stable oxygen isotope ratios (δ¹⁸O) of -14.0‰ in Northern Dvina river for the period 10 May-12 October 2012. We found a significant linear relationship between salinity (S) and δ¹⁸O (δ¹⁸O=-17.66±0.58+0.52±0.02×S; R²=0.96, N=162), which indicates a dominant contribution of river water to the freshwater budget and little influence of sea ice formation or melt. No apparent brine additions from sea-ice formation is evident in the White Sea deep waters as seen from a joint analysis of temperature (T), S, δ¹⁸O and aCDOM(350) data, confirming previous suggestions about strong tidal induced vertical mixing in winter being the likely source of the deep waters. We investigated properties and distribution of colored dissolved organic matter (CDOM) and dissolved organic carbon (DOC) in the White Sea basin and coastal areas in summer. We found contrasting DOM properties in the inflowing Barents Sea waters and White Sea waters influenced by terrestrial runoff. Values of absorption by CDOM at 350 nm (aCDOM(350)) and DOC (exceeding 10 m⁻¹ and 550 μmol l⁻¹, respectively) in surface waters of the White Sea basin are higher compared to other river-influenced coastal Arctic domains. Linear relationship between S and CDOM absorption, and S and DOC (DOC=959.21±52.99-25.80±1.79×S; R²=0.85; N=154) concentrations suggests conservative mixing of DOM in the White Sea. The strongest linear correlation between CDOM absorption and DOC was found in the ultraviolet (DOC=56.31±2.76+9.13±0.15×aCDOM(254); R²=0.99; N=155), which provides an easy and robust tool to trace DOC using CDOM absorption measurements as well as remote sensing algorithms. Deviations from this linear relationship in surface waters likely indicate contribution from different rivers along the coast of the White Sea. Characteristics of CDOM further indicate that there is limited removal or change in the DOM pool before it exits to the Barents Sea.
Quantum yields of natural organic matter and organic compounds: Implications for the fluorescence-based interpretation of organic matter composition

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of New South Wales
Authors: Wünsch, U. (Intern), Murphy, K. R. (Ekstern), Stedmon, C. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016
Sediment extracted organic matter fluorescence: an archive of organic matter flux and origins?

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Lund University
Authors: Stedmon, C. (Intern), Funkey, C. (Ekstern), Conley, D. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

The compositional change of Fluorescent Dissolved Organic Matter across Fram Strait assessed with use of a multi channel in situ fluorometer

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute
Authors: Raczkowska, A. (Ekstern), Kowalczuk, P. (Ekstern), Sagan, S. (Ekstern), Zabłocka, M. (Ekstern), Pavlov (Ekstern), Granskog, M. A. (Ekstern), Stedmon, C. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Using fluorescent dissolved organic matter to trace and distinguish the origin of Arctic surface waters
Climate change affects the Arctic with regards to permafrost thaw, sea-ice melt, alterations to the freshwater budget and increased export of terrestrial material to the Arctic Ocean. The Fram and Davis Straits represent the major gateways connecting the Arctic and Atlantic. Oceanographic surveys were performed in the Fram and Davis Straits, and on the east Greenland Shelf (EGS), in late summer 2012/2013. Meteoric (f(mw)), sea-ice melt, Atlantic and Pacific water fractions were determined and the fluorescence properties of dissolved organic matter (FDOM) were characterized. In Fram Strait and EGS, a robust correlation between visible wavelength fluorescence and f(mw) was apparent, suggesting it as a reliable tracer of polar waters. However, a pattern was observed which linked the organic matter characteristics to the origin of polar waters. At depth in Davis Strait, visible wavelength FDOM was correlated to apparent oxygen utilization (AOU) and traced deep-water DOM turnover. In surface waters FDOM characteristics could distinguish between surface waters from eastern (Atlantic + modified polar waters) and western (Canada-basin polar waters) Arctic sectors. The findings highlight the potential of designing in situ multi-channel DOM fluorometers to trace the freshwater origins and decipher water mass mixing dynamics in the region without laborious samples analyses.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI), Norwegian Polar Institute, Fisheries and Oceans Canada
Authors: Goncalves-Araujo, R. (Ekstern), Granskog, M. A. (Ekstern), Bracher, A. (Ekstern), Azetsu-Scott, K. (Ekstern), Dodd, P. A. (Ekstern), Stedmon, C. A. (Intern)
Pages: 1-12
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
Journal: Scientific Reports
Volume: 6
ISSN (Print): 2045-2322
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.625 SNIP 1.401
Web of Science (2016): Indexed yes
ABUNDANCE, SIZE AND POLYMER COMPOSITION OF MARINE MICROPLASTICS ≥10μM IN THE ATLANTIC OCEAN AND THEIR MODELLED VERTICAL DISTRIBUTION

We studied abundance, size and polymer type of microplastic down to 10 μm along a transect from the European Coast to the North Atlantic Subtropical Gyre (NASG) using an underway intake filtration technique and Raman micro-spectrometry. Concentrations ranged from 13 to 501 items m⁻³. Highest concentrations were observed at the European coast, decreasing towards mid-Atlantic waters but elevated in the western NASG. We observed highest numbers among particles in the 10–20 μm size fraction, whereas the total volume was highest in the 50–80 μm range. Based on a numerical model size-dependent depth profiles of polyethylene microspheres in a range from 10–1000 μm were calculated and show a strong dispersal throughout the surface mixed layer for sizes smaller than 200 μm. From model and field study results we conclude that small microplastic is ubiquitously distributed over the ocean surface layer and has a lower residence time than larger plastic debris in this compartment.
A critical assessment of visual identification of marine microplastics using Raman spectroscopy for analysis improvement

Identification and characterisation of microplastic (MP) is a necessary step to evaluate their concentrations, chemical composition and interactions with biota. MP ≥10 μm diameter filtered from below the sea surface in the European and subtropical North Atlantic were simultaneously identified by visual microscopy and Raman micro-spectroscopy. Visually identified particles below 100 μm had a significantly lower percentage confirmed by Raman than larger ones indicating that visual identification alone is inappropriate for studies on small microplastics. Sixty-eight percent of visually counted MP (n = 1279) were spectroscopically confirmed being plastic. The percentage varied with type, colour and size of the MP. Fibres had a higher success rate (75%) than particles (64%). We tested Raman micro-spectroscopy applicability for MP identification with respect to varying chemical
composition (additives), degradation state and organic matter coating. Partially UV-degraded postconsumer plastics provided identifiable Raman spectra for polymers most common among marine MP, i.e. polyethylene and polypropylene.

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Department of Micro- and Nanotechnology, Technical University of Denmark  
**Authors:** Lenz, R. (Intern), Enders, K. (Intern), Stedmon, C. (Intern), Mackenzie, D. M. (Intern), Nielsen, T. G. (Intern)  
**Pages:** 82-91  
**Publication date:** 2015  
**Main Research Area:** Technical/natural sciences

**Publication information**  
**Journal:** Marine Pollution Bulletin  
**Volume:** 100  
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**Ratings:**  
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Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 2  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 2  
Scopus rating (2016): CiteScore 3.46 SJR 1.302 SNIP 1.331  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 2  
Scopus rating (2015): SJR 1.245 SNIP 1.277 CiteScore 3.23  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): SJR 1.304 SNIP 1.425 CiteScore 3.04  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 1  
Scopus rating (2013): SJR 1.208 SNIP 1.546 CiteScore 2.89  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 1  
Scopus rating (2012): SJR 1.241 SNIP 1.377 CiteScore 2.64  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): SJR 1.248 SNIP 1.336 CiteScore 2.57  
ISI indexed (2011): ISI indexed yes  
Web of Science (2011): Indexed yes  
BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 1.284 SNIP 1.284  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 1.302 SNIP 1.202  
Web of Science (2009): Indexed yes  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 1.366 SNIP 1.336  
Web of Science (2008): Indexed yes  
Scopus rating (2007): SJR 1.333 SNIP 1.343  
Scopus rating (2006): SJR 1.176 SNIP 1.384  
Scopus rating (2005): SJR 0.927 SNIP 1.26  
Scopus rating (2004): SJR 1.06 SNIP 1.302  
Scopus rating (2003): SJR 1.226 SNIP 1.379
A model of extracellular enzymes in free-living microbes: Which strategy pays off?

An initial modeling approach was applied to analyze how a single, nonmotile, free-living, heterotrophic bacterial cell may optimize the deployment of its extracellular enzymes. Free-living cells live in a dilute and complex substrate field, and to gain enough substrate, their extracellular enzymes must be utilized efficiently. The model revealed that surface-attached and free enzymes generate unique enzyme and substrate fields, and each deployment strategy has distinctive advantages. For a solitary cell, surface-attached enzymes are suggested to be the most cost-efficient strategy. This strategy entails potential substrates being reduced to very low concentrations. Free enzymes, on the other hand, generate a radically different substrate field, which suggests significant benefits for the strategy if free cells engage in social foraging or experience high substrate concentrations. Swimming has a slight positive effect for the attached-enzyme strategy, while the effect is negative for the free-enzyme strategy. The results of this study suggest that specific dissolved organic compounds in the ocean likely persist below a threshold concentration impervious to biological utilization. This could help explain the persistence and apparent refractory state of oceanic dissolved organic matter (DOM). Microbial extracellular enzyme strategies, therefore, have important implications for larger-scale processes, such as shaping the role of DOM in ocean carbon sequestration.
An approach to estimate the freshwater contribution from glacial melt and precipitation in East Greenland shelf waters using colored dissolved organic matter (CDOM)

Changes in the supply and storage of freshwater in the Arctic Ocean and its subsequent export to the North Atlantic can potentially influence ocean circulation and climate. In order to understand how the Arctic freshwater budget is changing and the potential impacts, it is important to develop and refine empirical approaches for tracing freshwater contributions. This in turn can help develop and validate model simulations. Arctic rivers are an important source of freshwater and stable oxygen isotope measurements are used to separate contributions from meteoric water (river, glacial, and precipitation) and sea ice melt. We develop this approach further and investigate the use of an additional tracer, colored dissolved organic matter (CDOM), which is largely specific to freshwater originating from Arctic rivers. A robust relationship between the freshwater contribution from meteoric water and CDOM is derived from 4 years of measurements in Fram Strait (2009-2012), combined with measurements from the East Greenland shelf and Dijmpha Sound (NE Greenland). Results confirm a high contribution of riverine CDOM in Arctic halocline waters with salinities >31.5 and indicate the importance of shelf processes (riverine input and sea ice formation), while previously, these waters where thought to be derived from open sea processes (cooling and sea ice formation) in the northern Barents and Kara Seas. In Greenlandic coastal waters the meteoric water contribution is influenced by Greenland ice sheet meltwater and deviations from the CDOM-meteorics water relationships found are applied to quantify meltwater contribution along the East Greenland shelf waters (0-13%).

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute
Authors: Stedmon, C. (Intern), Granskog, M. A. (Ekstern), Dodd, P. A. (Ekstern)
Pages: 1107-1117
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Geophysical Research: Oceans
Volume: 120
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ISSN (Print): 2169-9275
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.36 SJR 1.996 SNIP 1.313
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.288 SNIP 1.362 CiteScore 3.39
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.324 SNIP 1.349 CiteScore 3.27
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.357 SNIP 1.44 CiteScore 3.38
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.365 SNIP 1.35 CiteScore 2.93
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.239 SNIP 1.301 CiteScore 3.03
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Anoxia-mediated release of dissolved organic matter from sediments in the Baltic Sea

BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.449 SNIP 1.324
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.347 SNIP 1.359
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.101 SNIP 1.296
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.054 SNIP 1.26
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.166 SNIP 1.351
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.159 SNIP 1.228
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.232 SNIP 1.376
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.116 SNIP 1.455
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.269 SNIP 1.581
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.66 SNIP 1.524
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 2.729 SNIP 1.489
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 2.901 SNIP 1.532
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Publication: Research - peer-review › Journal article – Annual report year: 2015

Biotilgængelighed og mikrobiel nedbrydning af organisk materiale i en højtaktisk fjord, Young Sound - NØ Grønland

Biotilgængelighed og mikrobiel nedbrydning af organisk materiale i en højtaktisk fjord, Young Sound - NØ Grønland

Changes in the composition and bioavailability of dissolved organic matter during sea ice formation

The Arctic Ocean receives a large amount of terrestrial dissolved organic matter (DOM) from rivers and more than half of this is removed during its passage through the Arctic Ocean. Terrestrial DOM is generally believed to have a low
bioavailability and recent studies point to physicochemical processes such as sea ice formation as the source of the significant DOM removal in the Arctic Ocean. We present the results of a mesocosm experiment designed to investigate how sea ice formation affects DOM composition and bioavailability. We measured the change in different fluorescent dissolved organic matter (FDOM) fractions in sea ice, brines (contained in small pores between the ice crystals), and the underlying seawater during a 14 d experiment. Two series of mesocosms were used: one with seawater alone and one with seawater enriched with humic-rich river water. Abiotic processes increased the humic-like FDOM signal in the seawater below the ice during the initial ice formation. Humic-like FDOM fractions with a marine signal were preferentially retained in sea ice (relative to salinity), whereas humic-like FDOM with a terrestrial signal behaved more conservatively with respect to salinity. Amino acid-like FDOM and an unknown FDOM component, only previously found in Antarctic brines, were associated with biological activity and possibly extracellular polymeric substances in sea ice. An additional long-term (226-228 d) bioassay experiment with seawater collected from the mesocosm experiment revealed that 11%+/− 2% of the bulk dissolved organic carbon (DOC) was bioavailable. However, 16%+/− 12% of DOC expelled from the ice into the seawater below was bioavailable and the bioavailability of DOC in brine was even higher at 45%. DOM is highly susceptible to physicochemical changes during sea ice formation, leading to modifications in composition and increased bioavailability, which can in part explain terrestrial DOC removal in the Arctic Ocean.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Copenhagen, Bangor University, Finnish Environment Institute
Authors: Jørgensen, L. (Intern), Stedmon, C. A. (Intern), Kaartokallio, H. (Ekstern), Middelboe, M. (Ekstern), Thomas, D. N. (Ekstern)
Pages: 817-830
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Main Research Area: Technical/natural sciences

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Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.38 SNIP 1.425
Web of Science (2010): Indexed yes
Changes in the freshwater inventory of the Young Sound-Tyroler fjord system (NE Greenland): evidence from 10 years of Greenland Ecosystem Monitoring

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Aarhus University, Greenland Institute of Natural Resources
Authors: Stedmon, C. (Intern), Sejr, M. (Ekstern), Juul Pedersen, T. (Ekstern)
Publication date: 2015
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Main Research Area: Technical/natural sciences
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Changes in the freshwater inventory of Young Sound-Tyroler fjord system (NE Greenland): Evidence from 10 years of Greenland Ecosystem Monitoring

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Aarhus University, Greenland Climate Research Centre, Aarhus University
Authors: Stedmon, C. (Intern), Sejr, M. (Ekstern), Bendtsen, J. (Ekstern), Dalsgaard, T. (Ekstern), Juul Pedersen, T. (Ekstern), Mortensen, J. (Ekstern), Rysgaard, S. (Ekstern)
Number of pages: 1
Publication date: 2015

Host publication information
Title of host publication: Book of Abstracts. DTU's Sustain Conference 2015
Characterising organic matter in recirculating aquaculture systems with fluorescence EEM spectroscopy

The potential of recirculating aquaculture systems (RAS) in the aquaculture industry is increasingly being acknowledged. Along with intensified application, the need to better characterise and understand the accumulated dissolved organic matter (DOM) within these systems increases. Mature RASs, stocked with rainbow trout and operated at steady state at four feed loadings, were analysed by dissolved organic carbon (DOC) analysis and fluorescence excitation-emission matrix (EEM) spectroscopy. The fluorescence dataset was then decomposed by PARAFAC analysis using the drEEM toolbox. This revealed that the fluorescence character of the RAS water could be represented by five components, of which four have previously been identified in fresh water, coastal marine water, wetlands and drinking water. The fluorescence components as well as the DOC showed positive correlations with feed loading, however there was considerable variation between the five fluorescence components with respect to the degree of accumulation with feed loading. The five components were found to originate from three sources: the feed; the influent tap water (groundwater); and processes related to the fish and the water treatment system. This paper details the first application of fluorescence EEM spectroscopy to assess DOM in RAS, and highlights the potential applications of this technique within future RAS management strategies.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Department of Environmental Engineering, Section for Aquaculture
Authors: Hambly, A. (Intern), Arvin, E. (Intern), Pedersen, L. (Intern), Pedersen, P. B. (Intern), Seredynska-Sobecka, B. (Intern), Stedmon, C. (Intern)
Pages: 112-120
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.629 SNIP 2.558
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.689 SNIP 2.507 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.957 SNIP 2.727 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.693 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.966 SNIP 2.456 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Contrasting optical properties of surface waters across the Fram Strait and its potential biological implications

