

**PAN-CANADIAN ARCTIC CYCLING OF MARINE DISSOLVED
ORGANIC CARBON AND NITROGEN**

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Table of Contents

Statement of Authorship Contributions	iii
Thesis Abstract	iv
Thesis Acknowledgements	vi
List of Figures	vii
List of Tables	viii
Glossary	ix
1. Background and Literature Review	1
1.1 Biogeochemical cycling of marine DOM and its role in climate modulation.....	1
1.2 Diversity of biogeochemical provinces in the Canadian Arctic.....	3
2. Introduction	8
3. Materials and Methods	9
3.1 Sample collection and nutrient analyses.....	9
3.2 Dissolved organic matter concentrations and C:N ratios	10
3.3 Determination of river, sea-ice melt and seawater fractions contributing to DOC and DON values.....	11
4. Results and Discussion	12
4.1 DOM Cycling within the Mackenzie River plume, Beaufort Sea and Amundsen Gulf.....	13
4.2 DOM Cycling within the Kitikmeot Sea and Eastern CAA	14
4.3 DOM Cycling within Baffin Bay	16
4.4 Pan-Canadian sinks of terrestrial and marine DOM.....	17
5. Summary and Implications.....	20
6. Chapter Acknowledgments.....	21
7. Figures with Captions	22
8. Conclusions.....	24
9. References.....	26
Appendix A: Supplementary Figures	37
Appendix B: Supplementary and Extended Tables	45

Statement of Authorship Contributions

This thesis contains a manuscript in preparation for submission and comprises a collaboration with co-authors Jonathan Gagnon (J.G.), Dr. Jean-Éric Tremblay (J.E.T.), Dr. Brent Else (B.E.), and supervisor Dr. Brett Walker (B.D.W.). All coauthors declare no conflict of interest through their contributions. We declare no ethics approval was required. Lauren O'Reilly (L.O.) wrote the paper under the supervision of B.D.W. Manuscript comments were provided by J.E.T. and B.E. B.D.W. conceived the hypothesis and objectives of this investigation. Funding and logistics for the 2019 research cruise (Cruise# 1902, Leg 2) were managed by ArcticNet and the 2021 research cruise (Cruise# 2104, Leg 4) were managed by co-principal investigator B.E. We thank B.D.W. for providing the necessary research facilities, training, and analysis assistance, as well as for securing ship time for his students and coordinating coauthors on the attached manuscript.

Thesis Abstract

Marine dissolved organic matter (DOM; $<0.1\mu\text{m}$) is one of Earth's largest reservoirs (662 GtC; 32-70 GtN) of reactive carbon (as dissolved organic carbon; DOC) and nitrogen (as dissolved organic nitrogen; DON). It is produced autochthonously in the ocean through primary production via fixation of atmospheric CO_2 or can be delivered allochthonously, primarily from riverine or atmospheric input (Hansell et al., 2009). The lifetimes of DOM in the ocean span from minutes to millenia, with most DOM being rapidly consumed and remineralized in the surface ocean by heterotrophic microbes. However, the portion that is not consumed comprises small dissolved and colloidal molecules that resist biological degradation and accumulate in the ocean, playing a critical role in global atmospheric carbon sequestration and climate modulation (Benner & Amon, 2015). DOM biogeochemistry of the Canadian Arctic is largely unconstrained despite the region being exacerbated by the impacts of global climate change and currently warming four times faster than the rest of the planet (Rantanen et al., 2022). The Canadian Arctic Archipelago (CAA) and Baffin Bay connect Arctic, Pacific, and Atlantic-origin waters to the North Atlantic and are thus key regions of DOM production, delivery and transformation that will be translated into North Atlantic Deep Water (NADW) and potentially stored for centuries to millenia via global thermohaline circulation. Baseline DOC and DON concentrations, with respective elemental stoichiometry (C:N), are needed for the Canadian Arctic as they can be used as basic indicators of carbon and nitrogen sources, sinks and chemical transformation which are necessary in order to understand their contribution to global carbon and nitrogen cycles. Only surface values have been reported for DOC and DON in the CAA and Baffin Bay to date, with no published data regarding carbon and nitrogen stoichiometry. Here we report the first depth profiles of DOC and DON concentrations with stoichiometric ratios (DOM C:N) in the CAA and Baffin Bay. We evaluate these data considering DOM sources, bioavailability and removal mechanisms in the Canadian Arctic.

We find that DOC and DON cycling are decoupled in the Canadian Arctic. DOC is significantly higher in CAA surface and Pacific Winter Water ($\sim 200\text{m}$) than in Baffin Bay. We quantify contributions of terrestrial and marine DOM using a $\delta^{18}\text{O}$ proxy and find a loss of both terrestrial and marine DOM from the CAA to Baffin Bay, suggesting removal of DOM with lateral transport into Baffin Bay and along the Baffin Island Current (BIC) before entering the Labrador Sea. We identify three regions of very high DON and low DOM C:N: the North Water Polynya,

Davis Strait, and an upwelling region in the Amundsen Gulf, suggesting labile DOM production and export and/or the accumulation of recalcitrant DON. We find that the CAA and Baffin Bay differ with respect to biogeochemical cycling. Our results support previous work suggesting Baffin Bay as a source of labile DOC fueled by high primary productivity, however our study also suggests it is a sink for primarily marine, but also high C:N terrestrial DOM from the CAA that is removed within the BIC. In contrast, DOM in the CAA may be more strongly controlled by marine microbial loop processes and the microbial transformation of terrestrial DOM into more recalcitrant, high C:N compounds. Finally, we observe that the Kitikmeot Sea has unique DOM biogeochemistry, with very high DOC at depth (~300m) and high DOM C:N, possibly explained by large contained freshwater inputs and enhanced heterotrophy. We identify the CAA and Baffin Bay as previously unrecognized sinks of both terrestrial and marine DOM and estimate removal rates of DOM along key advective pathways in the Canadian Arctic. These results provide a critical baseline understanding of DOM biogeochemical cycling in the Pan-Canadian Arctic which aid in quantifying the impact of climate change on Arctic DOM reservoirs.

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List of Figures

Figure 1. Pan-Canadian Arctic surface distributions of dissolved organic matter (DOM) and hydrographic data.....	22
Figure 2. Section plots depicting subsurface hydrographic and DOM data along transect.....	23
Figure S1. Sample locations and dominant current systems within the CAA and Baffin Bay	37
Figure S2. Salinity and $\delta^{18}\text{O}$ data for the CAA and Baffin Bay showing chosen mixing model endmembers	38
Figure S3. Terrestrial and total Pacific Winter Water (PWW) DOM in the Pan-Canadian Arctic.....	39
Figure S4. Section plots of Kitikmeot Sea region hydrographic and DOM parameters	40
Figure S5. PWW terrestrial and marine DOM (tDOM, mDOM) concentrations from Beaufort Sea to Baffin Bay.....	41
Figure S6. Pacific Winter Water DOC and DON removal rates from Beaufort Sea to Baffin Bay.....	42
Figure S7. Sections of chromophoric dissolved organic matter (CDOM) in Baffin Bay.....	43
Figure S8. Depth profiles of measured DOC, f_{RW} , and CDOM depth for sampled Baffin Island Current (BIC) Stations.....	44

List of Tables

Table S1. Station and CTD data for all depths measured in the CAA and Baffin Bay	45
Table S2. Station DOM and nutrient measurements with hydrographic data	51
Table S3. Calculated DOM removal rates along specified advective pathways from PWW	60