Underwater light regime is controlled by distribution and optical properties of colored dissolved organic matter (CDOM) and particulate matter. The Fram Strait is a region where two contrasting water masses are found. Polar water in the East Greenland Current (EGC) and Atlantic water in the West Spitsbergen Current (WSC) differ with regards to temperature, salinity and optical properties. We present data on absorption properties of CDOM and particles across the Fram Strait (along 79° N), comparing Polar and Atlantic surface waters in September 2009 and 2010. CDOM absorption of Polar water in the EGC was significantly higher (more than 3-fold) compared to Atlantic water in the WSC, with values of absorption coefficient, $a_{CDOM}(350)$, m$^{-1}$ of 0.565±0.100 (in 2009) and 0.458±0.117 (in 2010), and 0.138±0.036 (in 2009) and 0.153±0.039 (in 2010), respectively. An opposite pattern was observed for particle absorption with higher absorption found in the eastern part of the Fram Strait. Average values of particle absorption ($a_p(440)$, m$^{-1}$) were 0.016±0.013 (in 2009) and 0.014±0.011 (in 2010), and 0.047±0.012 (in 2009) and 0.016±0.014 (in 2010), respectively for Polar and Atlantic water. Thus absorption of light in eastern part of the Fram Strait is dominated by particles - predominantly phytoplankton, and the absorption of light in the western part of the strait is dominated by CDOM, with predominantly terrigenous origin. As a result the balance between the importance of CDOM and particulates to the total absorption budget in the upper 0-10m shifts across Fram Strait. Underwater spectral irradiance profiles were generated using ECOLIGHT 5.4.1 and the results indicate that the shift in composition between dissolved and particulate material does not influence substantially the penetration of photosynthetic active radiation (PAR, 400-700nm), but does result in notable differences in ultraviolet (UV) light penetration, with higher attenuation in the EGC. Future changes in the Arctic Ocean system will likely affect EGC through diminishing sea-ice cover and potentially increasing CDOM export due to increase in river runoff into the Arctic Ocean. Role of attenuation of light by CDOM in determining underwater light regime will become more important, with a potential for future increase in marine productivity in the area of EGC due to elevated PAR and lowered UV light exposures.
Effect of sea-ice melt on inherent optical properties and vertical distribution of solar radiant heating in Arctic surface waters

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute, Polish Academy of Sciences
Authors: Granskog, M. A. (Ekstern), Pavlov, A. K. (Ekstern), Sagan, S. (Ekstern), Kowalczuk, P. (Ekstern), Raczkowska, A. (Ekstern), Stedmon, C. A. (Intern)
Pages: 7028-7039
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Geophysical Research: Oceans
Volume: 120
Issue number: 10
ISSN (Print): 2169-9275
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.36 SJR 1.996 SNIP 1.313
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.288 SNIP 1.362 CiteScore 3.39
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.324 SNIP 1.349 CiteScore 3.27
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.357 SNIP 1.44 CiteScore 3.38
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.365 SNIP 1.35 CiteScore 2.93
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2

Absorbance and fluorescence spectroscopy are economical tools for tracing the supply, turnover and fate of dissolved organic matter (DOM). The colored and fluorescent fractions of DOM (CDOM and FDOM, respectively) are linked by the apparent fluorescence quantum yield (AQY) of DOM, which reflects the likelihood that chromophores emit fluorescence after absorbing light. Compared to the number of studies investigating CDOM and FDOM, few studies have systematically investigated AQY spectra for DOM, and linked them to fluorescence quantum yields (Φ) of organic compounds. To offer a standardized approach, a MATLAB toolbox for the determination of apparent quantum yields of DOM (aquaDOM), featuring two calculation approaches, was developed and used to derive AQYs for samples from the Norwegian Sea. Φ of the organic compounds varied between 0.00079 and 0.35, whereas the average AQY for DOM samples at 350 nm was 0.011 ± 0.003. The AQY at 350 nm increased with depth, while the AQY at 250 nm showed no trend. Laboratory tests indicated that Φ of compound mixtures are additive and represent an intermediate of the constituents. Additionally, the presence of non-fluorescent chromophores greatly suppressed calculated AQYs. Similar trends in the DOM AQY at 350 nm were observed in natural samples. We therefore hypothesize that fluorescence AQYs can indicate changes in the relative abundances of CDOM and FDOM. Additionally, the optical properties of 15 potential DOM constituents were determined and compared to more than 200 modeled spectra (PARAFAC components) in the OpenFluor database. Apparent matches, based on spectral similarity, were subsequently evaluated using molar fluorescence and absorbance. Five organic compounds were potential matches with PARAFAC components from 16 studies; however, the ability to confirm matches was limited due to multiple compounds exhibiting very similar spectra. This reiterates the fact that spectral similarity alone is insufficient evidence of the presence of particular compounds, and additional evidence is required.
**From Fresh to Marine Waters: Characterization and Fate of Dissolved Organic Matter in the Lena River Delta Region, Siberia**

Connectivity between the terrestrial and marine environment in the Artic is changing as a result of climate change, influencing both freshwater budgets and the supply of carbon to the sea. This study characterizes the optical properties of dissolved organic matter (DOM) within the Lena Delta region and evaluates the behavior of DOM across the fresh water-marine gradient. Six fluorescent components (four humic-like; one marine humic-like; one protein-like) were identified by Parallel Factor Analysis (PARAFAC) with a clear dominance of allochthonous humic-like signals. Colored DOM (CDOM) and dissolved organic carbon (DOC) were highly correlated and had their distribution coupled with hydrographical conditions. Higher DOM concentration and degree of humification were associated with the low salinity waters of the Lena River. Values decreased towards the higher salinity Laptev Sea shelf waters. Results demonstrate different responses of DOM mixing in relation to the vertical structure of the water column, as reflecting the hydrographical dynamics in the region. Two mixing curves for DOM were apparent. In surface waters above the pycnocline there was a sharper decrease in DOM concentration in relation to salinity indicating removal. In the bottom water layer the DOM decrease within salinity was less. We propose there is a removal of DOM occurring primarily at the surface layer, which is likely driven by photodegradation and flocculation.
Kulstof i havet - en tynd kop te?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Marine Living Resources, University of Copenhagen
Authors: Traving, S. J. (Ekstern), Stedmon, C. (Intern), Riemann, L. (Ekstern), Thygesen, U. H. (Intern)
Pages: 14-18
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Aktuel naturvidenskab
Issue number: 5
ISSN (Print): 1399-2309
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2015

Mass and UV-visible spectral fingerprints of dissolved organic matter: sources and reactivity

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Copenhagen, Lund University
Authors: Reader, H. (Intern), Stedmon, C. (Intern), Nielsen, N. J. (Ekstern), Kritzberg, E. (Ekstern)
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Marine Science
Volume: 2
Issue number: 88
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.53 SJR 0.173 SNIP 0.109
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.145 SNIP 0.05
BFI (2014): BFI-level 1
Microbially-Mediated Fluorescent Organic Matter Transformations in the Deep Ocean: Do the Chemical Precursors Matter?

The refractory nature of marine dissolved organic matter (DOM) increases while it travels from surface waters to the deep ocean. This resistant fraction is in part composed of fluorescent humic-like material, which is relatively difficult to metabolize by deep water prokaryotes, and it can also be generated by microbial activity. It has been recently argued that microbial production of new fluorescent DOM (FDOM) requires the presence of humic precursors in the surrounding environment. In order to experimentally test how the chemical quality of the available organic compounds influences the production of new FDOM, three experiments were performed with bathypelagic Atlantic waters. Microbial communities were incubated in three treatments which differed in the quality of the organic compounds added: i) glucose and acetate; ii) glucose, acetate, essential amino acids and humic acids; and iii) humic acids alone. The response of the prokaryotes and the production of FDOM were simultaneously monitored. Prokaryotic abundance was highest in treatments where labile compounds were added. The rate of humic-like fluorescence production scaled to prokaryotic abundance varied depending on the quality of the additions. The precursor compounds affected the generation of new humic-like FDOM, and the cell-specific production of this material was higher in the incubations amended with humic precursors. Furthermore, we observed that the protein-like fluorescence decreased only when fresh amino acids were added. These findings contribute to the understanding of FDOM variability in deep waters and provide valuable information for studies where fluorescent compounds are used in order to track water masses and/or microbial processes.
Monitoring RAS organic matter by fluorescence EEM spectroscopy

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Department of Environmental Engineering, Section for Aquaculture
Authors: Hambly, A. (Intern), Arvin, E. (Intern), Pedersen, L. (Intern), Pedersen, P. B. (Intern), Stedmon, C. (Intern)
Pages: 25
Publication date: 2015

Host publication information
Title of host publication: 3rd NordicRAS Workshop on Recirculating Aquaculture Systems Molde, Norway, 30 September - 1 October 2015 : Book of Abstracts
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
Editor: Dalsgaard, A. T.

Predicting spectral and PAR light attenuation in Greenlandic coastal waters
The spectral quality and penetration of light are key parameters controlling the productivity of Greenlandic fjords. Solar elevation and sea ice play an important role, but during the increasing ice free period and summer months in particular, light is also regulated by water constituents. We present models for spectral and PAR (photosynthetically active radiation) attenuation in two contrasting Greenlandic fjords, Godthåbsfjord (SW Greenland) and Young Sound (NE Greenland). The fjords differ in the character and concentrations of optically active components present: dissolved organic material (CDOM), phytoplankton pigments and inorganic particles. These differences are due in part to hydrography and to the sources of meltwater: respectively, fjord-terminating and land-terminating glaciers. We present a model to explain the variation in spectral and PAR irradiance in terms of the variation in optically active components. The ability of our model to predict irradiance is compared with that of 2 existing models.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Aarhus University
Authors: Murray, C. (Ekstern), Markager, S. (Ekstern), Stedmon, C. (Intern)
Publication date: 2015
Event: Abstract from ASLO Aquatic Sciences Meeting 2015, Granada, Spain.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2015

Recent decrease in DOC concentrations in Arctic lakes of southwest Greenland: Decreasing DOC in Arctic lakes

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Maine, North Carolina State University, Loughborough University
Authors: Saros, J. E. (Ekstern), Osburn, C. L. (Ekstern), Northington, R. M. (Ekstern), Birkel, S. D. (Ekstern), Auger, J. D. (Ekstern), Stedmon, C. A. (Intern), Anderson, N. J. (Ekstern)
Pages: 6703-6709
Publication date: 2015
Main Research Area: Technical/natural sciences

Recent decrease in DOC concentrations in Arctic lakes of southwest Greenland: Decreasing DOC in Arctic lakes

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Maine, North Carolina State University, Loughborough University
Authors: Saros, J. E. (Ekstern), Osburn, C. L. (Ekstern), Northington, R. M. (Ekstern), Birkel, S. D. (Ekstern), Auger, J. D. (Ekstern), Stedmon, C. A. (Intern), Anderson, N. J. (Ekstern)
Pages: 6703-6709
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Geophysical Research Letters
Volume: 42
Issue number: 16
ISSN (Print): 0094-8276
Ratings:
BFI (2018): BFI-level 1
Struktur og aktivitet af det mikrobielle samfund gennem den isfrie periode i en højarktisk fjord (Young Sund, NØ Grønland)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Copenhagen, Aarhus University, University of Bergen
Authors: Paulsen, M. L. (Ekstern), Stedmon, C. (Intern), Nielsen, S. E. B. (Intern), Middelboe, M. (Ekstern), Møller, E. F. (Ekstern), Larsen, A. (Ekstern), Sejr, M. (Ekstern)
Publication date: 2015
Event: Abstract from 18. Danske Havforskermøde, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2015

The influence of glacial melt water on bio-optical properties in two contrasting Greenlandic fjords

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Aarhus University, Greenland Institute of National Resources
Authors: Murray, C. (Ekstern), Markager, S. (Ekstern), Stedmon, C. A. (Intern), Juul-Pedersen, T. (Ekstern), Sejr, M. K. (Ekstern), Bruhn, A. (Ekstern)
Pages: 72-83
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Estuarine, Coastal and Shelf Science
Volume: 163
ISSN (Print): 0272-7714
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.43 SJR 0.997 SNIP 1.127
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.107 SNIP 1.186 CiteScore 2.44
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.067 SNIP 1.257 CiteScore 2.28
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.323 SNIP 1.439 CiteScore 2.64
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.256 SNIP 1.419 CiteScore 2.52
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.383 SNIP 1.325 CiteScore 2.52
ISI indexed (2011): ISI indexed yes
The optical properties of DOM in the ocean

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Stedmon, C. (Intern), Nelson, N. (Ekstern)
Number of pages: 712
Pages: 481-508
Publication date: 2015

Host publication information
Title of host publication: Biogeochemistry of Marine Dissolved Organic Matter
Publisher: Elsevier Science
Editors: Hansell, D., Carlson, C.
Edition: 2.
ISBN (Print): 9780124059405
ISBN (Electronic): 9780124071537
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2015

Turnover time of fluorescent dissolved organic matter in the dark global ocean

Marine dissolved organic matter (DOM) is one of the largest reservoirs of reduced carbon on Earth. In the dark ocean (>200 m), most of this carbon is refractory DOM. This refractory DOM, largely produced during microbial mineralization of organic matter, includes humic-like substances generated in situ and detectable by fluorescence spectroscopy. Here we show two ubiquitous humic-like fluorophores with turnover times of 435±41 and 610±55 years, which persist significantly longer than the ~350 years that the dark global ocean takes to renew. In parallel, decay of a tyrosine-like fluorophore with
a turnover time of 379±103 years is also detected. We propose the use of DOM fluorescence to study the cycling of resistant DOM that is preserved at centennial timescales and could represent a mechanism of carbon sequestration (humic-like fraction) and the decaying DOM injected into the dark global ocean, where it decreases at centennial timescales (tyrosine-like fraction).

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Universidad De Granada, University of Vigo, CSIC Instituto de Investigaciones Mariñas, Institut de Ciències del Mar-CSIC, IEO Centro Oceanográfico de A Coruña
Publication date: 2015
Main Research Area: Technical/natural sciences

**Bioavailability and radiocarbon age of fluvial dissolved organic matter (DOM) from a northern peatland-dominated catchment: effect of land-use change**

The radiocarbon age and biodegradability of dissolved organic matter (DOM) from a northern peat-dominated river system was studied and the effects of land-use were compared. Samples were obtained from streams and ditches comprising sub-catchments of the Kiiminki River, Northern Finland. Sample sites included areas of natural mire, areas subjected to moderate disturbance (ditching to enhance forestry), and areas subjected to serious land use change (agriculture and peat excavation). The study employed a 55 day bioassay that measured the biodegradation potential of surface-water DOM. We identified release of modern (mean 6-13 year old) DOM from natural sites, and material aged up to 1,553 years from...
disturbed sites. The proportion of biodegradable DOC ranged from 4.1 to 17.9 %, and bacterial DOC removal was modelled using twin-pool and reactivity-continuum (beta distribution) approaches. Bacterial growth efficiency ranged from 0.11 to 0.26 between areas of different land use, and these relatively low values reflect the humic-rich DOM released from boreal peatland. Despite the range of land-use types studied, including intensive peatland excavation areas, there was no detectable relationship between the biological lability of DOM and its radiocarbon age.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Finnish Environment Institute, University of Helsinki
Pages: 393-404
Publication date: 2014
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Aquatic Sciences
Volume: 76
Issue number: 3
ISSN (Print): 1015-1621
Ratings:
- BFI (2018): BFI-level 1
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 1
- Web of Science (2017): Indexed Yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): SJR 1.076 SNIP 1.093 CiteScore 2.78
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 1.182 SNIP 1.309 CiteScore 2.54
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 1.272 SNIP 1.61 CiteScore 3.15
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 1.193 SNIP 1.288 CiteScore 2.71
- ISI indexed (2013): ISI indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 1.106 SNIP 1.15 CiteScore 2.33
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 0.892 SNIP 1.184 CiteScore 2.08
- ISI indexed (2011): ISI indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 0.758 SNIP 0.612
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 0.956 SNIP 1.042
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 0.659 SNIP 0.896
- Scopus rating (2007): SJR 0.988 SNIP 1.066
- Scopus rating (2006): SJR 0.822 SNIP 0.973
- Scopus rating (2005): SJR 0.991 SNIP 1.435
- Scopus rating (2004): SJR 0.761 SNIP 0.947
- Web of Science (2004): Indexed yes
- Scopus rating (2003): SJR 0.535 SNIP 0.893
- Scopus rating (2002): SJR 0.361 SNIP 0.841
- Scopus rating (2001): SJR 0.482 SNIP 0.809
Biological origins and fate of fluorescent dissolved organic matter

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Colorado
Authors: Stedmon, C. (Intern), Cory, R. M. (Ekstern)
Number of pages: 418
Pages: 278-300
Publication date: 2014

Host publication information
Title of host publication: Aquatic organic matter fluorescence
Publisher: Cambridge University Press
Editors: Coble, P., Lead, J., Baker, A., Reynolds, D., Spencer, R. G.
ISBN (Print): 9780521764612
Chapter: 8
Series: Cambridge Environmental Chemistry Series
ISSN: 1359-0243
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2014

Chemometric analysis of organic matter fluorescence

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of New South Wales, University of Copenhagen
Authors: Murphy, K. (Ekstern), Stedmon, C. (Intern), Bro, R. (Ekstern)
Number of pages: 418
Pages: 339-375
Publication date: 2014

Host publication information
Title of host publication: Aquatic organic matter fluorescence
Publisher: Cambridge University Press
Editors: Coble, P., Lead, J., Baker, A., Reynolds, D., Spencer, R. G.
ISBN (Print): 9780521764612
Chapter: 10
Series: Cambridge Environmental Chemistry Series
ISSN: 1359-0243
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2014

Controls of dissolved organic matter quality: Evidence from a large-scale boreal lake survey

Inland waters transport large amounts of dissolved organic matter (DOM) from terrestrial environments to the oceans, but DOM also reacts en route, with substantial water column losses by mineralization and sedimentation. For DOM transformations along the aquatic continuum, lakes play an important role as they retain waters in the landscape allowing for more time to alter DOM. We know DOM losses are significant at the global scale, yet little is known about how the reactivity of DOM varies across landscapes and climates. DOM reactivity is inherently linked to its chemical composition. We used fluorescence spectroscopy to explore DOM quality from 560 lakes distributed across Sweden and encompassed a wide climatic gradient typical of the boreal ecozone. Six fluorescence components were identified using parallel factor analysis (PARAFAC). The intensity and relative abundance of these components were analyzed in relation to lake chemistry, catchment, and climate characteristics. Land cover, particularly the percentage of water in the catchment, was a primary factor explaining variability in PARAFAC components. Likewise, lake water retention time influenced DOM
quality. These results suggest that processes occurring in upstream water bodies, in addition to the lake itself, have a
dominant influence on DOM quality. PARAFAC components with longer emission wavelengths, or red-shifted
components, were most reactive. In contrast, protein-like components were most persistent within lakes. Generalized
characteristics of PARAFAC components based on emission wavelength could ease future interpretation of fluorescence
spectra. An important secondary influence on DOM quality was mean annual temperature, which ranged between -6.2 and
+7.5 °C. These results suggest that DOM reactivity depends more heavily on the duration of time taken to pass through
the landscape, rather than temperature. Projected increases in runoff in the boreal region may force lake DOM toward a
higher overall amount and proportion of humic-like substances

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Uppsala University, Lund University
Authors: Kothawala, D. (Ekstern), Stedmon, C. (Intern), Müller, R. (Ekstern), Weyhenmeyer, G. (Ekstern), Köhler, S.
(Ekstern), Tranvik, L. (Ekstern)
Pages: 1101-1114
Publication date: 2014
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Global Change Biology
Volume: 20
Issue number: 4
ISSN (Print): 1354-1013
Ratings:
- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 8.75 SJR 4.768 SNIP 2.615
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 5.239 SNIP 2.585 CiteScore 8.48
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 4.636 SNIP 2.693 CiteScore 8.33
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 4.624 SNIP 2.655 CiteScore 8.4
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 4.228 SNIP 2.388 CiteScore 7.2
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 4.385 SNIP 2.23 CiteScore 6.86
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 2
- Scopus rating (2010): SJR 4.394 SNIP 2.257
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 2
- Scopus rating (2009): SJR 4.127 SNIP 2.178
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 2
- Scopus rating (2008): SJR 3.934 SNIP 2.203
- Web of Science (2008): Indexed yes
Links between implementation of Water Framework Directive and changes in plaice distribution along the Danish west coast

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography
Authors: Støttrup, J. (Intern), Kodama, J. (Ekstern), Stedmon, C. (Intern)
Publication date: 2014
Event: Abstract from The International Symposium on Integrated Coastal Zone Management, Antalya, Turkey.
Main Research Area: Technical/natural sciences

OpenFluor - an online spectral library of auto-fluorescence by organic compounds in the environment

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of New South Wales, University of Copenhagen
Authors: Murphy, K. R. (Ekstern), Stedmon, C. A. (Intern), Wenig, P. (Ekstern), Bro, R. (Ekstern)
Pages: 658-661
Publication date: 2014
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Analytical Methods
Volume: 6
Issue number: 3
ISSN (Print): 1759-9660
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.99 SJR 0.593 SNIP 0.632
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
We investigated how physical incorporation, brine dynamics and bacterial activity regulate the distribution of inorganic nutrients and dissolved organic carbon (DOC) in artificial sea ice during a 19-day experiment that included periods of both ice growth and decay. The experiment was performed using two series of mesocosms: the first consisted of seawater and the second consisted of seawater enriched with humic-rich river water. We grew ice by freezing the water at an air temperature of −14°C for 14 days after which ice decay was induced by increasing the air temperature to −1°C. Using the ice temperatures and bulk ice salinities, we derived the brine volume fractions, brine salinities and Rayleigh numbers. The temporal evolution of these physical parameters indicates that there was two main stages in the brine dynamics: bottom convection during ice growth, and brine stratification during ice decay. The major findings are: (1) the incorporation of dissolved compounds (nitrate, nitrite, ammonium, phosphate, silicate, and DOC) into the sea ice was not conservative (relative to salinity) during ice growth. Brine convection clearly influenced the incorporation of the dissolved compounds, since the non-conservative behavior of the dissolved compounds was particularly pronounced in the absence of brine convection. (2) Bacterial activity further regulated nutrient availability in the ice: ammonium and nitrite accumulated as a result of remineralization processes, although bacterial production was too low to induce major changes in DOC concentrations. (3) Different forms of DOC have different properties and hence incorporation efficiencies. In particular, the terrestrial-derived DOC from the river water was less efficiently incorporated into sea ice than the DOC in the seawater. Therefore, the main factors regulating the distribution of the dissolved compounds within sea ice are clearly a complex interaction of brine dynamics, biological activity and in the case of dissolved organic matter, the physico-chemical properties of the dissolved constituents themselves.

Physical and bacterial controls on inorganic nutrients and dissolved organic carbon during a sea ice growth and decay experiment
Processing of humic-rich riverine dissolved organic matter by estuarine bacteria: effects of predegradation and inorganic nutrients

The bioavailability of predegraded dissolved organic matter (DOM) from a humic-rich, boreal river to estuarine bacteria from the Baltic Sea was studied in 39-day bioassays. The river waters had been exposed to various degrees of bacterial degradation by storing them between 0 and 465 days in dark prior to the bioassay. The resulting predegraded DOM was
inoculated with estuarine bacteria and the subsequent changes in DOM quantity and quality measured. During the incubations, dissolved organic carbon (DOC) and oxygen concentrations decreased, indicating heterotrophic activity. Coloured DOM was degraded less than DOC, indicating a selective utilization of DOM, and humic-like fluorescence components increased during the incubations. The amount of DOC degraded was not affected by the length of DOM predegradation. The percentage of bioavailable DOC (%BDOC) was higher in experiment units with added inorganic nitrogen and phosphorus than without addition (on average 13.5 % and 9.0, respectively), but had no effect on the degradation of fresh, non-predegraded, DOC (%BDOC 12.0 %). Bacterial growth efficiency (BGE) was highest (65 ± 2 %) in the units with fresh DOM, and lowest in units with predegraded DOM and no added inorganic nutrients (11 ± 4 %). The addition of inorganic nutrients increased the BGE of predegraded DOM units by an average of 28 ± 4 %. There was no significant effect on BGE by length of predegradation after the initial drop (<3 months). This study suggests that both the length of predegradation and the inorganic nutrient status in the receiving estuary has consequences to carbon cycling and will determine the amount of terrestrial-derived DOC being ultimately assimilated into marine food webs.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Finnish Environment Institute
Authors: Asmala, E. (Ekstern), Autio, R. (Ekstern), Kaartokallio, H. (Ekstern), Stedmon, C. (Intern), D.N., T. (Ekstern)
Pages: 451-463
Publication date: 2014
Main Research Area: Technical/natural sciences

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BFI (2018): BFI-level 1
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.076 SNIP 1.093 CiteScore 2.78
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.182 SNIP 1.309 CiteScore 2.54
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.272 SNIP 1.61 CiteScore 3.15
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.193 SNIP 1.288 CiteScore 2.71
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.106 SNIP 1.15 CiteScore 2.33
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.892 SNIP 1.184 CiteScore 2.08
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.758 SNIP 0.612
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.956 SNIP 1.042
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.659 SNIP 0.896
Scopus rating (2007): SJR 0.988 SNIP 1.066
Scopus rating (2006): SJR 0.822 SNIP 0.973
Scopus rating (2005): SJR 0.991 SNIP 1.435
Scopus rating (2004): SJR 0.761 SNIP 0.947
Production and transformation of dissolved neutral sugars and amino acids by bacteria in seawater

Dissolved organic matter (DOM) in the ocean consists of a heterogeneous mixture of molecules, most of which are of unknown origin. Neutral sugars and amino acids are among the few recognizable biomolecules in DOM, and the molecular composition of these biomolecules is shaped primarily by biological production and degradation processes. This study provides insight into the bioavailability of biomolecules as well as the chemical composition of DOM produced by bacteria. The molecular compositions of combined neutral sugars and amino acids were investigated in DOM produced by bacteria and in DOM remaining after 32 days of bacterial degradation. Results from bioassay incubations with natural seawater (sampled from water masses originating from the surface waters of the Arctic Ocean and the North Atlantic Ocean) and artificial seawater indicate that the molecular compositions following bacterial degradation are not strongly influenced by the initial substrate or bacterial community. The molecular composition of neutral sugars released by bacteria was characterized by a high glucose content (47 mol %) and heterogeneous contributions from other neutral sugars (3–14 mol %). DOM remaining after bacterial degradation was characterized by a high galactose content (33 mol %), followed by glucose (22 mol %) and the remaining neutral sugars (7–11 mol %). The ratio of D-amino acids to L-amino acids increased during the experiments as a response to bacterial degradation, and after 32 days, the D/L ratios of aspartic acid, glutamic acid, serine and alanine reached around 0.79, 0.32, 0.30 and 0.51 in all treatments, respectively. The striking similarity in neutral sugar and amino acid compositions between natural (representing marine semi-labile and refractory DOM) and artificial (representing bacterially produced DOM) seawater samples, suggests that microbes transform bioavailable neutral sugars and amino acids into a common, more persistent form.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of South Carolina, University of Copenhagen
Authors: Jørgensen, L. (Intern), Lechtenfeld, O. (Ekstern), Benner, R. (Ekstern), Middelboe, M. (Ekstern), Stedmon, C. (Intern)
Pages: 5349-5363
Publication date: 2014
Main Research Area: Technical/natural sciences

Publication information
Journal: Biogeosciences
Volume: 11
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ISSN (Print): 1726-4170
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.25 SJR 2.328 SNIP 1.305
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.453 SNIP 1.324 CiteScore 4.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.194 SNIP 1.363 CiteScore 4.03
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Radiocarbon dating of fluvial organic matter reveals land-use impacts in boreal peatlands

This study measured the effects of land use on organic matter released to surface waters in a boreal peat catchment using radiocarbon dating of particulate and dissolved organic carbon (POC and DOC), DOC concentration, stable carbon and nitrogen isotope composition, and optical measurements. Undisturbed sites invariably released modern DOC and POC (...

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Helsinki, Bangor University, Finnish Environment Institute
Authors: Hulatt, C. J. (Ekstern), Kaartokallio, H. (Ekstern), Oinonen, M. (Ekstern), Sonninen, E. (Ekstern), Stedmon, C. A. (Intern), Thomas, D. N. (Ekstern)
Pages: 12543-12551
Publication date: 2014
Main Research Area: Technical/natural sciences

Publication information

Journal: Environmental Science and Technology
Volume: 48
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ISSN (Print): 0013-936X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
Seasonal contribution of terrestrial organic matter and biological oxygen demand to the Baltic Sea from three contrasting river catchments

To examine the potential influence of terrestrially derived DOM on the Baltic Sea, a year-long study of dissolved organic matter (DOM) was performed in three river catchments in Sweden. One catchment drains into the Bothnian Sea, while two southern catchments drain into the Baltic proper. Dissolved organic carbon (DOC) concentrations were positively correlated with discharge from forested catchments over the year. While the overall concentrations of DOC were several times higher in the southern two catchments, higher discharge in the northern catchment resulted in the annual loadings of DOC being on the same order of magnitude for all three catchments. Biological oxygen demand (BOD) was used as a proxy for the lability of carbon in the system. The range of BOD values was similar for all three catchments, however, the ratio of BOD to DOC (an indication of the labile fraction) in Ume river was four times higher than in the southern two catchments. Total annual BOD loading to the Baltic Sea was twice as high in the northern catchment than in the two southern catchments. Lower winter temperatures and preservation of organic matter in the northern catchment combined with an intense spring flood help to explain the higher concentrations of labile carbon in the northern catchment. Lower lability of DOM as well as higher colour in the southern catchments suggest that wetlands (i.e. peat bogs) may be the dominant source of DOM in these catchments, particularly in periods of low flow. With climate change expected to increase precipitation events and temperatures across the region, the supply and quality of DOM delivered to the Baltic Sea can also be expected to change. Our results indicate that DOM supply to the Baltic Sea from boreal rivers will be more stable throughout the year, and potentially have a lower bioavailability.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Lund University
Authors: Reader, H. E. (Intern), Stedmon, C. A. (Intern), Kritzberg, E. S. (Ekstern)
Pages: 3409-3419
Publication date: 2014
Main Research Area: Technical/natural sciences

Publication information
Journal: Biogeosciences
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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.25 SJR 2.328 SNIP 1.305
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.453 SNIP 1.324 CiteScore 4.04
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.194 SNIP 1.363 CiteScore 4.03
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.468 SNIP 1.425 CiteScore 4.21
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.366 SNIP 1.312 CiteScore 3.92
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.524 SNIP 1.178 CiteScore 3.86
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Tracing the long-term microbial production of recalcitrant fluorescent dissolved organic matter in seawater

The majority of dissolved organic matter (DOM) in the ocean is resistant to microbial degradation, yet its formation remains poorly understood. The fluorescent fraction of DOM can be used to trace the formation of recalcitrant DOM (RDOM). A long-term (> 1 year) experiment revealed 27–52% removal of dissolved organic carbon and a nonlinear increase in RDOM fluorescence associated with microbial turnover of semilabile DOM. This fluorescence was also produced using glucose as the only initial carbon source, suggesting that degradation of prokaryote remnants contributes to RDOM. Our results indicate that the formation of a fluorescent RDOM component depends on the bioavailability of the substrate: the less labile, the larger the production of fluorescent RDOM relative to organic carbon remineralized. The anticipated increase in microbial carbon demand due to ocean warming can potentially force microorganisms to degrade less labile substrates, thereby increasing RDOM production and stimulating ocean carbon storage.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute, University of Copenhagen
Authors: Jørgensen, L. (Intern), Stedmon, C. A. (Intern), Granskog, M. A. (Ekstern), Middelboe, M. (Ekstern)
Pages: 2481-2488
Publication date: 2014
Main Research Area: Technical/natural sciences

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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
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Publishers version
DOIs:
10.5194/bg-11-3409-2014
Source: FindIt
Source-ID: 268671139
Publication: Research - peer-review › Journal article – Annual report year: 2014
Bioavailability of riverine dissolved organic matter in three Baltic Sea estuaries and the effect of catchment land use