Glossary

AMOC – Atlantic Meridional Overturning Circulation

AOU – Apparent Oxygen Utilization

ATL_{FS} – Atlantic Fram Strait Water

BIC – Baffin Island Current

CAA – Canadian Arctic Archipelago

CBDW – Canada Basin Deep Water

CDOM – Chromophoric Dissolved Organic Matter

CG – Coronation Gulf

CRAM – Carboxyl-Rich Alicyclic Molecules

CTD – Conductivity – Temperature – Depth

DIC – Dissolved Inorganic Carbon

DIN – Dissolved Inorganic Nitrogen

DOC – Dissolved Organic Carbon

DOM – Dissolved Organic Matter

DON – Dissolved Organic Nitrogen

FDOM – Fluorescent Dissolved Organic Matter

f_{RW} – Fraction River Water

f_{SIM} – Fraction Sea-Ice Melt

f_{SW} – Fraction Seawater

HWM – High Molecular Weight

LDOM – Labile Dissolved Organic Matter

LMW – Low Molecular Weight

MCP – Microbial Carbon Pump

mDOM – Marine Dissolved Organic Matter

NADW – North Atlantic Deep Water

NOW – North Water Polynya

POM – Particulate Organic Matter

PSW – Pacific Summer Water

PWW – Pacific Winter Water

QMG – Queen Maude Gulf

RDOM – Recalcitrant Dissolved Organic Matter

SLDOM – Semi-Labile Dissolved Organic Matter

SML – Seasonal Mixed Layer

TDAA – Total Dissolved Amino Acids

tDOM – Terrestrial Dissolved Organic Matter

TOC – Total Organic Carbon

WGC – Western Greenland Current

WGIW – West Greenland Irminger Water

$\delta^{13}\text{C}$ – Stable Carbon

$\Delta^{14}\text{C}$ – Radiocarbon

$\delta^{18}\text{O}$ – Stable Oxygen

1. Background and Literature Review

1.1 Biogeochemical cycling of marine DOM and its role in climate modulation

DOM is operationally defined as organic material smaller than $0.1\mu\text{m}$, comprising millions of chemically distinct molecules with varying bioavailability and reactivities (Amon & Benner, 1996). The vast quantity of exchangeable carbon as DOC within the oceanic carbon pool (662 GtC; Hansell et al., 2009; Walker et al., 2016) has the capacity to cause perturbations to the global carbon cycle on short timescales (1000 – 10000 years; Hedges, 2002) with even small changes to the reservoir. The DON pool, being smaller than that of DOC (32-70 GtN; Zhang et al., 2020) is the largest reservoir of organic nitrogen and most abundant form of fixed nitrogen in surface waters (Bronk, 2002; Aluwihare & Meador, 2008). DOC and DON are major constituents of the oceanic DOM pool and can be categorized according to bioavailability (i.e. chemical complexity), with bioavailable DOM being rapidly remineralized by heterotrophic microbes (labile; LDOM), less bioavailable DOM (semi-labile; SLDOM) having a longer residence time than LDOM, and refractory DOM (RDOM) resisting remineralization on long timescales (>1000 years). Most DOM in the ocean is ultimately derived from primary production in the surface, with primary producers generally producing labile particulate organic matter (POM; $>0.1\mu\text{m}$) and LDOM. Biochemical degradation of POM into DOM by heterotrophic microbes with diverse metabolisms increases chemical complexity, with continuous degradation of DOM producing semi-labile or refractory material with smaller molecular sizes – a process known as the microbial carbon pump (MCP; Jiao et al., 2010). Previous studies on the chemical composition and radiocarbon ($\Delta^{14}\text{C}$) content of DOM have shown that chemical complexity and ^{14}C age increase with decreasing molecular size, and that microbial degradation likely shapes the size-distribution of DOM in the ocean, giving rise to the idea of the ‘size-reactivity continuum’ model (e.g., Amon & Benner, 1996; Walker et al., 2011; Benner & Amon, 2015; Walker et al., 2016).

Size distributions of the DOM pool can be broadly separated into high molecular weight (HMW; ≥ 1 kDa) and low molecular weight (LMW; < 1 kDa) size classes based on common micro- and ultrafiltration techniques (Sharp, 1973, Carlson et al., 1985, Benner, 1991, Ogawa & Ogura, 1992). HMW DOM components include colloids and gels such as polysaccharides, aliphatic molecules and carboxylic acids, and to a lesser extent lipids and proteins, with HMW DOM comprising 10-30% of the total organic carbon (TOC) in the ocean (Benner et al., 1992, 1997;

Ogawa & Ogura, 1992; Guo et al., 1995; Kaiser & Benner, 2009; Walker et al., 2011). LMW DOM dominates the oceanic TOC reservoir comprising ~70%, and is thought to be largely RDOM, persisting in the ocean for millenia. Little is known about the composition and cycling of RDOM due to analytical difficulties in identification and quantification, though carboxyl-rich alicyclic molecules (CRAM) are found to contribute substantially to the RDOM pool (Hertkorn et al., 2006, 2013) with dissolved black carbon contributing to a lesser extent (Yamashita et al., 2022; Coppola et al., 2022), though not all CRAM is recalcitrant (McKee et al., in press). What is known is that HMW DOM and LMW DOM are distinct with respect to biogeochemical cycling, with HMW DOM being larger, remineralized faster, and having lower C:N and ^{14}C ages than LMW DOM in the global ocean (e.g. Walker & McCarthy, 2012; Walker et al., 2014).

The net flow of carbon from HMW LDOM to LMW RDOM via biodegradation in the MCP has major implications for global climate. Surface DOM that is not remineralized may be exported to deeper waters, where depending on its reactivity, will be remineralized to dissolved inorganic carbon (DIC) and temporarily stored until it is ventilated at the surface again via thermohaline circulation (Ducklow et al., 2001). However, RDOM can resist remineralization in the water column on long timescales, storing large amounts of fixed carbon for this time period (centennia to millenia). Ocean warming, stratification and deoxygenation as a result of climate change can enhance the MCP, increasing RDOM production and carbon storage (Legendre et al., 2015). Conversely, cooling events enhance vertical mixing and stimulate RDOM remineralization to CO_2 , contributing to global warming (Shen & Benner, 2018). The MCP is thus suggested to be a two-way regulator of climate change. Given the current trajectory of anthropogenic carbon emissions, the MCP is likely to play an important role in global marine carbon sequestration.

Allochthonous DOM sources to the ocean also influence marine biogeochemical cycling. Terrestrial DOM (tDOM) delivered from rivers is largely chromophoric (CDOM), containing highly photoreactive aromatic molecules such as lignin phenols which can be rapidly photodegraded in the coastal ocean, comprising an important sink of tDOM and source of inorganic nutrients (Miller & Zepp, 1995; Bushaw et al., 1996; Letscher et al., 2011). tDOM is largely removed on ocean margins where it can create hotspots of biological activity (Shen et al., 2012; 2016). Physical and biological processes occurring in rivers affect the photochemical and microbial reactivity of tDOM entering the ocean, with tDOM being characterized by elevated C:N ratios, depleted stable carbon ($\delta^{13}\text{C}$) ratios, and high aromaticity indicative of extensive

degradation before reaching the ocean (Hedges et al., 1992; Benner et al., 1992). CDOM photodegradation also shifts the size spectrum of DOM from HMW to LMW molecules (Opsahl & Benner, 1998; Helms et al., 2008; Dalzell et al., 2009), and is an important DOM cycling mechanism not discussed in our study.

1.2 Diversity of biogeochemical provinces in the Canadian Arctic

The Arctic Ocean is a unique region for DOM biogeochemistry, containing only ~1% of global ocean volume, however receiving approximately 10% of global river discharge (Aagaard & Carmack, 1989; McClelland et al., 2012). The significant delivery of freshwater results in the Arctic Ocean being vertically stratified, with cold, fresh surface water on top of warmer water originating in the Atlantic Ocean. Arctic DOM biogeochemistry is thus heavily influenced by the delivery of freshwater and tDOM draining from the extensive continental watersheds that surround the Arctic Ocean (Shiklomanov et al., 2000). tDOM is rapidly remineralized in the ocean via microbial and photochemical processes in tropical to temperate latitudes, generally comprising 1-2% of total DOC here (Hernes & Benner, 2006). In the Arctic, cold temperatures and reduced sunlight, coupled with large riverine input results in an accumulation of tDOM of up to 10% of total DOM in Arctic surface waters (Opsahl et al., 1999). Despite the significant contribution of tDOM to the Arctic DOM pool, most marine DOM is ultimately derived from primary production.

The Canadian Arctic Archipelago (CAA) is a continental shelf containing approximately 36,000 islands and is characterized by shallow bathymetry, with approximately 70% of the CAA being shallower than 500 metres (McLaughlin & Carmack, 2005). Main water inputs include substantial freshwater advection from the surface Arctic Ocean, as well as freshwater delivery from river discharge, sea ice melt, and net precipitation. Extensive freshwater input largely controls water stratification in the CAA. Shallow sills within the CAA limit the penetration and advection of deep Atlantic waters from Fram Strait, thus, most of the water beneath the surface fresh, meteoric water is of Pacific origin (Münchow et al., 2007). In general, Arctic surface waters flow westward and southwestward through channels in the CAA to Baffin Bay and eventually into the Labrador Sea. Sea ice is present for most of the year, with both multiyear and seasonal sea ice present. Seasonal variations in sea ice distribution exists and freezing generally begins in October, with thaw beginning in May and minimum ice cover in September (McLaughlin & Carmack, 2005). A unique feature of the CAA is the presence of the colloquial “Kitikmeot Sea”, located in

Coronation and Queen Maud Gulf. This sea is bounded by shallow sills that allow the accumulation of freshwater (<30 PSU) to depths of approximately 300 metres in the gulfs due to sea ice melt and the drainage of major rivers into this region, notably the Kugluktuk and Burnside rivers. The Kitikmeot Sea is unique in that it is nitrogen-depleted and highly stratified due to the extreme freshwater input, emphasizing the heterogeneous nature of the CAA.

In contrast, Baffin Bay is a marginal sea connected to the Arctic and Atlantic Ocean through restrictive straits and is bordered by Greenland to its east and Baffin Island to its west. The channels of the CAA also connect Baffin Bay to the Arctic Ocean, notably through Jones Sound and Lancaster Sound on the western side. There is a deep abyssal plain in the center of the bay reaching depths of ~2300 metres (Tang et al., 2004), with narrow continental shelves on the west and more extensive continental shelves on the east. The influential Western Greenland Current (WGC) enters Baffin Bay through Davis Strait flowing north along southern Greenland, carrying warm and salty water of North Atlantic origin. In contrast, the Baffin Island Current (BIC) flows south along western Baffin Bay carrying cold, fresh water into the North Atlantic. The striking differences in the characteristics of the WGC and BIC cause the western and eastern sides of Baffin Bay to differ greatly with respect to water mass characteristics and climatology, including high east-west gradients in winter air temperature and significant ice cover along the western side in the winter, with almost complete lack of winter ice cover on the eastern side (Tang et al., 2004). The Greenland Ice Sheet is present in western Greenland which delivers freshwater and nutrients to eastern Baffin Bay during ice melt, and multiple fjords are present along this region including the large Vaigat fjord. The waters entering Baffin Bay through the CAA, WGC and Arctic Ocean differ in their geochemical characteristics, making Baffin Bay a dynamic and heterogeneous environment.