The microbial degradation of dissolved organic carbon and nitrogen (DOC, DON) was studied in three Finnish boreal estuaries with contrasting land use patterns (Kiiminkijoki - natural forest and peatland; Kyrönjoki - agricultural; Karjaanjoki - mixed/urban). Bioassays of 12-18 d long durations were used in 3 seasons at in situ temperatures. Besides the bulk parameters, a suite of dissolved organic matter (DOM) quality parameters were also investigated, including colored DOM (CDOM), fluorescent DOM and the molecular weight of DOM. Bioavailable DOC and DON pools varied significantly between the estuaries, from 7.9 to 10.6% and from 5.5 to 21.9%, respectively. DOM originating from the catchment dominated by natural forests and peatlands (Kiiminkijoki) had the lowest DOC and DON degradation rates, as well as the lowest proportions of biodegradable DOC and DON. A greater proportion of agricultural land in the catchment increased the bioavailability of DON, but not the bioavailability of DOC (Kyrönjoki). Additionally, DOM quality varied significantly between the estuaries, and DOM originating from the agricultural Kyrönjoki catchment sustained higher DOC and DON degradation rates and higher bacterial growth efficiency (BGE) compared to those of the natural forest and peat dominated Kiiminkijoki catchment. The quality of DOM, indicated by differences in CDOM, fluorescent DOM and molecular weight, varied between estuaries with differing land use and was concluded to be major driver of BGE of these systems and thereafter to the microbial CO2 fluxes from the estuaries. The differences in BGE resulted in a 5-fold difference in the calculated daily bacterial CO2 emissions between the study's estuaries due to bacterial activity, ranging from 40 kg C d-1 in the Karjaanjoki estuary to 200 kg C d-1 in the Kyrönjoki estuary. Lower DOC:DON ratios, smaller molecular weight and higher CDOM absorption spectral slope values of DOM resulted in higher proportion of the initial DOC and DON being transferred to microbial growth and therefore to the pelagic food web. The pristine, peatland and forest-dominated Kiiminkijoki catchment had the lowest BGE, and therefore proportionally highest CO2 fluxes.
Bright light, white light...right light?: Hvordan få vi en bedre beskrivelse af lys forholdene i modeller

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Stedmon, C. (Intern)
Publication date: 2013
Event: Abstract from 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research – Conference abstract for conference – Annual report year: 2013
Coupling the UV-visible spectroscopic properties of dissolved organic matter to its chemical characteristics evidence across contrasting environments

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Lund University, University of Copenhagen
Authors: Stedmon, C. (Intern), Christensen, J. (Ekstern), Kritzberg, E. (Ekstern), Nielsen, N. (Ekstern), Reader, H. (Ekstern)
Publication date: 2013
Event: Abstract from ASLO 2013 Aquatic Sciences Meeting, New Orleans, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2013

En spektral lysdæmpningsmodel for 2 grønlandske fjorde

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Murray, C. (Ekstern), Stedmon, C. (Intern), Markager, S. (Ekstern), Pedersen, T. J. (Ekstern), Sejr, M. (Ekstern)
Publication date: 2013
Event: Abstract from 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2013

Fluorescence spectroscopy and multi-way techniques. PARAFAC
PARAllel FACtor analysis (PARAFAC) is increasingly used to decompose fluorescence excitation emission matrices (EEMs) into their underlying chemical components. In the ideal case where fluorescence conforms to Beers Law, this process can lead to the mathematical identification and quantification of independently varying fluorophores. However, many practical and analytical hurdles stand between EEM datasets and their chemical interpretation. This article provides a tutorial in the practical application of PARAFAC to fluorescence datasets, demonstrated using a dissolved organic matter (DOM) fluorescence dataset. A new toolbox for MATLAB is presented to support improved visualisation and sensitivity analyses of PARAFAC models in fluorescence spectroscopy. © 2013 The Royal Society of Chemistry.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Department of Systems Biology, University of New South Wales, Aarhus University
Authors: Murphy, K. R. (Ekstern), Stedmon, C. A. (Intern), Graeber, D. (Forskerdatabase), Bro, R. (Intern)
Pages: 6557-6566
Publication date: 2013
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Analytical Methods
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.99 SJR 0.593 SNIP 0.632
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.602 SNIP 0.647 CiteScore 1.98
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.611 SNIP 0.662 CiteScore 1.91
Inner filter correction of dissolved organic matter fluorescence

The fluorescence of dissolved organic matter (DOM) is suppressed by a phenomenon of self-quenching known as the inner filter effect (IFE). Despite widespread use of fluorescence to characterize DOM in surface waters, the advantages and constraints of IFE correction are poorly defined. We assessed the effectiveness of a commonly used absorbance-based approach (ABA), and a recently proposed controlled dilution approach (CDA) to correct for IFE. Linearity between corrected fluorescence and total absorbance (ATotal; the sum of absorbance at excitation and emission wavelengths) across the full excitation-emission matrix (EEM) in dilution series of four samples indicated both ABA and CDA were effective to an absorbance of at least 1.5 in a 1 cm cell, regardless of wavelength positioning. In regions of the EEMs where signal to background noise (S/N) was low, CDA correction resulted in more variability than ABA correction. From the ABA algorithm, the onset of significant IFE (>5%) occurs when absorbance exceeds 0.042. In these cases, IFE correction is required, which was the case for the vast majority (97%) of lakes in a nationwide survey (n= 554). For highly absorbing samples, undesirably large dilution factors would be necessary to reduce absorbance below 0.042. For rare EEMs with ATotal > 1.5 (3.0% of the lakes in the Swedish survey), a 2-fold dilution is recommended followed by ABA or CDA correction. This study shows that for the vast majority of natural DOM samples the most commonly applied ABA algorithm provides adequate correction without prior dilution.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Uppsala University, University of New South Wales
Authors: Kothawala, D. (Ekstern), Murphy, K. (Ekstern), Stedmon, C. (Intern), Weyhenmeyer, G. (Ekstern), Tranvik, L. (Ekstern)
Pages: 616-630
Publication date: 2013
Main Research Area: Technical/natural sciences

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Journal: Limnology and Oceanography: Methods
Volume: 11
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.005 SNIP 0.898 CiteScore 2.03
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.375 SNIP 1.226 CiteScore 2.61
Linking optical and chemical properties of dissolved organic matter in natural waters

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, North Carolina State University, Woods Hole Research Center, Skidaway Institute of Oceanography
Authors: Osburn, C. (Ekstern), Stedmon, C. (Intern), Spencer, R. (Ekstern), Stubbins, A. (Ekstern)
Pages: 78-82
Publication date: 2013
Main Research Area: Technical/natural sciences

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Journal: Limnology and Oceanography Bulletin
Volume: 22
Issue number: 3
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Ratings:
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BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.312 SNIP 0.801 CiteScore 0.47
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.143 SNIP 0.111 CiteScore 0.1
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.132 SNIP 0.043 CiteScore 0.02
Mikrobiel dannelse af sværtnedbrydelige organiske humusstoffer i arktiske egne

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Copenhagen
Authors: Jørgensen, L. (Intern), Middelboe, M. (Forskerdatabase), Stedmon, C. (Intern)
Publication date: 2013
Event: Abstract from 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Links: http://aslo.org/bulletin/issues/13_v22_i3.pdf
Publication: Research › Journal article – Annual report year: 2013

Radiocarbon age, lability and optical fingerprints of riverine dissolved organic matter exported from a northern peat-dominated catchment

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Hulatt, C. (Ekstern), Kaartokallio, H. (Ekstern), Stedmon, C. (Intern), Sonninen, E. (Ekstern), Oinonen, M. (Ekstern), Thomas, D. (Ekstern)
Publication date: 2013
Event: Abstract from ASLO 2013 Aquatic Sciences Meeting, New Orleans, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2013

Riverine dissolved organic matter in three boreal estuaries entering the Baltic Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Asmala, E. (Ekstern), Autio, R. (Ekstern), Kaartokallio, H. (Ekstern), Pitkänen, L. (Ekstern), Stedmon, C. (Intern), Thomas, D. (Ekstern)
Publication date: 2013
Event: Abstract from ASLO 2013 Aquatic Sciences Meeting, New Orleans, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2013
Selective incorporation of dissolved organic matter (DOM) during sea ice formation
This study investigated the incorporation of DOM from seawater into b2 day-old sea ice in tanks filled with seawater alone or amended with DOM extracted from the microalga, Chlorella vulgaris. Optical properties, including chromophoric DOM (CDOM) absorption and fluorescence, as well as concentrations of dissolved organic carbon (DOC), dissolved organic nitrogen (DON), dissolved carbohydrates (dCHOs) and dissolved uronic acids (dUAs) were measured. Enrichment factors (EFs), calculated from salinity-normalized concentrations of DOM in bulk ice, brine and frost flowers relative to under-ice water, were generally N1. The enrichment factors varied for different DOM fractions: EFs were the lowest for humic-like DOM (1.0–1.39) and highest for amino acid-like DOM (1.10–3.94). Enrichment was generally highest in frost flowers with there being less enrichment in bulk ice and brine. Size exclusion chromatography indicated that there was a shift towards smaller molecules in the molecular size distribution of DOM in the samples collected from newly formed ice compared to seawater. Spectral slope coefficients did not reveal any consistent differences between seawater and ice samples. We conclude that DOM is incorporated to sea ice relatively more than inorganic solutes during initial formation of sea ice and the degree of the enrichment depends on the chemical composition of DOM

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Helsinki, University of Jyväskylä, Norwegian Polar Institute, University of Technology, Sydney, University of Essex, Alfred Wegener Institute for Polar and Marine Research, Bangor University
Authors: Müller, S. (Ekstern), Vähätalo, A. V. (Ekstern), Stedmon, C. (Intern), Granskog, M. A. (Ekstern), Norman, L. (Ekstern), Aslam, S. N. (Ekstern), Underwood, G. J. (Ekstern), Dieckmann, G. S. (Ekstern), Thomas, D. N. (Ekstern)
Pages: 148-157
Publication date: 2013
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Chemistry
Volume: 155
ISSN (Print): 0304-4203
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.2 SJR 1.4 SNIP 1.038
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.384 SNIP 1.354 CiteScore 3.09
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.525 SNIP 1.39 CiteScore 3.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.276 SNIP 1.74 CiteScore 3.86
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.007 SNIP 1.275 CiteScore 3.15
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.126 SNIP 1.289 CiteScore 3.24
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.678 SNIP 1.093
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.725 SNIP 1.386
Web of Science (2009): Indexed yes
Characteristics of colored dissolved organic matter (CDOM) in the Arctic outflow in Fram Strait: assessing the changes and fate of terrigenous CDOM in the Arctic Ocean

Absorption coefficients of colored dissolved organic matter (CDOM) were measured together with salinity, δ18O, and inorganic nutrients across the Fram Strait. A pronounced CDOM absorption maximum between 30 and 120 m depth was associated with river and sea ice brine enriched water, characteristic of the Arctic mixed layer and upper halocline waters in the East Greenland Current (EGC). The lowest CDOM concentrations were found in the Atlantic inflow. We show that the salinity-CDOM relationship is not suitable for evaluating conservative mixing of CDOM. The strong correlation between meteoric water and CDOM is indicative of the riverine/terrigenous origin of CDOM in the EGC. Based on CDOM absorption in Polar Water and comparison with an Arctic river discharge weighted mean, we estimate that a 49–59% integrated loss of CDOM absorption across 250–600 nm has occurred. A preferential removal of absorption at longer wavelengths reflects the loss of high molecular weight material. In contrast, CDOM fluxes through the Fram Strait using September velocity fields from a high-resolution ocean–sea ice model indicate that the net southward transport of terrigenous CDOM through the Fram Strait equals up to 50% of the total riverine CDOM input; this suggests that the Fram Strait export is a major sink of CDOM. These contrasting results indicate that we have to constrain the (C)DOM budgets for the Arctic Ocean much better and examine uncertainties related to using tracers to assess conservative mixing in polar waters.

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Organisations: National Institute of Aquatic Resources, Section for Ocean Ecology and Climate, Norwegian Polar Institute
Authors: Granskog, M. (Ekstern), Stedmon, C. (Intern), Dodd, P. (Ekstern), Amon, R. (Ekstern), Pavlov, A. (Ekstern), de Steur, L. (Ekstern), Hansen, E. (Ekstern)
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ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
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Web of Science (2009): Indexed yes
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Web of Science (2002): Indexed yes
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Dissolved organic matter sources in large Arctic rivers
The biomarker composition of dissolved organic carbon (DOC) of the six largest Arctic rivers was studied between 2003 and 2007 as part of the PARTNERS Project. Samples were collected over seasonal cycles relatively close to the river mouths. Here we report the lignin phenol and p-hydroxybenzene composition of Arctic river DOC in order to identify major sources of carbon. Arctic river DOC represents an important carbon conduit linking the large pools of organic carbon in the Arctic/Subarctic watersheds to the Arctic Ocean. Most of the annual lignin discharge (>75%) occurs during the two month of spring freshet with extremely high lignin concentrations and a lignin phenol composition indicative of fresh vegetation from boreal forests. The three large Siberian rivers, Lena, Yenisei, and Ob, which also have the highest proportion of forests within their watersheds, contribute about 90% of the total lignin discharge to the Arctic Ocean. The composition of river DOC is also characterized by elevated levels of p-hydroxybenzenes, particularly during the low flow season, which indicates a larger contribution from mosses and peat bogs. The lignin composition was strongly related to the average 14C-age of DOC supporting the abundance of young, boreal-vegetation-derived leachates during spring flood, and older, soil-, peat-, and wetland-derived DOC during groundwater dominated low flow conditions, particularly in the Ob and Yukon Rivers. We observed significant differences in DOC concentration and composition between the rivers over the seasonal cycles with the Mackenzie River being the most unique, the Lena River being similar to the Yenisei, and the Yukon being most similar to the Ob. The observed relationship between the lignin phenol composition and watershed characteristics suggests that DOC discharge from these rivers could increase in a warmer climate under otherwise undisturbed conditions.
Lake metabolism scales with lake morphometry and catchment conditions

We used a comparative data set for 25 lakes in Denmark sampled during summer to explore the influence of lake morphometry, catchment conditions, light availability and nutrient input on lake metabolism. We found that (1) gross primary production (GPP) and community respiration (R) decline with lake area, water depth and drainage ratio, and increase with algal biomass (Chl), dissolved organic carbon (DOC) and total phosphorus (TP); (2) all lakes, especially small with less incident light, and forest lakes with high DOC, have negative net ecosystem production (NEP); (3) daily variability of GPP decreases with lake area and water depth as a consequence of lower input of nutrients and organic matter per unit water volume; (4) the influence of benthic processes on free water metabolic measures declines with increasing lake size; and (5) with increasing lake size, lake metabolism decreases significantly per unit water volume, while depth integrated areal rates remain more constant due to a combination of increased light and nutrient limitation.

Overall, these meta-parameters have as many significant but usually weaker relationships to whole-lake and benthic metabolism as have TP, Chl and DOC that are directly linked to photosynthesis and respiration. Combining water depth and Chl to predict GPP, and water depth and DOC to predict R, lead to stronger multiple regression models accounting for 57–63% of the variability of metabolism among the 25 lakes. It is therefore important to consider differences in lake morphometry and catchment conditions when comparing metabolic responses of lakes to human impacts.
The quantity of chromophoric dissolved organic matter (CDOM) and dissolved organic carbon (DOC) in three Finnish estuaries (Karaanjoki, Kyrönjoki and Kiiminkijoki) was investigated, with respect to predicting DOC concentrations and loadings from spectral CDOM absorption measurements. Altogether 87 samples were collected from three estuarine transects which were studied in three seasons, covering a salinity range between 0 and 6.8, and DOC concentrations from 1572 \( \mu \text{mol}^{-1} \) in freshwater to 222\( \mu \text{mol}^{-1} \) in coastal waters. CDOM absorption coefficient, \( a_{\text{CDOM}}(375) \) values followed the trend in DOC concentrations across the salinity gradient and ranged from 1.67 to 33.4 m\(^{-1}\). The link between DOC and CDOM was studied using a range of wavelengths and algorithms. Wavelengths between 250 and 270 nm gave the best predictions with single linear regression. Total dissolved iron was found to influence the prediction in wavelengths above 520 nm. Despite significant seasonal and spatial differences in DOC–CDOM models, a universal relationship was tested with an independent data set and found to be robust. DOC and CDOM yields (loading/catchment area) from the catchments ranged from 1.98 to 5.44 gCm\(^{-2}\)yr\(^{-1}\), and 1.67 to 11.5 a\( a_{\text{CDOM}}(375) \)yr\(^{-1}\), respectively.

**General information**

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Oceanographic regime shift during 1997 in Disko Bay, Western Greenland

Data from a long time series of temperature, salinity, and nutrient measurements in Disko Bay (West Greenland) reveal a marked change in the water characteristics during recent years. Seasonal dynamics in the upper 150 m of the water column were highly affected by the seasonality in meteorological conditions, while the deeper water strata were more stable and were primarily influenced by large-scale circulation patterns. There was a marked increase in the average water temperatures at 200-m depth in spring 1997, with the long-term average increasing from 1.30°C to 2.25°C. Weekly data from 1996 to 1997 show that the sudden change in bottom water occurred in April 1997, due to the inflow of a larger proportion of North Atlantic water, which propagated north along the coast before entering the bay. Further support for this inflow was found when tracing the relative proportion of Atlantic water in the bay, using inorganic nutrients. These changes in the oceanography of the bay will not only lead to further glacial retreat but will also affect the local marine ecosystem by changing the relative dominance of major copepod species that overwinter in bottom waters of the bay.

General information
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Organisations: National Institute of Aquatic Resources, Section for Ocean Ecology and Climate
Authors: Hansen, M. O. (Intern), Nielsen, T. G. (Intern), Stedmon, C. A. (Intern), Munk, P. (Intern)
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Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
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Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
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Web of Science (2013): Indexed yes
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Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
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Web of Science (2010): Indexed yes
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Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.361 SNIP 1.682
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Web of Science (2006): Indexed yes
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Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.463 SNIP 1.778
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.685 SNIP 2.004
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.605 SNIP 1.798
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.91 SNIP 1.892
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Seasonal changes in the optical properties of dissolved organic matter (DOM) in large Arctic rivers

Arctic rivers deliver over 10% of the annual global river discharge yet little is known about the seasonal fluctuations in the quantity and quality of terrigenous dissolved organic matter (tDOM). A good constraint on such fluctuations is paramount to understand the role that climate change may have on tDOM input to the Arctic Ocean. To understand such changes the optical properties of colored tDOM (tCDOM) were studied. Samples were collected over several seasonal cycles from the six largest Arctic Rivers as part of the PARTNERS project. This unique dataset is the first of its kind capturing seasonal trends in Arctic river tCDOM composition. Parallel Factor Analysis was used to decompose the combined tCDOM fluorescence signal into five independent model components. The relationship of individual fluorescence components to dissolved organic carbon, lignin phenol concentrations, and the 14C-DOC age were explored. This study demonstrates the usefulness and limits of CDOM as a proxy to understand seasonal and longer term changes in the quantity and quality of Arctic river tDOM.

General information

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Organisations: National Institute of Aquatic Resources, Section for Ocean Ecology and Climate, Texas A&M University
Authors: Walker, S. (Ekstern), Amon, R. (Ekstern), Stedmon, C. (Intern)
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The freshwater composition of the Fram Strait outflow derived from a decade of tracer measurements

The composition of the Fram Strait freshwater outflow is investigated by comparing 10 sections of concurrent salinity, δ18O, nitrate and phosphate measurements collected between 1997 and 2011. The largest inventories of net sea ice meltwater are found in 2009, 2010 and 2011. The 2009–2011 sections are also the first to show positive fractions of sea ice meltwater at the surface near the core of the EGC. Sections from September 2009–2011 show an increased input of sea ice meltwater at the surface relative to older September sections. This suggests that more sea ice now melts back into the surface in late summer than previously. Comparison of April, July and September sections reveals seasonal variations in the inventory of positive sea ice meltwater, with maximum inventories in September sections. The time series of sections reveals a strong anti-correlation between meteoric water and net sea ice meltwater inventories, suggesting that meteoric water and brine may be delivered to Fram Strait together from a common source. We find that the freshwater
outflow at Fram Strait exhibits a similar meteoric water to net sea ice meltwater ratio as the central Arctic Ocean and Siberian shelves, suggesting that much of the sea ice meltwater and meteoric water at Fram Strait may originate from these regions. However, we also find that the ratio of meteoric water to sea ice meltwater inventories at Fram Strait is decreasing with time, due to an increased surface input of sea ice meltwater in recent sections.
The optical properties of Greenlandic coastal waters: Modelling light penetration in a changing climate

Greenlandic fjords are very productive and pristine ecosystems, which the local population is both intrinsically linked to and dependent on through heritage, industrial fisheries, and tourism. The availability and spectral quality of light are key parameters controlling the productivity of these waters. Although solar elevation and sea ice cover play an important role, during the summer month’s light is also regulated by water constituents such as dissolved and particulate organic matter, phytoplankton and suspended sediments. The relative importance of each of these constituents varies depending on the influence of shelf water entering the fjords, extent of glacial ice melt and the size and vertical distribution of the phytoplankton biomass. In this study the data from two contrasting sites are compared: Young Sound, a fjord system in Northeast Greenland that imports shelf waters with a considerable amount of terrestrial dissolved organic matter (DOM) from the Arctic Ocean; and Godthåbsfjord a fjord in Southwest Greenland where strong tides ensure a regular supply of warm shelf water which melt glacial ice before it can leave the fjord.

The spectral optical properties and relative radiant heating contribution of dissolved and particulate matter in the surface waters across the Fram Strait

The Fram Strait is the key region for exchange processes between Arctic Ocean and North Atlantic. With two major near-surface currents, the warm and salty West Spitsbergen Current and cold low-salinity East Greenland Current, its waters encompass two distinct oceanographic environments. During autumns of 2009 and 2010 comprehensive observations were performed on transects along 79 N across the Fram Strait. Samples for chromophoric dissolved organic matter (CDOM) and particulate absorption were collected and analyzed together with distribution of temperature and salinity in surface waters (0-100 m). Large spatial variations in the distribution of CDOM and particulate matter as well as in their relative contributions to total absorption were apparent, with high contrast between waters of Arctic and Atlantic origin. In addition, estimates of underwater light profiles and radiant heating rate (RHR) of the upper layer were obtained using a simplistic exponential RHR model. This is one of the first detailed overviews of sea water optical properties across the northern Fram Strait, and might have potential implications for biological, biogeochemical and physical processes in the region.
A potential approach for monitoring drinking water quality from groundwater systems using organic matter fluorescence as an early warning for contamination events

The fluorescence characteristics of natural organic matter in a groundwater based drinking water supply plant were studied with the aim of applying it as a technique to identify contamination of the water supply. Excitation–emission matrices were measured and modeled using parallel factor analysis (PARAFAC) and used to identify which wavelengths provide the optimal signal for monitoring contamination events. The fluorescence was characterized by four components: three humic-like and one amino acid-like. The results revealed that the relative amounts of two of the humic-like components were very stable within the supply plant and distribution net and changed in a predictable fashion depending on which wells were supplying the water. A third humic-like component and an amino acid-like component did not differ between wells. Laboratory contamination experiments with wastewater revealed that combined they could be used as an indicator of microbial contamination. Their fluorescence spectra did not overlap with the other components and therefore the raw broadband fluorescence at the wavelengths specific to their fluorescence could be used to detect contamination. Contamination could be detected at levels equivalent to the addition of 60 μg C/L in drinking water with a TOC concentration of 3.3 mg C/L. The results of this study suggest that these types of drinking water systems, which are vulnerable to microbial contamination due to the lack of disinfectant treatment, can be easily monitored using online organic matter fluorescence as an early warning system to prompt further intensive sampling and appropriate corrective measures.

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Organisations: National Institute of Aquatic Resources, Department of Environmental Engineering, Urban Water Engineering, Technical University of Denmark, Krüger A/S
Authors: Stedmon, C. (Intern), Seredyńska-Sobecka, B. (Ekstern), Boe-Hansen, R. (Ekstern), Le Tallec, N. (Ekstern), Waul, C. K. (Intern), Arvin, E. (Intern)
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Publication information
Assessing the dynamics of chromophoric dissolved organic matter in a subtropical estuary using parallel factor analysis

The spatial and temporal dynamics of chromophoric dissolved organic matter (CDOM) were studied using excitation emission matrix fluorescence spectroscopy (EEMs) and parallel factor analysis (PARAFAC) during five cruises in the subtropical Jiulong Estuary from August 2008 to June 2009. Two humic-like (C1 and C3), one tryptophan-like (C4) and one possible protein-like (C2) component was identified by PARAFAC and their behavior in the river–estuary–coastal interface was evaluated. The spatial distributions of the maximum fluorescence (Fmax) for the fluorescent components showed a remarkable loss in the upper estuary. The following significant addition of all components in the low salinity turbidity maximum zone suggested the inputs from riverine source, sediment resuspension and the surrounding mangrove ecosystem. C1, C2 and C3 showed conservative behavior in the middle and lower estuary indicated by the linear relationship between their fluorescence intensities and salinity in the five cruises. However, the tryptophan-like C4 received widespread additions (likely from autochthonous production) in the estuary. Although the humic-like C1 and C3 showed no significant variation in the estuary–coastal interface, C2 and C4 decreased more rapidly beyond this interface, indicating the significant influence of coastal current to this estuarine environment. The seasonal variation of tryptophan-like C4 was characterized by higher Fmax values in the upper to middle estuary in the dry season, which is in contrast to that of the humic-like C3. Correlation analysis with DOC showed that the fluorescence intensity of C1 (or C2 and C3) was suitable for tracing DOC dynamics in this estuary. These results indicated different mixing behavior and temporal variability for different fluorescent components in this dynamic estuarine environment.

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Organisations: Xiamen University, Aarhus University
Authors: Guo, W. (Ekstern), Yang, L. (Ekstern), Hong, H. (Ekstern), Stedmon, C. (Intern), Wang, F. (Ekstern), Xu, J. (Ekstern), Xie, Y. (Ekstern)
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Linking the chemical and optical properties of dissolved organic matter in the Baltic-North Sea transition zone to differentiate three allochthonous inputs

General information
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Monitoring organic loading to swimming pools by fluorescence excitation–emission matrix with parallel factor analysis (PARAFAC)

Fluorescence Excitation–Emission Matrix spectroscopy combined with parallel factor analysis was employed to monitor water quality and organic contamination in swimming pools. The fluorescence signal of the swimming pool organic matter was low but increased slightly through the day. The analysis revealed that the organic matter fluorescence was characterised by five different components, one of which was unique to swimming pool organic matter and one which was specific to organic contamination. The latter component had emission peaks at 420 nm and was found to be a sensitive indicator of organic loading in swimming pool water. The fluorescence at 420 nm gradually increased during opening hours and represented material accumulating through the day.

General Information

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Organisations: Department of Environmental Engineering, Urban Water Engineering, National Institute of Aquatic Resources, Centre for Ocean Life, Krüger A/S
Authors: Seredynska-Sobecka, B. (Intern), Stedmon, C. (Intern), Boe-Hansen, R. (Ekstern), Waul, C. K. (Intern), Arvin, E. (Intern)
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- Web of Science (2015): Indexed yes
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- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
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- ISI indexed (2011): ISI indexed yes
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Phytoplankton growth and microzooplankton grazing along a sub-Arctic fjord (Godthåbsfjord, West Greenland)  
We evaluated the role of microzooplankton (sensu lato, grazers <500 µm) in determining the fate of phytoplankton production (PP) along a glacier-to-open sea transect in the Greenland subarctic fjord, Godthåbsfjord. Based on the distribution of size fractionated chlorophyll a (chl a) concentrations we established four zones: i) Fyllas Bank, characterized by deep chl a maxima (ca. 30-40 m) consisting of large cells; ii) the mouth and main branch of the fjord, where phytoplankton was relatively homogeneous distributed in the upper 30 m layer; iii) inner waters influenced by glacial melt water and upwelling, with high chl a concentrations (up to 12 µg L⁻¹) in the >10 µm fraction within a narrow (2 m) subsurface layer; and iv) the Kapisigdlit branch of the fjord, ice-free, and characterized with a thick and deep chl a maximum layer. Overall, microzooplankton grazing impact on primary production was variable and seldom significant in the Fyllas Bank and mouth of the fjord, quite intensive (up to >100% potential PP consumed daily) in the middle part of the main branch of the fjord and Kapisigdlit branch, and rather low and unable to control the fast growing phytoplankton population inhabiting the nutrient rich waters in the upwelling area in the vicinity of the glacier. Most of the grazing impact was on the <10 µm phytoplankton fraction, and the major grazers of the system seem to be >20 µm microzooplankton, as deduced from additional dilution experiments removing >20 µm. Overall, little or no export of phytoplankton out of the fjord to the Fyllas Bank can be deducted from our data.
Seasonal dynamics and conservative mixing of dissolved organic matter in the temperate eutrophic estuary Horsens Fjord

This study presents the results of a year-long study investigating the characteristics of dissolved organic matter (DOM) in the Danish estuary, Horsens Fjord. The estuary is shallow with a mean depth of 2.9 m and receives high loadings of
inorganic nutrients from its catchment. The behaviour of different DOM parameters i.e. dissolved organic carbon (DOC), nitrogen (DON), and phosphorous (DOP), light absorption and eight fluorescence components, were analysed relative to conservative mixing. Many of the parameters did not behave conservatively. For DON, DOP and absorption, more than 65% of the freshwater concentration was removed initially at salinities below 12. At higher salinities two general patterns were identified. Concentrations of DON, DOP and four humic fluorescent fractions were not, or only weakly, related to salinity, showing that other processes than mixing were involved. Other parameters such as DOC and two terrestrial humic components behaved conservatively. The same was true for DON during winter. These results are consistent with the finding that autochthonous DOM was the dominant source of DOM in this estuary. The molar C:N and C:P ratios for DOM (DOC:DON and DOC:DOP) in freshwater were 11 and 758, respectively. The DOC:DON ratio increased in the estuary during the productive season to average values between 13 and 17, due to accumulation of DOC and removal of DON. The DOC:DOP ratio decreased within the estuary showing that in general DOM was enriched with phosphorous, however, during the spring, when phosphorous was limiting, the DOC:DOP ratio increased due to low DOP concentrations. We hypothesise that in estuaries with high loadings of inorganic nutrients relative to DOM, production and degradation of DOM within the estuary will dominate over allochthonous inputs and control both concentration and characteristics of DOM. A conceptual model for this hypothesis is presented.

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Authors: Markager, S. (Ekstern), Stedmon, C. A. (Intern), Søndergaard, M. (Ekstern)
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Web of Science (2011): Indexed yes
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Scopus rating (2010): SJR 1.231 SNIP 1.202
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Shedding light on a black box: UV-visible spectroscopic characterization of marine dissolved organic matter

The characteristics of dissolved organic matter (DOM) and chromophoric dissolved organic matter (CDOM) in Antarctic sea ice

An investigation of coloured dissolved organic matter (CDOM) and its relationships to physical and biogeochemical parameters in Antarctic sea ice and oceanic water have indicated that ice melt may both alter the spectral characteristics of CDOM in Antarctic surface waters and serve as a likely source of fresh autochthonous CDOM and labile DOC. Samples were collected from melted bulk sea ice, sea ice brines, surface gap layer waters, and seawater during three expediions: one during the spring to summer and two during the winter to spring transition period. Variability in both physical (temperature and salinity) and biogeochemical parameters (dissolved and particulate organic carbon and nitrogen, as well as chlorophyll a) was observed during and between studies, but CDOM absorption coefficients measured at 375nm (a375) did not differ significantly. Distinct peaked absorption spectra were consistently observed for bulk ice, brine, and gap water, but were absent in the seawater samples. Correlation with the measured physical and biogeochemical parameters could not resolve the source of these peaks, but the shoulders and peaks observed between 260 and 280nm and between 320 to 330nm respectively, particularly in the samples taken from high light-exposed gap layer environment, suggest a
possible link to aromatic and mycosporine-like amino acids. Sea ice CDOM susceptibility to photo-bleaching was
demonstrated in an in situ 120 hour exposure, during which we observed a loss in CDOM absorption of 53% at 280nm,
58% at 330nm, and 30% at 375nm. No overall coincidental loss of DOC or DON was measured during the experimental
period. A relationship between the spectral slope (S) and carbon-specific absorption (a375) indicated that the
characteristics of CDOM can be described by the mixing of two broad end-members; and aged material, present in brine
and seawater samples characterised by high S values and low a375; and a fresh material, due to elevated in situ
production, present in the bulk ice samples characterised by low S and high a375. The DOC data reported here have been
used to estimate that approximately 8TgCyr−1 (∼11% of annual sea ice algae primary production) may be exported to the
surface ocean during seasonal sea ice melt in the form of DOC.