The CAA has lower primary productivity relative to other Arctic shelves (Michel et al., 2006; Sakshaug et al., 2004). However, bioavailable DOM and labile DOM were found in the CAA and Baffin Bay respectively as indicated by total dissolved amino acid (TDAA) yields, which are labile DOM proxies (Shen et al., 2018; Davis & Benner, 2007). Variability in bioavailable DOM production in the CAA was largely attributed to light availability and sea-ice extent, whereas labile DOM production in eastern Baffin Bay was attributed to the warm WGC carrying West Greenland Irminger Water (WGIW), contributing to ice-free conditions conducive to phytoplankton production (Shen et al., 2018). Previous studies also indicate the importance of

Pacific nutrients in the export and remineralization of DOM in the CAA and Baffin Bay, as well sustaining high primary productivity in Baffin Bay (Lehmann et al., 2019; 2022). The evaluation of fluorescent CDOM (FDOM) composition in the CAA and Baffin Bay indicated the *in situ* production of terrestrial humic-like (C1 and C3) FDOM in the CAA Arctic Outflow and WGIW, given by its linear correlation with apparent oxygen utilization (AOU), suggesting their production via microbial oxidation of organic matter (Guéguen et al., 2014).

Despite these few studies, the cycling of marine DOM in the Canadian Arctic and the Arctic marine carbon cycle in general remain poorly understood. Little DOC and DON concentration data exist in this region (Druffel et al., 2017; Griffith et al., 2012; Shen et al., 2018). This thesis reports the first water column depth profiles of [DOC] and [DON] across the pan-Canadian Arctic and evaluates biogeochemical cycling of DOM in the CAA and Baffin Bay.

Distributions, cycling and elemental stoichiometry of dissolved organic matter within the Canadian Arctic Archipelago and Baffin Bay

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Key Points:

- Dissolved organic carbon and nitrogen (DOC, DON) concentrations are low in Baffin Bay and high in the Canadian Arctic Archipelago, particularly near rivers
- Dissolved organic matter (DOM) elemental (C:N) ratios reveal high spatial variability and the export of low C:N DOM in the Amundsen Gulf, Baffin Bay and Davis Strait
- Previously unrecognized regional sinks for terrestrial and marine DOM are evaluated in the Canadian Arctic Archipelago and Baffin Bay

Abstract

Marine dissolved organic matter (DOM) is one of Earth's largest reservoirs of actively cycling carbon and nitrogen. However, few dissolved organic carbon and nitrogen concentrations ([DOC], [DON]) have been reported for the Canadian Arctic Archipelago (CAA) and Baffin Bay. Here we report [DOC], [DON] and C:N stoichiometric ratios at high spatial and depth resolution within the CAA and Baffin Bay. Higher surface and Pacific Winter Water DOC and DON concentrations in the CAA vs. Baffin Bay reveal previously unrecognized locations for carbon and nitrogen loss within the Canadian Arctic. High DON (low DOM C:N) depth profiles in the North Water (NOW) Polynya, Davis Strait, and Amundsen Gulf are regions of labile DOM export and potentially recalcitrant DON accumulation at depth. DOM within the river-dominated Kitikmeot Sea has a unique biogeochemistry. These results provide a critical baseline understanding of Pan-Canadian DOM biogeochemical cycling in an era of unprecedented global change.

Plain Language Summary

Organic molecules, freely dissolved in seawater, are an important nutrient and food source in marine systems. Dissolved organic molecules collectively store vast amounts of carbon and nitrogen in the ocean and help mitigate climate change on long timescales. Little is known about the delivery of dissolved organic molecules by Canadian rivers, their production by marine phytoplankton or consumption by bacteria in Canadian Arctic ecosystems. Here we discuss pathways for changing dissolved organic molecule composition and abundance from new measurements in the Beaufort Sea, Canadian Arctic Archipelago and Baffin Bay. We use models to separate dissolved organic molecules coming from rivers and those produced by marine life. We find that while the delivery of dissolved organic molecules from rivers can be high, this material is rapidly consumed by bacteria such that most of them made in the Canadian Arctic are of marine origin. This study helps us understand the complex pathways of dissolved organic molecule production, transformation and removal in the Canadian Arctic and sheds light on their significance in the broader context of global ocean health and climate change.

2. Introduction

Dissolved organic matter (DOM; $<0.1\mu\text{m}$) comprises two of the largest bioactive reservoirs of organic carbon and nitrogen in the oceans (DOC: 662 GtC; DON: 32-70 GtN; Hansell et al., 2009; Walker et al., 2016; Zhang et al., 2020). Molecular transformations, removal or storage of carbon and nitrogen within these massive reservoirs can have significant impacts on global carbon and nitrogen cycles (e.g. Kwon et al., 2009). Sources and cycling of DOM within the Arctic Ocean are well parameterized (e.g. Anderson & Amon, 2015). Roughly a dozen major rivers provide significant amounts of DOM to the Arctic Ocean (Amon et al., 2012; Raymond et al., 2007; Stedmon et al., 2011; Fichot et al., 2013). Terrestrial DOM (tDOM), chromophoric DOM (CDOM), and biomarkers (e.g. lignin phenols) have been found throughout the surface Arctic Ocean (Walker et al., 2009; Amon, 2004; Letscher et al., 2011; Fichot and Benner, 2012; Mathis et al., 2014; Opsahl et al., 1999). Surface currents from Fram Strait, the Barents Sea and the Bering Strait provide allochthonous sources of Atlantic and Pacific DOM and macronutrients to the Arctic Ocean. High primary production within the Arctic Ocean and, more specifically on wide Arctic shelves (e.g. Chukchi and Barents Seas) supplemented by sediment and river nutrients are a predominant source of DOM to the Arctic (Hansell & Carlson, 1998; Mathis et al., 2007; Walsh et al., 1997; Letscher et al., 2013b; Shen et al., 2018). To a smaller extent, sea-ice algae are also contributors to marine DOC during ice-melt (Smith et al., 1997; Mathis et al., 2007; Thomas et al., 1995). Predominant DOM sinks within the Arctic can be biological (e.g. the removal of tDOM via heterotrophic marine microbes; Amon & Benner, 2003; Amon et al., 2001; Davis and Benner, 2005, 2007; Hansell, 2013; Shen et al., 2018), photochemical oxidation (Grunert et al., 2021; Novak et al., 2022), or export to depth.

The Canadian Arctic is currently warming four times faster than the rest of the planet (Rantanen et al., 2022). How current global warming, enhanced Arctic freshening, ocean acidification, water column stratification, and resultant changes to primary production and community composition will impact DOM biogeochemistry remain almost completely unknown. To date, only a few studies have reported DOC and DON concentrations within this rapidly changing Arctic ecosystem. The most well-studied region for DOM cycling in the Canadian Arctic is the Beaufort Shelf and Canada Basin. The Beaufort Sea is heavily influenced by tDOM from the Mackenzie River (Letscher et al., 2011, 2013a; Tremblay et al., 2014), but is also subsidized by advection of bioavailable DOM from the productive Chukchi shelf (Mathis et al., 2007; Shen

et al., 2018). Druffel and co-workers (2017) reported DOC isotopic ($\Delta^{14}\text{C}$, $\delta^{13}\text{C}$) values for the Beaufort Shelf and found that modern DOM was selectively removed on the Beaufort Shelf/Slope resulting in increasing DOM ^{14}C -ages that were also inversely correlated to the abundance of total dissolved amino acids (TDAA).

The Canadian Arctic Archipelago (CAA) is also heavily influenced by the delivery of tDOM by rivers. Using DOC concentrations, optical properties and lignin phenol measurements for the CAA, Walker and co-workers (2009) found that CAA DOM is characterized by low levels of autotrophic production and substantial tDOM contributions (e.g. ~17% of surface CAA DOM). Using a TDAA proxy, Shen and co-workers (2018) found low DOM bioavailability in the CAA due to longer residence times and extensive microbial degradation of labile DOM into semi-labile DOM. In contrast, DOM in Baffin Bay was found to be more bioavailable with an overall autotrophic signature. This is consistent with reported optical properties of DOM suggesting *in situ* production of humic-like components in the CAA and Baffin Bay. Here, the microbial transformation of organic matter can explain 49% of humic-like DOM variation in the Canadian Arctic Archipelago's Arctic outflow (Guéguen et al., 2014).

Despite these few studies, the biogeochemistry of DOM within the Canadian Arctic remains largely unconstrained. Our interpretation of DOM cycling in the region has been broadly hindered by a lack of data. In addition, the majority of previous DOM studies only report surface concentrations and to the best of our knowledge, water column DOC and DON depth profiles have not been reported for the CAA or Baffin Bay. We also lack an understanding about DOM seasonal variability and elemental stoichiometry, which also have not been reported. Here we report high spatial resolution depth profiles of DOC and DON concentrations and elemental stoichiometric ratios (C:N) for the Beaufort Shelf, CAA, and Baffin Bay. We evaluate these data in the context of DOM cycling and biological availability in the Canadian Arctic.