General information
State: Published
Organisations: Antarctic Climate and Ecosystems Cooperative Research Centre, Alfred Wegener Institute for Polar and
Marine Research, Aarhus University, The University Centre in Svalbard, Bangor University
Authors: Norman, L. (Ekstern), Thomas, D. N. (Ekstern), Stedmon, C. A. (Intern), Granskog, M. A. (Ekstern),
Papadimitriou, S. (Ekstern), Krapp, R. H. (Ekstern), Meiners, K. M. (Ekstern), Lannuzel, D. (Ekstern), van der Merwe, P.
(Ekstern), Dieckmann, G. S. (Ekstern)
Pages: 1075-1091
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
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BFI (2018): BFI-level 1
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BFI (2016): BFI-level 1
Web of Science (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.35 SJR 1.335 SNIP 0.962
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.327 SNIP 1.063 CiteScore 2.5
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.735 SNIP 1.092 CiteScore 2.68
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.221 SNIP 1.32 CiteScore 3.06
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.84 SNIP 1.152 CiteScore 2.59
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.843 SNIP 1.098 CiteScore 2.6
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.905 SNIP 1.098
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.763 SNIP 1.114
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.432 SNIP 1.03
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.561 SNIP 1.052
The supply and characteristics of colored dissolved organic matter (CDOM) in the Arctic Ocean: Pan Arctic trends and differences

A comprehensive data set of dissolved organic carbon (DOC) and colored dissolved organic matter (CDOM) absorption measurements is analysed in light of tracing the supply and distribution of dissolved organic matter in the Arctic Ocean. Two years of river data from six major Arctic rivers (Kolyma, Lena, Ob, Mackenzie, Yenisei, and Yukon) and measurements from a transect across the Arctic Ocean are presented. The results show that although the Lena River currently dominates the supply of DOC and CDOM, climate change induced increases in base flow discharge will likely increase the contribution of the Yenisei River. Seasonal variations in the spectral characteristics of CDOM in the rivers reflected the shift in the dominant source of organic matter from modern plant litter in the spring freshet to older more degraded material during winter low flow periods. Strong correlations were found between the river loading of CDOM and DOC across the systems studied indicating that in situ CDOM sensors could be used in the future to improve estimates of riverine DOC loading. CDOM in the surface waters of the Eurasian Basin was largely characterised as riverine material although extrapolations to riverine end member concentrations suggested that approximately half the riverine CDOM is removed during its transport across the shelf. In contrast the Canadian Basin surface waters were characterised by a much greater proportion of autochthonous CDOM. These differences in DOM quality in the surface waters of the two basins are hypothesised to also influence the extent to which material is remineralised during its passage through the Arctic Ocean.

General information
State: Published
Organisations: Texas A&M University, Aarhus University
Authors: Stedmon, C. (Intern), Amon, R. (Ekstern), Rinehart, A. (Ekstern), Walker, S. (Ekstern)
Pages: 108-118
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Chemistry
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.2 SJR 1.4 SNIP 1.038
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.384 SNIP 1.354 CiteScore 3.09
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.525 SNIP 1.39 CiteScore 3.21
Web of Science (2014): Indexed yes
Using fluorescence to characterize dissolved organic matter in Antarctic sea ice brines

Sea ice plays a dynamic role in the air-sea exchange of CO2. In addition to abiotic inorganic carbon fluxes, an active microbial community produces and remineralizes organic carbon, which can accumulate in sea ice brines as dissolved organic matter (DOM). In this study, the characteristics of DOM fluorescence in Antarctic sea ice brines from the western Weddell Sea were investigated. Two humic-like components were identified, which were identical to those previously found to accumulate in the deep ocean and represent refractory material. Three amino-acid-like signals were found, one of which was unique to the brines and another that was spectrally very similar to tryptophan and found both in seawater and in brine samples. The tryptophan-like fluorescence in the brines exhibited intensities higher than could be explained by conservative behavior during the freezing of seawater. Its fluorescence was correlated with the accumulation of nitrogen-rich DOM to concentrations up to 900 μmol L−1 as dissolved organic carbon (DOC) and, thus, potentially represented proteins released by ice organisms. A second, nitrogen-poor DOM fraction also accumulated in the brines to concentrations up to 200 μmol L−1 but was not correlated with any of the fluorescence signals identified. Because of the high C:N ratio and lack of fluorescence, this material is thought to represent extracellular polymeric substances, which consist primarily of polysaccharides. The clear grouping of the DOM pool into either proteinaceous or carbohydrate-dominated material indicates that the production and accumulation of these two subpools of DOM in sea ice brines is, to some extent, decoupled.
Measurement of dissolved organic matter fluorescence in aquatic environments: An interlaboratory comparison

The fluorescent properties of dissolved organic matter (DOM) are often studied in order to infer DOM characteristics in aquatic environments, including source, quantity, composition, and behavior. While a potentially powerful technique, a single widely implemented standard method for correcting and presenting fluorescence measurements is lacking, leading to difficulties when comparing data collected by different research groups. This paper reports on a large-scale interlaboratory comparison in which natural samples and well-characterized fluorophores were analyzed in 20 laboratories in the U.S., Europe, and Australia. Shortcomings were evident in several areas, including data quality-assurance, the accuracy of spectral correction factors used to correct EEMs, and the treatment of optically dense samples. Data corrected by participants according to individual laboratory procedures were more variable than when corrected under a standard protocol. Wavelength dependency in measurement precision and accuracy were observed within and between instruments, even in corrected data. In an effort to reduce future occurrences of similar problems, algorithms for correcting and calibrating EEMs are described in detail, and MATLAB scripts for implementing the study's protocol are provided. Combined with the recent expansion of spectral fluorescence standards, this approach will serve to increase the intercomparability of DOM fluorescence studies.

General information
State: Published
Organisations: University of New South Wales, U.S. Geological Survey, Woods Hole Research Center, National Science Foundation, Aarhus University
Tracing water mass mixing in the Baltic–North Sea transition zone using the optical properties of coloured dissolved organic matter

The distribution and characteristics of coloured dissolved organic matter (CDOM) in the Baltic – North Sea transition zone were studied. The aim was to assess the validity of predicting CDOM absorption in the region on the basis of water mass mixing alone and demonstrate the utility of CDOM as an indicator of water mass mixing in coastal seas. A three-end-member mixing model representing the three major allochthonous CDOM sources was sufficient to describe the patterns in CDOM absorption distribution observed. The three-end-member water masses were the: Baltic outflow, German Bight and the central North Sea. Previously, it was thought that water from the German Bight transported northwards in the Jutland coastal current only sporadically influenced mixing between the Baltic and North Sea. The results from this study show that water from the German Bight is detectable at salinities down to 12 in the Kattegat and Belt Sea. On average, 23% of the CDOM in bottom waters of the Kattegat, Great Belt, Belt Sea, Arkona Sea and the Sound originated from the German Bight. Using this conservative mixing model approach, local CDOM inputs were detectable but found to be limited, representing only 0.25% of CDOM in the surface waters of the Kattegat and Belt Sea. The conservative mixing of CDOM makes it possible to predict its distribution and characteristics and offers a powerful tool for tracing water mass mixing in the region. The results also emphasize the need to include the Jutland Coastal current in hydrodynamic models for the region.

General information
State: Published
Organisations: Naval Research Laboratory, Aarhus University, University of Copenhagen
Authors: Stedmon, C. A. (Intern), Osburn, C. L. (Extern), Kragh, T. (Extern)
Pages: 156-162
Publication date: 2010
Main Research Area: Technical/natural sciences
Fluorescence intensity calibration using the Raman scatter peak of water

Fluorescence data of replicate samples obtained from different fluorescence spectrometers or by the same spectrometer but with different instrument settings can have great intensity differences. In order to compare such data an intensity calibration must be applied. Here we explain a simple calibration method for fluorescence intensity using only the integrated area of a water Raman peak. By applying this method to data from three different instruments, we show that it is possible to remove instrument-dependent intensity factors, and we present results on a unified scale of Raman units. The method presented is a rapid and simple approach suitable for routine measurements with no need for hazardous chemicals. © 2009 Society for Applied Spectroscopy.
Main Research Area: Technical/natural sciences

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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.48 SNIP 0.967 CiteScore 1.76
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.649 SNIP 1.09 CiteScore 1.96
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.619 SNIP 1.077 CiteScore 1.96
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.627 SNIP 1.162 CiteScore 2.08
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.581 SNIP 1.103 CiteScore 1.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.6 SNIP 1.031 CiteScore 1.62
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.687 SNIP 0.989
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.634 SNIP 0.907
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.85 SNIP 1.09
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.772 SNIP 0.992
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.795 SNIP 1.004
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.883 SNIP 1.135
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.879 SNIP 1.021
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.925 SNIP 1.178
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.876 SNIP 1.115
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.92 SNIP 1.204
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.28 SNIP 1.211
The use of PARAFAC modeling to trace terrestrial dissolved organic matter and fingerprint water masses in coastal Canadian Arctic surface waters

The optical properties of chromophoric dissolved organic matter (CDOM) were investigated in the Canadian Archipelago and coastal Beaufort Sea surface waters using fluorescence spectroscopy coupled with parallel factor analysis (PARAFAC). Environmental dynamics of individual components were evaluated and compared to salinity, in situ fluorescence, absorption at 312 nm (a(312)), dissolved organic carbon, and lignin phenol concentrations. A positive linear relationship between four fluorescent components and lignin phenols suggests a terrestrial origin, whereas two components were unrelated to a river source, suggesting an autochthonous source. Elevated concentrations of terrestrial components were observed in the Mackenzie River plume near the coast of Alaska and decreased as water was transported to the Canadian Archipelago. The two nonterrestrial components exhibited only background levels in concentrations along the transect, suggesting minimal productivity within plume and archipelago surface waters. The relative abundance of terrestrial components in relation to nonterrestrial components allowed us to distinguish water masses including Atlantic, Archipelago, and Mackenzie River plume, respectively. This study illustrates the usefulness of PARAFAC to fingerprint water masses based on the optical characteristics of CDOM and shows promise to improve our understanding of upper Arctic Ocean ventilation.

General information
State: Published
Organisations: National Environmental Research Institute, Texas A&M University
Authors: Walker, S. A. (Ekstern), Amon, R. M. W. (Ekstern), Stedmon, C. (Intern), Duan, S. (Ekstern), Louchouarn, P. (Ekstern)
Pages: G00F06
Publication date: 2009
Main Research Area: Technical/natural sciences

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Journal: JOURNAL OF GEOPHYSICAL RESEARCH-BIOGEOSCIENCES
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- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 3.36 SJR 1.996 SNIP 1.313
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 2.288 SNIP 1.362 CiteScore 3.39
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 2.324 SNIP 1.349 CiteScore 3.27
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 2.357 SNIP 1.44 CiteScore 3.38
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 2.365 SNIP 1.35 CiteScore 2.93
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 2.239 SNIP 1.301 CiteScore 3.03
A sub-fraction of dissolved organic matter fluoresces when excited with ultraviolet light. This property is used to quantify and characterize changes in dissolved organic matter (DOM) in aquatic environments. Detailed mapping of the fluorescence properties of DOM produces excitation emission matrices (EEM), which are well suited to multi-way data analysis techniques (chemometrics). Techniques such as parallel factor analysis (PARAFAC) are increasingly being applied to characterize DOM fluorescence properties. Here, an introduction to the technique and description of the advantages and pitfalls of its application to DOM fluorescence is presented. Additionally a MATLAB based tutorial and toolbox specific to PARAFAC analysis of DOM fluorescence is presented.

**General information**

State: Published
Organisations: Aarhus University, University of Copenhagen
Authors: Stedmon, C. A. (Intern), Bro, R. (Ekstern)
Pages: 572-579
Publication date: 2008
Main Research Area: Technical/natural sciences

**Publication information**

Journal: LIMNOLOGY AND OCEANOGRAPHY-METHODS
Volume: 6
ISSN (Print): 1541-5856
Ratings:
BFI (2018): BFI-level 1
Distinguishing between terrestrial and autochthonous organic matter sources in marine environments using fluorescence spectroscopy

The optical properties of chromophoric dissolved organic matter (CDOM) are frequently used as tracers of water masses in bays and estuaries but present unique challenges in the ocean due to the small quantities of organic matter present and the similarities between spectra from coastal and offshore environments. Samples collected on trans-oceanic cruises in the Pacific and Atlantic oceans were used to investigate the optical characteristics of dissolved organic matter in waters with limited freshwater influence (salinity >30). Parallel Factor Analysis (PARAFAC) of fluorescence spectra revealed that coastal and oceanic dissolved organic matter (DOM) fluorescence could be separated into at least eight separate components: 4–5 humic-like and 3–5 protein-like signals. Two of the humic components were identified as representing terrestrial organic matter and their signals could be traced in the open ocean (Pacific and Atlantic) at levels of approximately 1.5% of riverine concentrations. An additional humic component, traditionally identified as the “marine” or “M” peak, was found to be both sourced from land and produced in the ocean. These results demonstrate that the supply, mixing and removal of terrestrial organic matter in oceanic waters can be observed with relatively simple measurement techniques, suggesting that fluorescence spectroscopy could play a useful role in future studies of the origin and fate of DOM in oceanic environments.

General information
State: Published
Organisations: University of New South Wales, Smithsonian Environmental Research Center, Aarhus University
Characteristics of dissolved organic matter in baltic coastal sea ice: Allochthonous or autochthonous origins?

The origin of dissolved organic matter (DOM) within sea ice in coastal waters of the Baltic Sea was investigated using parallel factor (PARAFAC) analysis of DOM fluorescence. Sea ice DOM had distinctly different fluorescence characteristics than that of the underlying humic-rich waters and was dominated by protein-like fluorescence signals. PARAFAC analysis identified five fluorescent components, all of which were present in both sea ice and water. Three humic components were negatively correlated to salinity and concluded to be terrestrially derived material. Baltic Sea ice DOM was found to be a mixture of humic material from the underlying water column incorporated during ice formation and autochthonous material produced by organisms within the ice. Dissolved organic carbon (DOC) and nitrogen (DON) concentrations were correlated to the humic fluorescence, indicating that the majority of the organic carbon and nitrogen in Baltic Sea ice is bound in terrestrial humic material trapped within the ice. This has implications for our understanding of sea ice carbon cycling in regions influenced by riverine input (e.g., Baltic and Arctic coastal waters), as the susceptibility of DOM to degradation and remineralization is largely determined by its source. © 2007 American Chemical Society.
The release of ammonium from the photochemical degradation of dissolved organic matter (DOM) has been proposed by earlier studies as a potentially important remineralisation pathway for refractory organic nitrogen. In this study the photochemical production of ammonium from Baltic Sea DOM was assessed in the laboratory. Filtered samples from the Bothnian Bay, the Gulf of Finland and the Arkona Sea were exposed to UVA light at environmentally relevant levels, and the developments in ammonium concentrations, light absorption, fluorescence and molecular size distribution were followed. The exposures resulted in a decrease in DOM absorption and loss of the larger sized fraction of DOM. Analysis of the fluorescence properties of DOM using parallel factor analysis (PARAFAC) identified 6 independent components. Five components decreased in intensity as a result of the UVA exposures. One component was produced as a result of the exposures and represents labile photoproducts derived from terrestrial DOM. The characteristics of DOM in samples from the Bothnian Bay and Gulf of Finland were similar and dominated by terrestrially derived material. The DOM from the Arkona Sea was more autochthonous in character. Photoammonification differed depending on the composition of DOM. Calculated photoammonification rates in surface waters varied between 121 and 382 μmol NH4+ L−1 d−1. Estimated areal daily production rates ranged between 37 and 237 μmol NH4+ m−2 d−1, which are comparable to atmospheric deposition rates and suggest that photochemical remineralisation of organic nitrogen may be a significant source of bioavailable nitrogen to surface waters during summer months with high irradiance and low inorganic nitrogen concentrations.

General information
State: Published
Organisations: Aarhus University, Uppsala University, Åbo Academy University
Authors: Stedmon, C. A. (Intern), Markager, S. (Ekstern), Tranvik, L. (Ekstern), Kronberg, L. (Ekstern), Slätis, T. (Ekstern), Martinsen, W. (Ekstern)
The conservative and non-conservative behavior of chromophoric dissolved organic matter in Chinese estuarine waters

The spectral absorption properties of chromophoric dissolved organic matter (CDOM) and their distributions in two Chinese estuaries, the Yangtze River Estuary and the Jiulong River Estuary, were studied during August 2003 (wet season) and during different seasons between 2003–2005, respectively. The CDOM concentrations (a355) of fresh end members in the Jiulong River Estuary varied seasonally, while its quality remained relatively stable. However, the a355 of the marine end members exhibited less variability. Application of a conservative mixing model indicated that CDOM behaved conservatively in the Yangtze River Estuary. No photobleaching removal was observed at high salinity region of this estuary. Although CDOM showed conservative behavior for many cruises in the Jiulong River Estuary, there was evidence for removal in the low salinity regions during some cruises. Laboratory mixing experiments and a salt addition experiment suggested that particle sorption of CDOM maybe the possible reason for the removal. These results showed that absorption properties of CDOM can be used as a tool to observe the quantitative and qualitative dynamics of DOM during estuarine mixing.