3. Materials and Methods

3.1 Sample collection and nutrient analyses

Seawater samples from 31 stations were collected aboard the CCGS *Amundsen* from Baffin Bay (Cruise #1902, Leg 2) between July 5th to 25th, 2019, and from the CAA (Cruise# 2104, Leg 4) between September 10th and October 4th, 2021 (Figure S1). Filtered seawater was collected using pre-cleaned (10% HCl) ultra-high purity silicone tubing, pre-combusted (540°C/2hr) 70mm

diameter Whatman GF/F microfiber filters (WHA1825070, $<0.7\mu\text{m}$) in a custom-built stainless-steel manifold, and filled directly into pre-cleaned (overnight 10% HCl soak) 60mL high density polyethylene bottles (Fisher Scientific, #03-331-32B) or into 40mL glass autosampler vials with silicone septa caps (Fisher Scientific, #03-375-25) from the CTD rosette. All sample depths were filtered for cruise 2104 and only samples shallower than 400m were filtered for cruise 1902. Samples were immediately frozen and stored at -20°C until analysis. Nutrient samples were collected using 50mL Falcon tubes and immediately measured on-board using a Bran and Luebbe Auto-Analyzer 3 (for NO_3^- and NO_2^-) and fluorometrically for NH_4^+ (Holmes et al., 1999). Detection limits were $0.03\ \mu\text{mol L}^{-1}$ for $\text{NO}_3^- + \text{NO}_2^-$ and $0.02\ \mu\text{mol L}^{-1}$ for NO_2^- and NH_4^+ . The analytical precision of nutrient sample triplicates was similar to or better than the detection limits. Where $[\text{NO}_2^-]$ and $[\text{NH}_4^+]$ measurements were not available, $[\text{NO}_2^-]$ was assumed to equal $0.1\ \mu\text{mol kg}^{-1}$ to 100m depth and $[\text{NH}_4^+]$ assumed to equal $0.0\ \mu\text{mol kg}^{-1}$ below 100m. Salinity, temperature, and density data (Table S1) were collected at all stations using a Seabird SBE911 conductivity-temperature-depth (CTD) profiler.

3.2 Dissolved organic matter concentrations and C:N ratios

At the University of Ottawa, $n=99$ seawater samples from Baffin Bay and $n=134$ from the CAA were prepared for DOC and total dissolved nitrogen (TDN) analysis by transferring into pre-combusted ($540^{\circ}\text{C}/2\text{h}$) 40mL glass vials (Fisher Scientific, #03-375-25) and acidifying to $\text{pH} < 2$ with $50\mu\text{L}$ of 12M HCl. Samples were re-frozen, shipped and measured at the CERC.OCEAN laboratory at Dalhousie University using a Shimadzu TOC-L analyzer equipped with a TNM-L detector following Dickson, Sabine & Christian (2007). DOC and TDN concentrations ($[\text{DOC}]$, $[\text{TDN}]$) are reported in $\mu\text{mol kg}^{-1}$ with an individual measurement precision better than $\pm 2\%$. DON concentrations ($[\text{DON}]$, $\mu\text{mol kg}^{-1}$) were determined by subtracting the sum of measured dissolved inorganic nitrogen (DIN; NO_3^- , NO_2^- , and NH_4^+) from TDN and propagating the measurement errors. Analysis of sample duplicates resulted in a total analytical reproducibility of $\pm 2.2\ \mu\text{mol kg}^{-1}$ DOC ($n=18$), $\pm 0.6\ \mu\text{mol kg}^{-1}$ TDN ($n=18$), and $\pm 0.7\ \mu\text{mol kg}^{-1}$ DON ($n=14$). The presence of high DIN increases the coefficient of variation (%CV) in estimating $[\text{DON}]$, especially in deep waters with high $[\text{DIN}]$ and low $[\text{DON}]$ (Bronk et al., 2000; Sharp et al., 2002). In addition, low DON concentrations can result in exponential increases in DOM C:N ratios as $[\text{DON}]$ approaches zero. To prevent the reporting of unconstrained $[\text{DON}]$ concentrations, we exclude: i) $[\text{DON}]$ data

below 400m depth and ii) $[DON] \leq 2.0 \mu\text{mol kg}^{-1}$. This data filtration was effective in eliminating the reporting of unconstrained DON values (e.g. those with over $\pm 50\%$ uncertainty) and anomalously high DOM C:N ratios ($C:N > 30$). In total, this data integrity prescription resulted in the exclusion of $n=39$ [DON] out of $n=233$ total measurements.

3.3 Determination of river, sea-ice melt and seawater fractions contributing to DOC and DON values

We use sample $\delta^{18}\text{O}$ and salinity values to calculate fractions of river water (f_{RW}), sea-ice melt (f_{SIM}) and seawater (f_{SW}) within the seasonal mixed layer (SML; 0-30m), Pacific Summer Water (PSW; 40-80m), and Pacific Winter Water (PWW; 80-250m) following established methods (e.g., Cooper et al. 2005; Mathis et al., 2007; Figure S2). Fractions were calculated by simultaneous solution of the three endmember mixing equations 1-3 below (Letscher et al., 2011; 2013b):

$$\begin{aligned}
 (1) \quad 1 &= f_{RW} + f_{SIM} + f_{SW} \\
 (2) \quad S &= f_{RW}S_{RW} + f_{SIM}S_{SIM} + f_{SW}S_{SW} \\
 (3) \quad \delta^{18}\text{O} &= f_{RW}\delta^{18}\text{O}_{RW} + f_{SIM}\delta^{18}\text{O}_{SIM} + f_{SW}\delta^{18}\text{O}_{SW}
 \end{aligned}$$

For the CAA, prescribed $\delta^{18}\text{O}$ and salinity endmember values for RW and SIM are those used for the Western Arctic (Letscher et al., 2011): RW $S=0$, $\delta^{18}\text{O}=-19.6\text{‰}$ (Coachman et al., 1975; Cooper et al., 2008), SIM $S=4.5$, $\delta^{18}\text{O}=-1.9\text{‰}$ (Eicken et al., 2002; Mathis et al., 2007). Higher salinity and $\delta^{18}\text{O}$ values were used for the CAA seawater endmember to account for measured values in our dataset: SW $S=35$, $\delta^{18}\text{O}=+0.8\text{‰}$. In Baffin Bay, we assume that freshwater sources (minor riverine components and glacial meltwater) have similar $\delta^{18}\text{O}$ (-21‰) and salinity ($S=0$) endmembers (Bédard et al., 1981; Thibodeau et al., 2017; Brown et al., 2020). Due to the stark contrast in East-West current systems and seawater sources in Baffin Bay (Pacific/Arctic vs. Atlantic), we prescribe different $\delta^{18}\text{O}$ and salinity endmembers for Pacific/Arctic-influenced stations ($S=33$, $\delta^{18}\text{O}=-0.80\text{‰}$; 323, BB2, 224, 193) and Atlantic-influenced stations ($S=35$, $\delta^{18}\text{O}=+0.20\text{‰}$) (Yamamoto-Kawai et al., 2008; Alkire et al., 2010). Given the minor contribution of freshwater to Baffin Bay stations, we only performed the analysis to 200 m depth. Partial least-squares regression analysis of $\delta^{18}\text{O}$ and salinity values revealed pronounced 2-component mixing

between only SW and RW endmembers, with minimal SIM contributions in both the CAA and Baffin Bay (Figure S2). Seawater $\delta^{18}\text{O}$ values were determined at the University of Calgary using a triple liquid water isotope analyzer (T-LWIA, model 912-0032-0000-ULRS) with a total analytical precision better than $\pm 0.2\%$.

4. Results and Discussion

Pan-Canadian surface distributions of [DOC], [DON] and DOM C:N ratios are shown in Figure 1 whereas depth distributions are shown in Figure 2. For detailed results, we refer the reader to Tables S1-3. Pan-Canadian surface ($< 10\text{m}$) [DOC] and [DON] values had large ranges ($50.0\text{-}246.4 \mu\text{mol kg}^{-1}$ and $3.5\text{-}11.5 \mu\text{mol kg}^{-1}$, respectively; Figure 1a,b), consistent with previous studies (Letscher et al., 2013a; Shen et al., 2018). Across the entire Pan-Canadian Arctic, we calculate average surface [DOC] and [DON] were $86.4\pm 40.2 \mu\text{mol kg}^{-1}$ ($n=32$) and $6.6\pm 2.2 \mu\text{mol kg}^{-1}$ ($n=31$), respectively, consistent with early work examining surface DOM distributions in the CAA (Walker et al., 2009). We observe higher [DOC] in the CAA and lower [DOC] in Baffin Bay than previously reported (Shen et al., 2018). Surface [DOC] and DOM C:N ratio decreases from the CAA to Baffin Bay possibly due to riverine input of high C:N DOM in the CAA (Wheeler et al., 1997; Amon, 2004; Amon et al., 2012). Average surface DOM C:N ratios for the entire study region were 13.7 ± 4.4 ($n=31$; Figure 1c), consistent with previous studies observing high DOM C:N variability in proximity to large rivers and cross-shelf salinity gradients (Fitznar, 1999; Dittmar et al., 2001). Surface DOM C:N ratios had large ranges (C:N = $5.1\text{-}25.4$; Figure 1c), with highest values in the Western CAA, adjacent to the Mackenzie, Kugluktuk, Burnside and Back rivers, and lowest values in Baffin Bay.

Vertical depth distributions of pan-Canadian [DOC] and [DON] had very large ranges ($36.6\text{-}246.4 \mu\text{mol kg}^{-1}$ and $2.0\text{-}11.5 \mu\text{mol kg}^{-1}$, respectively; Figure 2d,e) and average water column values of $65.4\pm 21.9 \mu\text{mol kg}^{-1}$ and $5.4\pm 2.1 \mu\text{mol kg}^{-1}$, respectively. Depth profiles of DOM C:N ranged between $5.0\text{-}32.1$, with an average of 14.5 ± 5.0 across the dataset (Figure 2f). Mean vertically integrated [DOC] in the CAA is $\sim 25 \mu\text{mol kg}^{-1}$ higher than that of Baffin Bay. [DON] shows higher variability at depth which may be attributed to physical and biological processes (e.g., upwelling, heterotrophic remineralization, primary productivity, etc.). Several distinct biogeochemical provinces are evident from these DOC, DON, and C:N distributions. Below we discuss DOM cycling in three key regions: the Mackenzie River plume and Beaufort Sea, the

Canadian Arctic Archipelago (CAA), and Baffin Bay. We also evaluate marine vs. tDOM sinks in the Pan-Canadian Arctic.

4.1 DOM Cycling within the Mackenzie River plume, Beaufort Sea and Amundsen Gulf

Nutrient-rich PSW and PWW enter the Canada Basin from the Chukchi Sea. PWW transits the CAA via Parry Channel into Baffin Bay where it becomes the Baffin Island Current (BIC) and exits through Davis Strait (McLaughlin et al., 2004; Steele et al., 2004; Davis & Benner, 2007; Jones & Anderson, 1986; Shen et al., 2016). The oligotrophic Beaufort Sea is supplemented by PWW and elevated labile DOC and remineralized macronutrients from the Chukchi Shelf – highlighting the importance of the export of rapidly cycled microbial DOM to the Canada basin (Carmack et al., 2004; Davis & Benner, 2007; Walsh et al., 1997). High total dissolved amino acid (TDAA) yields on the Beaufort Shelf are strongly anti-correlated with bacterial production (Shen et al., 2012) and DOC radiocarbon (as $\Delta^{14}\text{C}$) values (Druffel et al., 2017), suggesting rapid microbial cycling of labile DOM. Previous studies highlight the importance of Mackenzie River DOM as a critical source of labile DOM to the Beaufort Sea (Fichot et al., 2013). Riverine DOC is rapidly removed on Arctic shelves (Letscher et al., 2011), whereas riverine DON has lower bioavailability on short timescales (Shen et al., 2012; Tremblay et al., 2014). However, on timescales of a few years, between 55-70% cross-shelf DON loss was inferred by Letscher and co-workers (2013b).

We observe high [DOC] and [DON] in the Beaufort Sea, Amundsen Gulf and Western CAA (Figure 2d,e). The highest [DOC] ($246.6 \mu\text{mol kg}^{-1}$, Station 434) and [DON] values (9.7 and $9.9 \mu\text{mol kg}^{-1}$, Stations 434 and PCB-18 respectively) were found adjacent to the Mackenzie River. Surface [DOC] and [DON] decrease offshore and away from the influence of the river (Figure 2a,b). This is also consistent with removal of labile and tDOM found in previous studies (e.g. Letscher et al., 2013b). Elevated [DOC] and [DON] are also found in these regions above the upper halocline (30-60m; [DOC]: $69.2\text{-}81.5 \mu\text{mol kg}^{-1}$; [DON]: $4.8\text{-}7.3 \mu\text{mol kg}^{-1}$), and within PWW to ~250m depth (σ_{θ} : $\sim 26.0\text{-}27.0 \text{ kg m}^{-3}$; [DOC]: $58.3\text{-}76.0 \mu\text{mol kg}^{-1}$; [DON]: $2.0\text{-}8.5 \mu\text{mol kg}^{-1}$; Figure 2d,e and Figure S3). These concentrations are consistent with observations of enhanced DON export and remineralization fueled by Pacific nutrients and the production of labile marine DOM (Davis & Benner, 2007; Shen et al., 2012; Lehmann et al., 2019, 2022). Variable DOM C:N

in the Beaufort Sea and Amundsen Gulf (~8.9–25.4) suggests heterogeneous DOM sources and cycling. Presumably labile “protein-rich” DOM (C:N ~4-10) is evident in the Beaufort Sea and Amundsen Gulf, whereas high C:N (>13) DOM is observed near the Mackenzie River (Lobbes et al., 2000; Lamb et al., 2006). In the western Canadian Arctic, we find similar [DOC] values in Atlantic Fram Strait Water (ATL_{FS}; 300-1000m; 53.9-59.6 $\mu\text{mol kg}^{-1}$) and Canada Basin Deep Water (CBDW; >1000m; 52.9-57.1 $\mu\text{mol kg}^{-1}$) to those previously reported (Davis & Benner, 2005; Mathis et al., 2005; Wheeler et al., 1997). At Station 546, we observe decreasing [DON] values in the Canada Basin from 6-8 $\mu\text{mol kg}^{-1}$ in the seasonal mixed layer (SML; 0-30m) and PSW, to values of 5-6 $\mu\text{mol kg}^{-1}$ in PWW and 3-5 $\mu\text{mol kg}^{-1}$ in ATL_{FS} (250-300m). We thus hypothesize that the standing stock of CBDW DON (3.2-4.3 $\mu\text{mol kg}^{-1}$; Table S1) may be 2-4 times higher than the deep Atlantic or Pacific Ocean (1.0-2.5 $\mu\text{mol kg}^{-1}$; Letscher & Moore, 2015).

Marine primary production and microbial heterotrophic remineralization are predominant biogeochemical processes in the seasonally ice-covered Amundsen Gulf (Galley et al., 2008; Morata et al., 2008; Forest et al., 2010; Magen et al., 2010). The Cape Bathurst Polynya at the entrance of Amundsen Gulf sustains high primary productivity and upwelling (Arrigo & van Dijken, 2004; Brugel et al., 2009; Tremblay et al., 2014). We find elevated [DOC] (65.5 $\mu\text{mol kg}^{-1}$), [DON] (6.8 $\mu\text{mol kg}^{-1}$) and low DOM C:N ratios (9.6) to 300m entering the Amundsen Gulf (Station 414). These high concentrations are consistent with autotrophic production of labile DON during upwelling in the region (Forest et al., 2011; Tremblay et al., 2014; Sipler & Bronk, 2015; Shen et al., 2018). Within the Amundsen Gulf, DOM C:N increases (10.6-28.6) and [DON] values decrease at depth (> 40m; 2.8-6.1 $\mu\text{mol kg}^{-1}$), suggesting enhanced microbial remineralization of labile DOM. This is consistent with previous studies observing excess NO_3^- (Figure 2b), PO_4^{3-} and Si(OH)_4 and high AOU at depth in Amundsen Gulf (Figure 2c; Simpson et al., 2008). Together, these results support enhanced respiration and DOM recycling as a major process in the Amundsen Gulf (Nguyen et al., 2012).

4.2 DOM Cycling within the Kitikmeot Sea and Eastern CAA

The Kitikmeot Sea includes Stations C010, C011 and C012 and we define the Eastern CAA to include Franklin Strait (Stations 312, C009 and C004), Prince Regent Inlet and Lancaster Sound (Stations C003, C002 and 323). The physical oceanography of each region is explained in McLaughlin et al., 2004. Briefly, the Kitikmeot Sea is a semi-enclosed waterway that includes

Coronation and Queen Maude Gulf (CG: Station C012 and QMG: Station C010, respectively). It is physically isolated from the rest of the CAA – bounded by the shallow Dolphin and Union Straits to the west and Victoria Strait to the east (< 30m). It is oligotrophic and heavily influenced by local rivers, with an average salinity <30 (Williams et al., 2018). Delivery of nutrient-rich PWW is limited by the shallow sills resulting in low primary productivity and nitrogen depletion within the system (Back et al., 2021; Xu et al., 2021). In contrast, Franklin Strait, Prince Regent Inlet and Lancaster Sound are influenced by the advection of PWW via Parry Channel (Lehmann et al., 2022). Multiyear ice persists throughout the end of the melt season (Howell et al., 2013; Michel et al., 2015) in these eastern waterways, but is mostly absent in the Kitikmeot Sea. The eastern CAA is also influenced by saline Arctic inflow via Lancaster Sound and northern gateways (e.g. Nares Strait; McLaughlin et al., 2004). However, ~60% of the water flowing through Lancaster Sound is of Pacific origin (Codispoti & Owens 1975; Jones et al., 2003).