General information
State: Published
Organisations: Xiamen University, National Environmental Research Institute
Authors: Guo, W. (Ekstern), Stedmon, C. A. (Intern), Han, Y. (Ekstern), Wu, F. (Ekstern), Yu, X. (Ekstern), Hu, M. (Ekstern)
Pages: 357-366
Publication date: 2007
Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.2 SJR 1.4 SNIP 1.038
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.384 SNIP 1.354 CiteScore 3.09
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.525 SNIP 1.39 CiteScore 3.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.276 SNIP 1.74 CiteScore 3.86
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.007 SNIP 1.275 CiteScore 3.15
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.126 SNIP 1.289 CiteScore 3.24
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.678 SNIP 1.093
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.725 SNIP 1.386
The effect of evapoconcentration on dissolved organic carbon concentration and quality in lakes of SW Greenland

1. Dissolved organic carbon (DOC) concentration was determined for a range of lakes of varying conductivity (30–4000 μS cm⁻¹) in the low Arctic of SW Greenland. DOC concentration range from 100 mg C L⁻¹, occasionally approaching 200 mg C L⁻¹ in meromictic, oligosaline lakes. DOC concentration was strongly related to \(\text{log}_{10}\) conductivity and total nitrogen. 2. Peak DOC concentrations (>80 mg L⁻¹) occur in lakes located approximately 50 km from the present ice sheet margin, a zone of low effective precipitation; evaporative concentration is the first-order control on DOC concentration. Lakes at the coast and closer to the ice margin had lower DOC concentrations (21 μm⁻¹) and this may reflect increasingly longer lake water residence times, greater DOM age and photochemical degradation.

General information
State: Published
Organisations: Loughborough University, National Environmental Research Institute
Authors: Anderson, N. J. (Ekstern), Stedmon, C. (Intern)
Pages: 280-289
Publication date: 2007
Main Research Area: Technical/natural sciences

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Journal: Freshwater Biology
Volume: 52
Issue number: 2
ISSN (Print): 0046-5070
Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.36 SJR 1.568 SNIP 1.41
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.537 SNIP 1.371 CiteScore 2.95
BFI (2014): BFI-level 2
Dissolved organic matter (DOM) export to a temperate estuary: Seasonal variations and implications of land use

Inputs of dissolved carbon, nitrogen, and phosphorus were assessed for an estuary and its catchment (Horsens, Denmark). Seasonal patterns in the concentrations of DOM in the freshwater supply to the estuary differed depending on the soil and drainage characteristics of the area. In streams draining more natural areas the patterns observed were largely driven by seasonal temperature fluctuations. The material exported from agricultural areas was more variable and largely controlled by precipitation events. Positive exponential relationships were found between the nitrogen and phosphorus loading, and the percentage of catchment area used for agriculture. Colored DOM (CDOM) loading measurements were found to be a good predictor of dissolved organic carbon (DOC) loading across the different subcatchments, offering a rapid and inexpensive alternative of operationally monitoring DOC export. For all the dissolved nutrient inputs to the estuary, dissolved inorganic nitrogen (DIN) and dissolved organic phosphorus dominated the loadings. Although 81% of the nitrogen annually supplied to the estuary was DIN, 83% of the nitrogen exported from the estuary was dissolved organic nitrogen (DON). Results show that increasing the area of the catchment covered by forest and natural pastures would have a positive effect on the trophic status of the estuary, leading to a considerable decrease in the phosphorus loading and a shift in the nitrogen loading from DIN to DON. Such a change in land use would also increase the export of DOC and CDOM to the estuary having the potential to increase oxygen consumption and reduce the photic depth.

General information
State: Published
Organisations: University of Copenhagen, National Environmental Research Institute, Vejle County
Authors: Stedmon, C. A. (Intern), Markager, S. (Ekstern), Søndergaard, M. (Ekstern), Vang, T. (Ekstern), Laubel, A. (Ekstern), Borch, N. H. (Ekstern), Windelin, A. (Ekstern)
Pages: 388-400
Handling of Rayleigh and Raman scatter for PARAFAC modeling of fluorescence data using interpolation

Fluorescence excitation-emission matrix (EEM) measurements are useful in fields such as food science, analytical chemistry, biochemistry and environmental science. EEMs contain information which can be modeled using the parallel factor analysis (PARAFAC) model but the data analysis is often complicated due to both Rayleigh and Raman scattering. There are several established ways to deal with scattering effects. However, all of these methods have associated
problems. This paper develops a new method for handling scattering using interpolation in the areas affected by first- and second-order Rayleigh and Raman scatter in such a way that the interfering signal is, at best, removed. The suggested method is fast and requires no additional input other than specifying the scattering region. The results of the proposed method were compared with those obtained from common alternative approaches used for preprocessing fluorescence data before analysis with PARAFAC and were shown to be equally good for various types of EEM data. The main advantage of the interpolation method is in its lack of additional metaparameters, its algorithmic speed and subsequent speed-up of PARAFAC modeling. It also allows for using EEM data in software not able to handle missing data.

**General information**

State: Published
Organisations: Bu-Ali Sina University, Royal Veterinary and Agricultural University, National Environmental Research Institute
Authors: Bahram, M. (Ekstern), Bro, R. (Ekstern), Stedmon, C. A. (Intern), Afkhami, A. (Ekstern)
Pages: 99-105
Publication date: 2006
Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): SJR 0.5 SNIP 0.873 CiteScore 1.71
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 0.553 SNIP 0.984 CiteScore 1.82
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 0.536 SNIP 1.235 CiteScore 1.72
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 0.749 SNIP 1.316 CiteScore 2.2
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 0.66 SNIP 1.342 CiteScore 2.03
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 0.742 SNIP 1.037 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 0.591 SNIP 0.75
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 0.931 SNIP 1.008
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.868 SNIP 0.903
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.829 SNIP 1.097
Scopus rating (2006): SJR 1.073 SNIP 1.509
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.435 SNIP 1.358
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.432 SNIP 1.371
Modeling absorption by CDOM in the Baltic Sea from season, salinity and chlorophyll

In the Baltic Sea the underwater light regime is to a large extent governed by absorption by colored dissolved organic matter (CDOM), where the largest source is riverine input. We have applied a conservative mixing model of CDOMs optical properties to a dataset collected in the Baltic Sea during 11 years of continuous observations in 1993–2004. The majority of observations agreed well with the model indicating that conservative mixing is important in the area, as terrestrial organic matter is diluted with open sea water. Deviations from the conservative mixing pattern mainly occurred at salinities over 6.8, and chlorophyll a concentrations over 1.5 mg m−3, and were located in open sea waters, coastal zone and Pomeranian Bay. The seasonal dependence between the light absorption coefficient by CDOM aCDOM(375) and salinity and chlorophyll a concentrations was explored. In March, April and November, months of intensive mixing and high riverine discharge, most of the variability in aCDOM(375) values could be explained by dilution of terrestrially derived CDOM alone. In February, May, and September, months of thermal stratification, reduced riverine discharge and enhanced biological activity, inclusion of chlorophyll a concentration resulted in significantly better models. Autochthonous production of CDOM was found to be a significant source of CDOM in the Southern Baltic Sea in these months. A series of algorithms for the prediction of CDOMs optical properties is presented.

General information
State: Published
Organisations: Unknown
Publication date: 2006

Publication information
Publisher: Danish Polar Center
Original language: English
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 315697
Publication: Research › Journal article – Annual report year: 2006

Interactions between algal-bacterial populations and trace metals in fjord surface waters during a nutrient-stimulated summer bloom
We examined how variations in algal-bacterial community structure relate to Cu, Zn, and Mn speciation during a diatom-rich bloom that was induced by daily additions of inorganic macronutrients to fjord waters in August 2002. The experiments were carried out in 11-m(^3) floating mesocosm bags deployed in the Rauneljord, near Bergen, Norway, and operated in a chemostat (flow-through) mode. Copper speciation was controlled by the formation of very strong organic complexes (log K-1' = 15.2-15.8; log K-2' = 13.0-13.4) whose likely source was the cyanobacterium Synechococcus sp. Strong ligand concentrations were comparable to dissolved Cu levels. This covariation kept the free Cu^{2+} concentration within the range of 10(-12.4) to 10(-11.2) mol L-1, i.e., below the toxicity threshold for Synechococcus. Weaker ligands (log K-3' = 8.2-9.4) were released during-and up to 4 d following-the exponential growth of algae. During this period, the weaker Cu-binding ligands appeared to have the same source or production process as the proteinlike fluorophores detected in these coastal waters. Zinc speciation was controlled by complexation with a single class of organic ligands that appeared to be released inadvertently upon the death and/or grazing of phytoplankton. Labile manganese fluctuations were inversely synchronized with the abundance of heterotrophic bacteria until the coastal waters experienced a massive rain event on day 17 of the experiment. The rainfall, which was a source of nitrogen and micronutrients, appeared to stimulate the growth of larger cells (diatoms) but to inhibit that of the smaller cells (heterotrophic bacteria and cyanobacteria).

General information
State: Published
Organisations: University of Copenhagen, National Environmental Research Institute, University of Bergen
Authors: Muller, F. L. L. (Ekstern), Larsen, A. (Ekstern), Stedmon, C. (Intern), Søndergaard, M. (Ekstern)
Pages: 1855-1871
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Limnology and Oceanography
Volume: 50
Issue number: 6
ISSN (Print): 0024-3590
Ratings: BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Resolving the variability in dissolved organic matter fluorescence in a temperate estuary and its catchment using PARAFAC analysis

Excitation emission matrix fluorescence spectroscopy combined with PARAFAC analysis provides a fast and effective method of characterizing the fluorescent fraction of dissolved organic matter (DOM). Fluorescence measurements can be used as a tracer for quantitative and qualitative changes occurring in the DOM pool as a whole. An earlier study found that the fluorescence signal could be modeled by five fractions. This study presents an analysis on a considerably larger data set (> 1,200 samples) resulting from a 1-yr sampling program in Horsens Estuary, Denmark. Eight fluorescent fractions were identified. Four biogenic terrestrial, two anthropogenic, and two protein-like fractions were identified. Analysis of covariation between the components identified source-specific fractions and the presence of common factors controlling...
the composition of terrestrial DOM exported from different catchments.

**General information**
State: Published
Organisations: National Environmental Research Institute
Authors: Stedmon, C. (Intern), Markager, S. (Ekstern)
Pages: 686-697
Publication date: 2005
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Limnology and Oceanography
Volume: 50
Issue number: 2
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.38 SNIP 1.425
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.329 SNIP 1.682
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.381 SNIP 1.615
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.361 SNIP 1.682
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.38 SNIP 1.641
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.302 SNIP 1.697
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.463 SNIP 1.778
Tracing the production and degradation of autochthonous fractions of dissolved organic matter by fluorescence analysis

We present the results of a mesocosm experiment investigating the production and utilization of autochthonous dissolved organic matter (DOM) by the plankton community under different inorganic nutrient regimes. Fluorescence spectroscopy combined with parallel factor analysis was applied to study the dynamics of autochthonous DOM. Seven independent fluorescent fractions were identified, differing in their spectral characteristics, production rates, and sensitivity to photochemical and microbial degradation processes. Five different humic fractions, a marine protein, and a peptide fluorescence were found. The five humic fractions were produced microbially, with the greatest production occurring under combined Si- and P-limiting conditions. The two proteinaceous fractions were produced during exponential growth of phytoplankton, irrespective of biomass composition. Photodegradation was an important sink for the microbially derived humic material, and the marine protein material was susceptible to both photo- and microbial degradation.

General information
State: Published
Organisations: National Environmental Research Institute
Authors: Stedmon, C. (Intern), Markager, S. (Ekstern)
Pages: 1415-1426
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Limnology and Oceanography
Volume: 50
Issue number: 5
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
Changes in fulvic acid redox state through the oxycline of a permanently ice-covered Antarctic lake

The McMurdo Dry Valleys of Antarctica contain many permanently ice-covered lakes that support populations of algae and bacteria in the water column. In these lakes the concentration of dissolved organic carbon (DOC) is typically greatest at depth. In Lake Fryxell, the DOC concentration is 25 mg C/L at 18 m and 5 mg C/L at 5 m, just below the ice-cover. Dissolved humic substances account for about 20–24% of the DOC in the lake water. The DOC sources to the photic zone of this lake are streamflow, extracellular release by phytoplankton and benthic algal mats and upward diffusion across the oxycline at 9.5 m. Experiments with fulvic acids isolated from four depths show that these humic substances have the capacity to act as electron acceptors in the anoxic degradation of acetate by an iron- and humic-reducing microorganism. We used fluorescence spectroscopy to characterize the abundance and redox state of the quinone functional groups in these experiments and in filtered whole water samples from the lake. The fluorescence intensity of fulvic acid was greater in the oxycline and bottomwaters than in the photic zone. This result suggests that incorporation of quinone functional groups into humic substances may be enhanced in zones of high bacterial activity. Statistical analysis of the excitation emission matrices (EEMs) was used to evaluate trends in the fulvic acid redox state with depth. The results indicate that fulvic acid in the upper photic zone was in an oxidized state and that fulvic acid in the bottomwaters was in a reduced state. The shift in the EEMs indicating a more reduced state occurred in the vicinity of the oxycline (8 to 11 m). The shift in the EEMs began in the zone from 8 and 9 m, where dissolved oxygen concentrations range from to 5 and 10 mg L−1, suggesting that fulvic acid was oxidized upon upward diffusion from the oxycline. This oxidation may be an abiotic process in which reduced humic substances interact with ferric iron generated in this zone.

General information
Behaviour of the optical properties of coloured dissolved organic matter under conservative mixing

The optical properties of coloured dissolved organic matter (CDOM) can be used, in some environments, to trace water masses and provide information about the dynamics of the dissolved organic fraction in natural waters. This work presents the results from a modelling exercise, laboratory experiment and field data, which describe the variations in the optical properties of CDOM during mixing. The exponential slope coefficient (S) is frequently used to characterise different CDOM pools; however, its behaviour during conservative mixing of two different CDOM types is often misunderstood. Identification of a theoretical conservative mixing line allows the rapid identification of non-conservative processes (e.g. in situ production, flocculation and degradation) acting on the pool during mixing. The results suggest that some of the patterns reported in the literature could purely be a result of conservative mixing rather than a product of non-conservative processes.
Fate of terrigenous dissolved organic matter (DOM) in estuaries: Aggregation and bioavailability.
When dissolved organic matter (DOM) from terrestrial and freshwater sources is mixed with estuarine waters at the land- sea interface, the change in salinity has been suggested to cause fast aggregation and an increase in the bioavailability of dissolved organic carbon (DOC) and nitrogen (DON). These processes were investigated in different Danish freshwaters. Aggregation of DOC in short-term (hours) mixing events at increasing salinity was low. In one stream with forest and wetland runoff and in a humic lake, the decrease of DOC over a 0 to 25 ppt salinity gradient was 2 to 5%. Optical analyses by absorption and fluorescence, revealed changes in the composition of the humic components due to salt. The bioavailability of terrestrial DOC was also investigated and found not to change moving from limnic to estuarine conditions. Although the yield of freshwater bacteria cells was about twice the yield of estuarine bacteria, the utilization of DOC was equal, freshwater and estuarine bacterial communities differed in their preference to the humic fractions.
Tracing dissolved organic matter in aquatic environments using a new approach to fluorescence spectroscopy

Dissolved organic matter (DOM) is a complex and poorly understood mixture of organic polymers that plays an influential role in aquatic ecosystems. In this study we have successfully characterised the fluorescent fraction of DOM in the catchment of a Danish estuary using fluorescence excitation–emission spectroscopy and parallel factor analysis (PARAFAC). PARAFAC aids the characterisation of fluorescent DOM by decomposing the fluorescence matrices into different independent fluorescent components. The results reveal that at least five different fluorescent DOM fractions present (in significant amounts) in the catchment and that the relative composition is dependent on the source (e.g. agricultural runoff, forest soil, aquatic production). Four different allochthonous fluorescent groups and one autochthonous fluorescent group were identified. The ability to trace the different fractions of the DOM pool using this relatively cheap and fast technique represents a significant advance within the fields of aquatic ecology and chemistry, and will prove to be useful for catchment management.