We observe the highest [DOC] values (67.9-107.7 $\mu\text{mol kg}^{-1}$) in the Kitikmeot Sea (Figure 2d, S4d). Kitikmeot Sea [DON] values and C:N ratios were high, ranging between 3.5-6.8 $\mu\text{mol kg}^{-1}$ and 13.5-22.2 respectively (Figure S4e,f). Vertical distributions of [DOC] and [DON] are higher in QMG (91.7-107.7 $\mu\text{mol kg}^{-1}$ and 5.7-6.3 $\mu\text{mol kg}^{-1}$, respectively) than CG (67.9-92.3 $\mu\text{mol kg}^{-1}$ and 3.5-6.8 $\mu\text{mol kg}^{-1}$, respectively) (Figures 2d,e, S4d,e). Deep DOM C:N ratios are higher in CG (100m; C:N: 17.8) than QMG (90m; C:N: 16.1; Figures 2f, S4f). These values likely indicate substantial terrestrial DOC (tDOC) flux from rivers and an enhanced microbial loop in this low primary production region (Campbell et al., 2017, Williams et al., 2018). The Kitikmeot Sea receives the Kugluktuk and Back Rivers (average discharge of ~260 and 600 $\text{m}^3 \text{s}^{-1}$, respectively) and has a long residence time (~13 years; Williams et al., 2018) allowing for microbial heterotrophic re-working and degradation of DOM (Shen et al., 2018) and the accumulation of humic-like DOM (Guéguen et al. (2014)). CG receives more freshwater content than QMG due to its depth and longer open water season, whereas QMG has a higher inflow of sea ice from M'Clintock Channel (Xu et al., 2021). High DOM in QMG may therefore indicate higher tDOM flux or could result from QMG having a shallower basin (~125m) relative to CG (~325m). Bottom waters in CG (> 100m) have low seasonal variation due to a lack of annual diapycnal mixing (Xu et al., 2021), and have higher NO_3^- , AOU, DOM C:N values and low [DOC] and [DON] at depth (Figure S4). This likely suggests enhanced microbial remineralization of DOM in CG relative to QMG.

Elevated water column [DOC] in the eastern CAA (Stations C004, C009, C002, C003 and 323; 57.3-110.4 $\mu\text{mol kg}^{-1}$) is less likely to be tDOM given it is distant from major rivers (Figure 1f) and thus autotrophic or microbial DOM are more likely sources. CTD data from Station C004 and C009 showed high fluorescence at the deep chlorophyll maximum (20 and 40m) that also had elevated [DOC] (85.4 and 110.4 $\mu\text{mol kg}^{-1}$) suggesting an autotrophic DOM source (Table S2). Franklin Strait sea ice concentrations often remain high after the melt season (Howell et al., 2013; Michel et al., 2015). For example, microbial transformation of sea-ice algae DOM could contribute elevated recalcitrant [DOC] if it were to persist throughout the year (Aslam et al., 2012; Smith et al., 1997; Underwood et al., 2010; Xie et al., 2014). In contrast, we observe low [DON] values below 50 m (2.6-6.0 $\mu\text{mol kg}^{-1}$) – resulting in high C:N ratios (12.8-29.5). High DOM C:N has been previously reported in sea-ice covered regions in the CAA (Retelletti Brogi et al., 2018), potentially explained by preferential remineralization of N-rich amino acids in labile autochthonous sea-ice DOM versus the C-rich polysaccharides pool (Thomas et al., 1995), or the release of C-rich DOM by phytoplankton under nutrient limitations (Carlson & Hansell, 2015). Water column DOM C:N decreases eastward in the CAA reaching a minimum in Lancaster Sound (Stations 323 and C002; 7.1-20.8).

4.3 DOM Cycling within Baffin Bay

Baffin Bay is a marginal Arctic sea (2300m depth) connected to the Arctic via Nares and Barrow Straits and to a lesser extent Jones Sound, and to the Atlantic Ocean via Davis Strait (Tang et al., 2004). Baffin Bay has a narrow western continental shelf and wider eastern continental shelf near Greenland. The Western Greenland Current (WGC) carries warm, salty Atlantic/Irminger water into Baffin Bay via eastern Davis Strait. In contrast, the cold, fresh, southerly flowing BIC, which becomes the Labrador Current, is responsible for the majority of the export of freshwater, inorganic nutrients and possible DON from the Canadian Arctic into the North Atlantic (Rudels, 2021; Torres-Valdés et al., 2013; 2016). The detailed physical oceanography of Baffin Bay is described well by Curry and co-workers (2011).

Our surface Baffin Bay [DOC] values (49.4-63.9 $\mu\text{mol kg}^{-1}$; Figure 1a, 2d) are lower than those previously reported from October 2013 (66-97 $\mu\text{mol L}^{-1}$; Shen et al., 2018). This could be due to seasonal variability, or annual differences in seasonal sea ice extent, freshwater flux, primary productivity, and nutrient delivery (Arrigo et al., 2008; Ardyna et al., 2011; Arrigo & van

Dijken, 2011; Tremblay et al., 2015). Surface [DON] values (3.5–11.5 $\mu\text{mol kg}^{-1}$; Figure 1b, 2e) in the eastern CAA and Baffin Bay are consistent with recently reported values (2.1–6.1 $\mu\text{mol kg}^{-1}$; Westbrook, 2021). We observe high [DON] and low DOM C:N ratios in two Baffin Bay regions: the North Water Polynya (NOW, Station 108, <50m; 4.8-5.5 $\mu\text{mol kg}^{-1}$; C:N = 10.4-12.7) and Davis Strait (193, 196, <100m; 8.8-11.5 $\mu\text{mol kg}^{-1}$; C:N = 5.0-6.9; Figure 2f). This may indicate the production of highly labile DOM in regions of high primary production (e.g. the North Water Polynya; Tremblay et al., 2006) or the microbial accumulation of recalcitrant DON (e.g., deaminated peptides or heterocyclic DON; McCarthy et al., 1998; Dittmar et al., 2001, Abdulla et al., 2018; Broek et al., 2023) below the SML (e.g. Davis Strait). Mean surface DOM C:N is low in Baffin Bay (10.2 ± 3.5 , $n=12$; Figure 1c) with a total range of 5.1–14.3. Previous observations of elevated amino acids (as %DOC = 1.1–1.4%) in Baffin Bay and along the WGC suggest this region contains significant bioavailable marine DOC (Shen et al., 2018). Together, these are consistent with a dominant marine and autotrophic source of DOM in Baffin Bay. It is important to note, that both our study and that of Shen and co-workers (2018) did not sample the BIC directly (e.g. where the majority of CAA and Arctic freshwater leaves the region). Given the lack of major rivers in Baffin Bay, we hypothesize this nearshore current system would likely contain a significant quantity of CAA tDOM exported to the Labrador Sea and have much higher DOM C:N ratios (>15).

4.4 Pan-Canadian sinks of terrestrial and marine DOM

Across the Pan-Canadian Arctic, we observe higher [DOC], [DON] and C:N ratios within the Beaufort Sea and the Kitikmeot Sea vs. Baffin Bay (Figures 1 and 2). This is consistent with previous studies observing high riverine DOM export in the Western CAA and longer residence times in the CAA (several years) vs. the Beaufort Shelf and Baffin Bay (several months; Nguyen et al., 2011; Tao & Myers, 2022). Quantitative estimates of tDOM vs. marine autotrophic or microbial DOM exported from the CAA and Baffin Bay to the Labrador Sea remain unconstrained. Here we explore DOM removal pathways within the Pan-Canadian Arctic. First, we assume [tDOC] and [tDON] by multiplying measured [DOM] by the $\delta^{18}\text{O}$ model-derived f_{RW} parameter (Figure S3a,b, see Equation 1).

$$(1) \quad tDOM = [DOM] \times f_{RW}$$

Marine DOM (mDOM) concentrations are the difference between our measured seawater [DOM] and [tDOM] following Equation 2.

$$(2) \quad mDOM = [DOM] - [tDOM]$$

This calculation produces maximum estimates of tDOM because the model generally produces negative f_{SIM} values, requiring higher f_{RW} and f_{SW} values for conservation of mass. Second, we explore longitudinal changes in seawater DOM, tDOM and mDOM within the SML, PWW and the BIC extension ($26.0 \leq \sigma_{\theta} \leq 27.0$; Figure S3c,d).

Estimated [tDOC] and [tDON] values reveal the ubiquitous presence of tDOM in the SML (0-30m) of the CAA (Figure S3a,b). Highest tDOM values ($119.9 \mu\text{mol C kg}^{-1}$; $4.7 \mu\text{mol N kg}^{-1}$) are found in the surface (0-3m) adjacent to the Mackenzie River. Surface [tDOM] decrease with distance from the Mackenzie River to $16.5 \mu\text{mol C kg}^{-1}$ and $1.5 \mu\text{mol N kg}^{-1}$ at M'Clure Strait (Station 518), and $19.7 \mu\text{mol C kg}^{-1}$ and $1.3 \mu\text{mol N kg}^{-1}$ in the Amundsen Gulf (Station C014; Table S2). These tDOM concentration gradients suggest significant losses of tDOC (83-86%) and tDON (68-72%) – consistent with past estimates of ~70% cross-shelf tDON loss (Letscher et al., 2013b). tDOM values also decrease with depth to values of $3.9\text{-}10.4 \mu\text{mol C kg}^{-1}$ and $0.2\text{-}1.1 \mu\text{mol N kg}^{-1}$ within PWW between 80-200m depth (Figure S3a,b, S5a,b). Within the Kitikmeot Sea, high [tDOC] and [tDON] ($16.6\text{-}31.1 \mu\text{mol kg}^{-1}$; $1.0\text{-}2.0 \mu\text{mol kg}^{-1}$, respectively) persist to 200m depth, consistent with high riverine flux and long water residence times in this region (Williams et al., 2018). Assuming a straight advection path from Station 518 to Station 323, we estimate $10.6 \mu\text{mol tDOC kg}^{-1}$ and $0.9 \mu\text{mol tDON kg}^{-1}$ are lost within the SML of Parry Channel (Figure S3a,b), suggesting this as an important regional DOM sink. We hypothesize DOM may be lost here due to microbial heterotrophic respiration which can be enhanced with vertical mixing (Lehmann et al., 2022). Low [tDOC] and [tDON] values ($0\text{-}7.0 \mu\text{mol C kg}^{-1}$; $0\text{-}0.7 \mu\text{mol N kg}^{-1}$) are found in Baffin Bay (Figure S3a,b, Table S2), presumably due to a lack of major river input and high primary production. Despite the clear presence of tDOM throughout the CAA, ~85% of depth-integrated (0-200m) CAA DOM is marine. This average tDOM estimate is consistent with previous estimates derived from lignin phenol data (17%; Walker et al., 2009). We therefore

hypothesize the CAA is not only a regional capacitor of tDOM, but also a microbial incubator of chemically-distinct marine DOM.

PWW transits east through the CAA via Parry Channel, later forming the BIC which transports the majority of Arctic and CAA freshwater to the Labrador Sea via Davis Strait. We observe clear, yet disparate, losses of DOC vs. DON within PWW and BIC extension (Figure S3c,d). Moving average PWW DOC values reveal primary losses within Parry Channel ($-10.3 \mu\text{mol kg}^{-1}$ from 518 to 323, Table S3), the Amundsen Gulf ($-7.1 \mu\text{mol kg}^{-1}$ from 414 to C013), and within the BIC extension ($-5.8 \mu\text{mol kg}^{-1}$ from 323 to 224, Figure S3c). In contrast, most PWW DON is lost in the Amundsen Gulf ($-4.7 \mu\text{mol kg}^{-1}$) and within Parry Channel ($-1.4 \mu\text{mol kg}^{-1}$; Figure S3d). Using average CAA and Baffin Bay water mass transit times (Tao & Myers, 2022; Table S3), we estimate DOC loss rates to be -0.05 , -0.08 , and $-0.07 \mu\text{mol kg}^{-1}\text{d}^{-1}$ within Parry Channel, Amundsen Gulf, and the BIC extension respectively. DON loss rates within Parry Channel and the Amundsen Gulf are -0.008 , and $-0.051 \mu\text{mol kg}^{-1}\text{d}^{-1}$, respectively. On average we observe decreasing rates of DOC and DON removal within PWW in the CAA and Baffin Bay from West to East. We hypothesize that RDOM is therefore continuously produced as it transits the CAA, resulting in pre-degraded DOM export via the BIC to the Labrador Sea (Figure S6).

Longitudinal PWW DOM trends also suggest mDOM removal as the primary sink in the CAA. We find largely invariant PWW [tDOC] and [tDON] in the CAA (Figure S5a,b; $8\text{-}9 \mu\text{mol C kg}^{-1}$; $0.5 \mu\text{mol N kg}^{-1}$ moving average). Only $\sim 2.8 \mu\text{mol tDOC kg}^{-1}$ and $\sim 0.2 \mu\text{mol tDON kg}^{-1}$ are lost in PWW within Parry Channel – comprising ~ 27 and $\sim 14\%$ of total DOC and DON (Figure S5). We observe nearly identical tDOM losses along the BIC extension (Figure S5), consistent with a concomitant high CDOM anomaly in the BIC ($<100\text{km}$ from the coast; Figure S7). While most of our stations were just outside of the BIC core, changes in f_{RW} and [DOC] were not observed within the CDOM anomaly (Figure S8). Taken together, we hypothesize that this CDOM anomaly and PWW tDOM transiting the CAA into Baffin Bay comprises recalcitrant DOM pre-formed in the Beaufort Sea (e.g. not recently exported CAA tDOM), that is later removed or diluted via mixing within the BIC. Photochemical oxidation and microbial respiration of DOM within the BIC may also act as a DOM sink. This hypothesis is readily testable and future work should focus on deconvolving the cycling of DOM reactivity fractions through the use of specific tDOM and mDOM biomarkers (e.g. lignin phenols and D/L amino acids) and/or via incubations in subsurface waters of the CAA and Baffin Bay.

5. Summary and Implications

We report high spatial resolution depth profiles of [DOC], [DON] and DOM C:N ratios for the Beaufort Shelf, CAA, and Baffin Bay. Our results suggest the CAA and adjacent Beaufort Sea and Baffin Bay comprise a mosaic of distinct DOM biogeochemical provinces. We find the CAA is not only a zone of significant tDOM flux from rivers but may also act as a microbial incubator of recalcitrant DOM that is ultimately exported to the Labrador Sea via the BIC. DOM production and cycling in Baffin Bay appears to be fueled predominantly by high marine primary production found in this region, whereas the CAA appears to be controlled more strongly by marine microbial loop processes and the rapid transformation of tDOM into more recalcitrant marine DOM forms – particularly for the Kitikmeot Sea region. The CAA and Baffin Bay are previously unrecognized sinks of tDOM and mDOM, but also regions of significant microbial DOM transformation. In this way, the Canadian Arctic acts as an incubator of pre-formed recalcitrant DOM that is ultimately exported to the coastal Northwest Atlantic as well as the central Labrador Sea, where it is delivered to North Atlantic Deep Water via Atlantic Meridional Overturning Circulation. Given the rapid changes in the Canadian Arctic region, future work should focus on parameterizing detailed tDOM and mDOM cycling mechanisms with more detailed chemical, biological and isotopic methods.

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Conflict of Interest

The authors declare no conflicts of interest relevant to this study.

Data Availability Statement

The original contributions presented in the study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author.

7. Figures with Captions

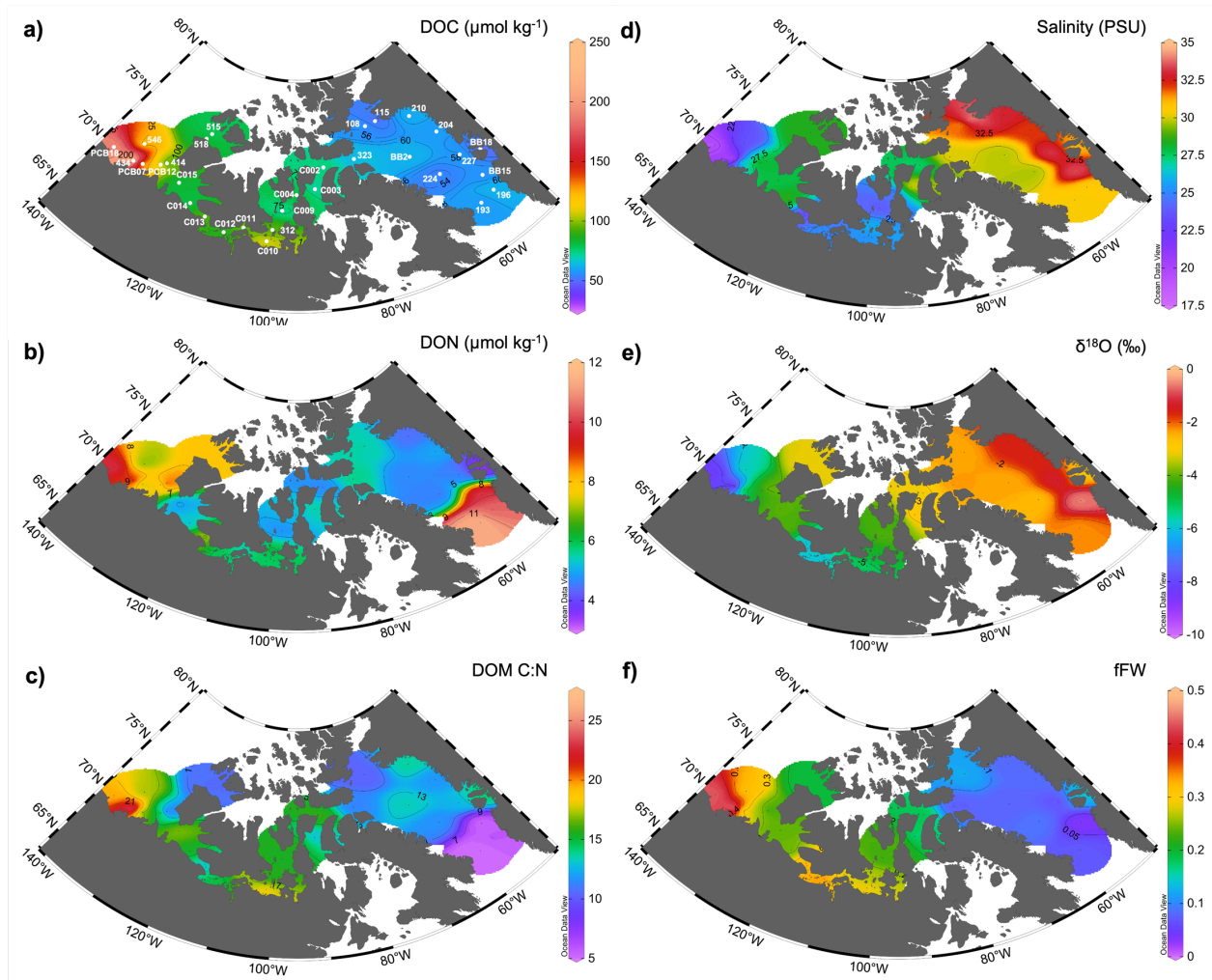


Figure 1. Pan-Canadian Arctic surface distributions of dissolved organic matter (DOM) and hydrographic data. a) Dissolved organic carbon (DOC, $\mu\text{mol kg}^{-1}$), **b)** dissolved organic nitrogen (DON, $\mu\text{mol kg}^{-1}$), **c)** DOM C:N ratios, **d)** practical salinity (PSU), **e)** stable oxygen ($\delta^{18}\text{O}$, ‰), and **f)** fraction of freshwater (*f*FW) at 20 stations in the CAA and 11 stations in Baffin Bay. White dots indicate station locations and values between stations were interpolated using Ocean Data View.