General information
State: Published
Organisations: National Environmental Research Institute, Royal Veterinary and Agricultural University
Authors: Stedmon, C. A. (Intern), Markager, S. (Ekstern), Bro, R. (Ekstern)
Pages: 239-254
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Chemistry
Volume: 82
Issue number: 3-4
ISSN (Print): 0304-4203
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.2 SJR 1.4 SNIP 1.038
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.384 SNIP 1.354 CiteScore 3.09
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.525 SNIP 1.39 CiteScore 3.21
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.276 SNIP 1.74 CiteScore 3.86
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
The optics of chromophoric dissolved organic matter (CDOM) in the Greenland Sea: An algorithm for differentiation between marine and terrestrially derived organic matter

The optics of chromophoric dissolved organic matter (CDOM) in the Greenland Sea were investigated and compared to results from earlier studies in the Southeastern North Sea. Absorption at 375 nm ($a_{375}$) in the Greenland Sea varied from 0.77 m$^{-1}$ to the detection limit of our instrument (0.05 m$^{-1}$), with the highest values found during summer. The spectral slope coefficient (S) ranged from 8.2 to 26.4 mum$^{-1}$ with the highest values occurring during winter. Seasonal variations in the in situ production and degradation of CDOM where shown to be responsible for the trends seen. A negative correlation between S and $a_{375}$ was evident in the Greenland Sea and differed noticeably from that found in coastal waters. The differing S-$a_{375}$ behavior of CDOM known to be of terrestrial origin allowed the development of an algorithm for the differentiation between marine and terrestrial organic matter. The behavior of marine CDOM was modeled by $S=7.4+1.1/a_{375}$.

**General information**

State: Published
Organisations: National Environmental Research Institute
Authors: Stedmon, C. (Intern), Markager, S. (Ekstern)
Pages: 2087-2093
Publication date: 2001
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Limnology and Oceanography
Optical properties and signatures of chromophoric dissolved organic matter (CDOM) in Danish coastal waters

The optical properties of chromophoric dissolved organic matter (CDOM) in Danish estuaries and coastal waters were investigated. A new method for estimating the spectral slope coefficient (S) was examined and found to give a closer fit for the measured absorption (92% reduction in sum of residuals) than the traditional method. The spectral pattern in residuals produced by the new technique enabled the identification of CDOM originating from areas of different land uses/types where S coefficients were similar. S values were found to behave conservatively with respect to salinity in all waters except for the off-shore North Sea region where CDOM from marine sources was suspected to have more influence. The specific absorption coefficient of CDOM did not vary significantly in Danish coastal waters. These waters are of particular interest in bio-optical studies as they allow the study of CDOM across a gradient from estuarine, brackish to near-oceanic environments. The results demonstrate that it is possible to develop regional models for the optical properties of CDOM which would then allow higher precision in remote sensing applications.
Projects:

**Supporting the national monitoring of Marine Strategy Framework Indicators (39304)**
In support of the national implementation of EU's Marine Framework Strategy Directive, the project assembles a one-off monitoring of indicators of the following aspects:

- Quality of sandeel habitat
- Proportion of large top predatory fish
- Biomass of planktonic secondary producers
- Pressure on the sea bed from towed fishing gear
- Marine macro-litter
- Marine micro-litter in the food chain

The quality of sandeel habitat is measured as the fraction of sampling sites in known sandeel habitat which are unsuitable for sandeel due to excessive silt content. The proportion of large top predatory fish describes the proportion of large cod and saithe in Danish waters, and biomass of secondary producers is measured as the annual average biomass of zooplankton of three size categories in Skagerrak/Kattegat in summer.
Pressure on the seabed is measured from VMS data and the minimum area which sustains 90% of all pressure estimated together with the effectively unfished area. Macro-litter is measured as the average catch of litter in fish trawl surveys, whereas micro-litter in the food chain is monitored as the amount and occurrence of microplastic particles in stomachs from pelagic and demersal fish.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Nature Agency.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
Period: 15/05/2015 → 31/12/2015
Number of participants: 4
Research areas: Ecosystem based Marine Management & Oceanography
Project participant:
Stedmon, Colin (Intern)
Mortensen, Lars O. (Intern)
Egekvist, Josefine (Intern)
Project Coordinator:
Rindorf, Anna (Intern)

Resolving the chemical structures responsible for the UV-visible spectroscopic properties of dissolved organic matter in aquatic environments
National Institute of Aquatic Resources
Period: 15/12/2014 → 14/12/2017
Number of participants: 7
Phd Student:
Wünsch, Urban (Intern)
Supervisor:
Koch, Boris (Eksterm)
Murphy, Kathleen R. (Eksterm)
Main Supervisor:
Stedmon, Colin (Intern)
Examiner:
Jonasdottir, Sigrun (Intern)
Christensen, Jan H (Eksterm)
Osburn, Christopher Lee (Eksterm)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Fluorescence analysis and monitoring of recirculating aquaculture systems (FAMoRAS) (39177)
FAMoRAS aimed to investigate fluorescence spectroscopy for potential utilization within 3 main areas of recirculating aquaculture system operation:
(1) system "health" monitoring
(2) treatment performance
(3) feed utilization.
Using sensitive lab-scale spectroscopic analysis and mathematical modeling, the project aimed to identify single wavelengths for future use as online, in-situ aquaculture system sensors.

This project was coordinated by DTU Aqua.

The project is funded by EU, Marie Curie.

Section for Marine Ecology and Oceanography
Investigation of causes for declines in fish abundance in coastal areas (Kystfisk II) (39164)
The project aims to describe changes in distribution of different age groups of cod and plaice in coastal areas. Changes in the distribution of plaice off the Danish west coast were documented and correlated to changes in nutrient loadings. These results were submitted for peer review. Potential changes in the distribution of cod of different size classes in inner Danish waters are being modelled to see if there are any consistent patterns. Datamining has been undertaken to provide environmental data to conduct analyses of potential causes for changes observed.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through a special governmental Funding for sustainable fisheries (“Bæredygtighedspuljen”).

Nutrient cocktails in coastal zones of the Baltic Sea (COCOA) (39145)
The overall objective of COCOA is to identify the major pathways of nutrients and organic material (simply referred to as nutrients in the following) across the diversity of coastal ecosystems and assess management implications. Specifically, COCOA will investigate four different types of coastal ecosystems: 1) river- dominated estuaries, 2) lagoons, 3) archipelagos, and 4) embayments with restricted water exchange to:
- Understand the changing nutrient (C/N/P/Si) cocktail across the land-sea continuum.
- Quantify processes that transform and accumulate nutrients.
- Estimate nutrient retention across coastal ecosystems.
- Investigate potential feed-back processes sustaining alternative stable states.
- Analyse how these process rates may have changed over time.
- Evaluate consequences of altered nutrient pathways on ecosystem services.
- Identify possible management responses for present and future projections.

The project is coordinated by Aarhus University, Denmark.

The project was funded EU; BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.
Stockholm University
University of Gdansk
Russian Academy of Sciences
Swedish Meteorological and Hydrological Institute
Klaipeda University
University of Helsinki
Finnish Environment Institute
Utrecht University
University of Gothenburg
Leibniz-Institute for Baltic Sea Research
Period: 01/01/2014 → 31/07/2017
Number of participants: 1
Research area: Oceanography
Project participant:
Stedmon, Colin (Intern)

**Linking the optical properties of DOM to its characteristics and origins (LOCO) (39110)**
The majority of organic carbon in the ocean exists as dissolved organic matter (DOM). A fraction of DOM absorbs ultraviolet (UV) and visible light, while a specific subset of this subsequently exhibits a natural fluorescence. These spectroscopic properties can be used as markers for the turnover of different DOM fractions in the ocean.

This project will link the UV-visible characteristics (optical properties) of DOM to its chemical structure. The results will lead to the capacity for widespread proxy measurements of DOM chemical properties estimated from its optical properties, and the ability to trace the production of both new “reactive” DOM and the humification processes that lead to the production of the bio-refractory DOM pool.

An international team of scientists from Denmark, Norway, Sweden, Germany and USA will collaborate to forge links (calibrate) between the optical properties of DOM to its chemical characteristics which will pave the way for new insights into the fate of terrestrial DOM in marine environments and the role of DOM in the global carbon cycle.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Council for Independent Research.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Lund University
Norwegian Polar Institute
Alfred-Wegener-Institut für Polar-und Meeresforschung
North Carolina State University
Period: 01/06/2013 → 31/05/2016
Number of participants: 1
Research area: Oceanography
Project Coordinator:
Stedmon, Colin (Intern)

**Cruise with RV Dana. North Atlantic-Arctic Ocean Coupling: Deep water overflows and surface water outflow (NAAO) (38928)**
This cruise was planned as an essential part of the Danish contribution to oceanographic fieldwork as part of the NAACOS project (2011-2014), funded by the Strategic Research Council.

The main objectives of the cruise were to obtain a comprehensive suite of physical, chemical and biological oceanographic measurements across the East Greenland shelf, extending into the Greenland Sea, and to study the deep-
water overflow in the Denmark Strait.

The data collected on this cruise formed the basis of validating and improving circulation and ecological models in the region and developing new approaches to tracing freshwater and organic carbon exported from the Arctic.

The project was funded by the Danish Center for Marine Research.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Aarhus University
University of Copenhagen
Greenland Institute of Natural Resources
Period: 01/01/2012 → 31/12/2012
Number of participants: 2
Research areas: Oceanography & Marine Populations and Ecosystem Dynamics
Project participant:
Jonasdottir, Sigrun (Intern)
Project Coordinator:
Stedmon, Colin (Intern)

Aqua Fingerprint - Early warning for contamination of drinking water (38966)
The majority of Danish drinking water supplies to some extent have at some point been troubled with periods of decline in water quality. For the majority of instances the contamination event is discovered by the routine microbiological control grab sampling and occurs in conjunction with extreme events, such as intense rain, where contaminated water enters the network as a short pulse with high concentration. For most cases the actual source of the contamination cannot be traced as the event has already passed through the network and this hinders progress in improving the network.

Some events could have been avoided if an early warning system indicating the occurrence of such a pulse was available. This project was focused on developing such an on-line sensor using organic matter fluorescence. Proof of concept was proved and a prototype online sensor was built to prove the feasibility of the technology.

This project was coordinated by Krüger AS, Denmark.

The project was funded by the Danish Environment Agency.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Krüger A/S
TREFOR Vand A/S
Technical University of Denmark
Period: 01/01/2012 → 31/12/2012
Number of participants: 1
Research area: Oceanography
Project participant:
Stedmon, Colin (Intern)

Center for Ocean Life (COOL) - a Villum-Kahn Rasmussen Centre of excellence for the study of life in a changing ocean (38980)
Our goal is to develop a fundamental understanding and predictive capability of marine ecosystems through the use of novel trait-based approaches and models.

The Centre is organized around three main research activities:
- Identification and mechanistic description of the traits and trade-offs required to characterize the main Darwinian missions (feed, survive, reproduce) of the various life forms in the ocean through experimental and theoretical work, as well as analysis of literature data.
- Models: scaling of individual behavior to population and ecosystem dynamics through the development of trait-based models.
- Testing model prediction by comparing to observed trait patterns in the ocean.
The Centre involves biologists, physicists, chemists, and mathematicians and has a very strong training component through the supervision of master students, and about 30 PhD and postdoctoral fellows as well as by offering PhD summer schools and organizing international workshops. The Centre in addition host many visiting students and scientists.

The Centre is lead by DTU Aqua.

The project is funded by the Villum Kahn-Rasmussen Foundation (Velux Foundations) as well as through various national and European fellowship programs (Research Council, H.C. Ørsted Fellowship programme, Marie Curie, Carlsberg Foundation, etc).

National Institute of Aquatic Resources
Centre for Ocean Life
Roskilde Universitet
University of Copenhagen
Massachusetts Institute of Technology
University of Oxford
Michigan State University
University of Bergen
Kiel University

Period: 01/01/2012 → 31/12/2017
Number of participants: 10
Research areas: Oceanography & Marine Populations and Ecosystem Dynamics & Marine Living Resources & Ecosystem based Marine Management

Project participant:
Andersen, Ken Haste (Intern)
Visser, Andre (Intern)
Stedmon, Colin (Intern)
Gislason, Henrik (Intern)
Payne, Mark (Intern)
Thygesen, Uffe Høgsbro (Intern)
MacKenzie, Brian (Intern)
Mariani, Patrizio (Intern)
Nielsen, Torkel Gissel (Intern)

Project Manager, academic:  
Kiørboe, Thomas (Intern)

Optical properties of Greenlandic coastal waters: modeling light penetration in a changing climate (38931)
The availability and spectral quality of light are key parameters controlling the productivity of Greenlandic coastal waters. Although solar elevation and sea ice cover play an important role, light is also regulated by water constituents (e.g. organic matter, phytoplankton and suspended sediments). Changing ocean circulation patterns and enhanced glacial melt stand to considerably alter the underwater light environment. This project will develop a 1D model for spectral light attenuation based on field measurements planned in two contrasting fjord systems. Results will provide valuable ground-truth data for remote sensing applications and more accurate description of the light environment for hydrodynamic models.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life
Aarhus University

Period: 01/01/2011 → 31/12/2012
Number of participants: 1
Research area: Oceanography
Project Coordinator:
Stedmon, Colin (Intern)
Climate change is most pronounced at high latitudes, with rapid and dramatic changes observed in sea-ice coverage, circulation and the ecosystem. These changes have profound effects both at the regional scale as well as globally.

The North Atlantic and Arctic Ocean are the headwaters of the thermohaline circulation (THC), the global heat engine responsible, amongst other things, for the relatively mild climate we experience in Denmark. Subtle change in sea-ice formation, deep water circulation, and freshwater supply on a relatively local scale will have repercussions around the world. More subtle still are the feedback controls these processes have on climate change. Sea-ice coverage and the earth’s albedo is one feedback, but there is also the drawdown and sequestering of atmospheric CO2 in deep waters by physical and biological processes. The whole is an intricate weave of interrelated mechanisms: the scientific challenge to draw together expertise across disciplines to address these issues was accomplished; the strategic outcome was a suite of knowledge-based tools designed to reduce the uncertainty and contribute to climate policies.

The NAACOS team comprised a number of well-recognized scientists with profound experience and a significant international collaboration. NAACOS developed and refined oceanographic models using remote sensing and observations to evaluate the impact of high latitude climate change on circulation, deep water formation, sea-ice and carbon flux, and their implications at regional scales.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Strategic Research and a DHI student stipend.
In essence, the project addressed if and how the molecular composition of tDOM and the structure of bacterial communities determine the fate of tDOM in aquatic systems.

The project was funded by the Swedish Research Council.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Lund University
Uppsala University

Period: 01/01/2011 → 31/12/2013
Number of participants: 1
Research area: Oceanography
Project participant:
Stedmon, Colin (Intern)

Activities:

**EGU 2017**
Period: 27 Apr 2017
Urban Wünsch (Speaker)
Colin Stedmon (Speaker)

National Institute of Aquatic Resources
Section for Oceans and Arctic

**Description**
General assembly of the European Geosciences Union 2017
Degree of recognition: International
Links:

**Related event**
EGU General Assembly 2017: European Geosciences Union 2017
24/04/2017 → 28/04/2017
Vienna, Austria
Activity: Talks and presentations › Conference presentations

**Havet, Klima og Kulstof: hvordan hænger det sammen?.**
Period: 5 Nov 2016
Colin Stedmon (Lecturer)

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

**Related event**
Dansk Laborant Forening årsmøde
05/11/2016 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

*Havet, Klima og Kulstof: hvordan hænger det sammen?.
Period: 28 Apr 2016
Colin Stedmon (Lecturer)

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

**Related event**

**Bestil en forsker (Folkeuniversitetet)**
28/04/2016 → …
Birkerød, Denmark
Activity: Talks and presentations › Conference presentations

**Nordic-Baltic IHSS Symposium**
Period: 10 Jun 2013 → 12 Jun 2013
Colin Stedmon (Invited speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

**Description**
Coupling the UV-visible spectroscopic properties of dissolved organic matter to its chemical characteristics: Evidence across contrasting environments

**Related event**

**Nordic-Baltic IHSS Symposium**
10/06/2013 → 12/06/2013
Uppsala, Sweden
Activity: Talks and presentations › Conference presentations

**Gordon Research Conference: Polar Marine Science**
Period: 11 Mar 2013
Colin Stedmon (Invited speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

**Description**
Conservative and non conservative behavior of DOM in polar environments: insight into macro and micro scale processes

**Related event**

**Gordon Research Conference: Polar Marine Science: Linking Polar Observations, Processes and Models at Regional and Global Scales**
10/03/2013 → 15/03/2013
Ventura, United States
Activity: Talks and presentations › Conference presentations