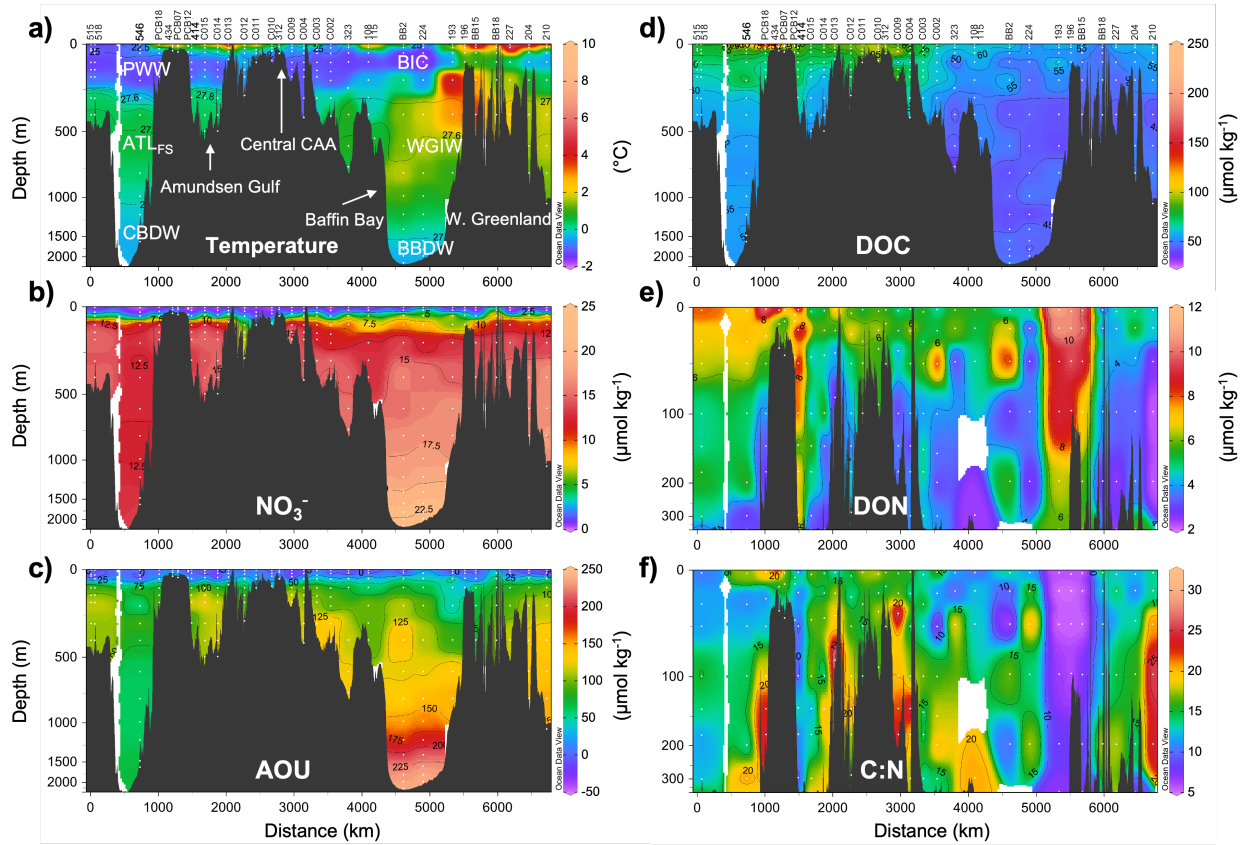


Figure 2. Section plots depicting subsurface hydrographic and DOM data along transect. Station names are indicated at the top of the section plots. a) Potential temperature data (°C) are shown with relevant geographic features and water masses indicated by white text. Contours shown on temperature plot are potential density ($\sigma\text{-}\theta$, kg m^{-3}) anomaly values. b) Nitrate concentrations ($\mu\text{mol kg}^{-1}$), c) apparent oxygen utilization (AOU, $\mu\text{mol kg}^{-1}$), d) DOC concentrations ($\mu\text{mol kg}^{-1}$), e) DON concentrations ($\mu\text{mol kg}^{-1}$), and f) DOM C:N stochiometric ratios. Note that the depth axis for e), f) is limited to 400m.

8. Conclusions

Marine biogeochemical cycles are affected by anthropogenic climate change. To compound the issue, the Arctic is disproportionately affected by climate change and is currently warming up to four times faster than the rest of the planet (Rantanen et al., 2022), which will affect the biogeochemistry and cycling of DOM. The biogeochemical cycling of DOM in the Canadian Arctic is poorly constrained and until now, standing stocks of DOC and DON did not exist in this region, which are needed in order to assess the effects of anthropogenic climate change on DOM carbon and nitrogen cycling. The MCP is hypothesized to be an important player in the mitigation of climate change effects by enhancing the production of RDOM, thus the sequestration of anthropogenic carbon into the ocean on long timescales under warming conditions (Legendre et al., 2015). Most DOM (>95%) is contained in the deep ocean (Hansell et al., 2009). The delivery, production, and transformation of DOM in the CAA and Baffin Bay will be translated into NADW via the outflow of these waters into the North Atlantic, meaning the reactivity of this DOM, which will be incorporated into deep water and global thermohaline circulation, could be constructed in the Canadian Arctic. We present the first DOC and DON concentrations with their C:N ratios throughout the water column in the pan-Canadian Arctic and used them to identify potential sources and sinks of DOM.

Our reported [DOC] and [DON] values are broadly consistent with previous work reporting surface values in the Arctic (Walker et al., 2009; Letscher et al., 2013b; Shen et al., 2018; Westbrook, 2021). We find that mean vertically integrated [DOC] in the CAA is $\sim 25 \mu\text{mol kg}^{-1}$ higher than that of Baffin Bay, suggesting the removal of DOC with transit through the Archipelago and into Baffin Bay. High DOM C:N ratios were found throughout the Archipelago which could be influenced both by long water transit times as well as high C:N terrestrial DOM delivered by rivers. Unique biogeochemical provinces exist in the Canadian Arctic, such as M'Clure Strait, the Amundsen Gulf, the NOW, and Davis Strait, which are highly productive regions exporting large amounts of fresh (low C:N) DON or potentially accumulating recalcitrant DON. Using a $\delta^{18}\text{O}$ mixing model we quantified fractions of river water, sea-ice melt, and seawater contributing to the water column and multiplied them by measured [DOC] and [DON] to broadly quantify terrestrial and marine DOM contributions. We found that tDOM is ubiquitous in the SML of the Canadian Arctic, with larger contributions in the river-influenced Kitikmeot Sea and next to the Mackenzie River. mDOM prevails as the predominant DOM source throughout the

water column in the Canadian Arctic and is abundant in PWW, where microbial reworking of DOM is likely within this nutrient-rich water. We estimated DOM, tDOM and mDOM loss rates along advective pathways in the CAA and Baffin Bay. Key regions of DOC loss were found within Parry Channel, the Amundsen Gulf, and the BIC extension, with rates of -0.05, -0.08, and -0.07 $\mu\text{mol kg}^{-1}\text{d}^{-1}$ respectively. Longitudinal PWW DOM trends also suggest mDOM removal as the primary sink in the CAA.

Measurements of [DOC], [DON] and their stoichiometric C:N ratios in marine environments are fundamental tools necessary for understanding marine carbon and nitrogen cycles. Standing stocks of DOC and DON are needed to fit Earth System Models and to calculate global carbon budgets which are increasingly important as global climate continues to change rapidly. Polar amplification, i.e. the more rapid warming of the poles relative to the rest of the planet due to reduced albedo as a result of melting snow and ice (Serreze & Barry, 2011), is occurring in the Canadian Arctic. Arctic freshening and stratification have also impacted Atlantic Meridional Overturning Circulation (AMOC). DOM transformed within the Canadian Arctic ultimately comprises the “pre-formed” fractions that are entrained within NADW, possibly controlling deep ocean DOM lability on millennial timescales. This thesis makes large inroads towards understanding DOM carbon and nitrogen cycling in the Canadian Arctic, however many challenges remain. Harsh environmental conditions and variable sea ice cover make the Canadian Arctic difficult to navigate and hinder our ability to obtain temporal and spatial data (Shen et al., 2021). Thus, the seasonal variability of DOM cycling in this region is unknown. To better constrain sources and cycling of DOM, we suggest that future work should entail further isotopic ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\Delta^{14}\text{C}$) and molecular characterization of DOM in the Canadian Arctic for which little to no data exist, as well as seasonal sampling of DOM.

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Appendix A: Supplementary Figures

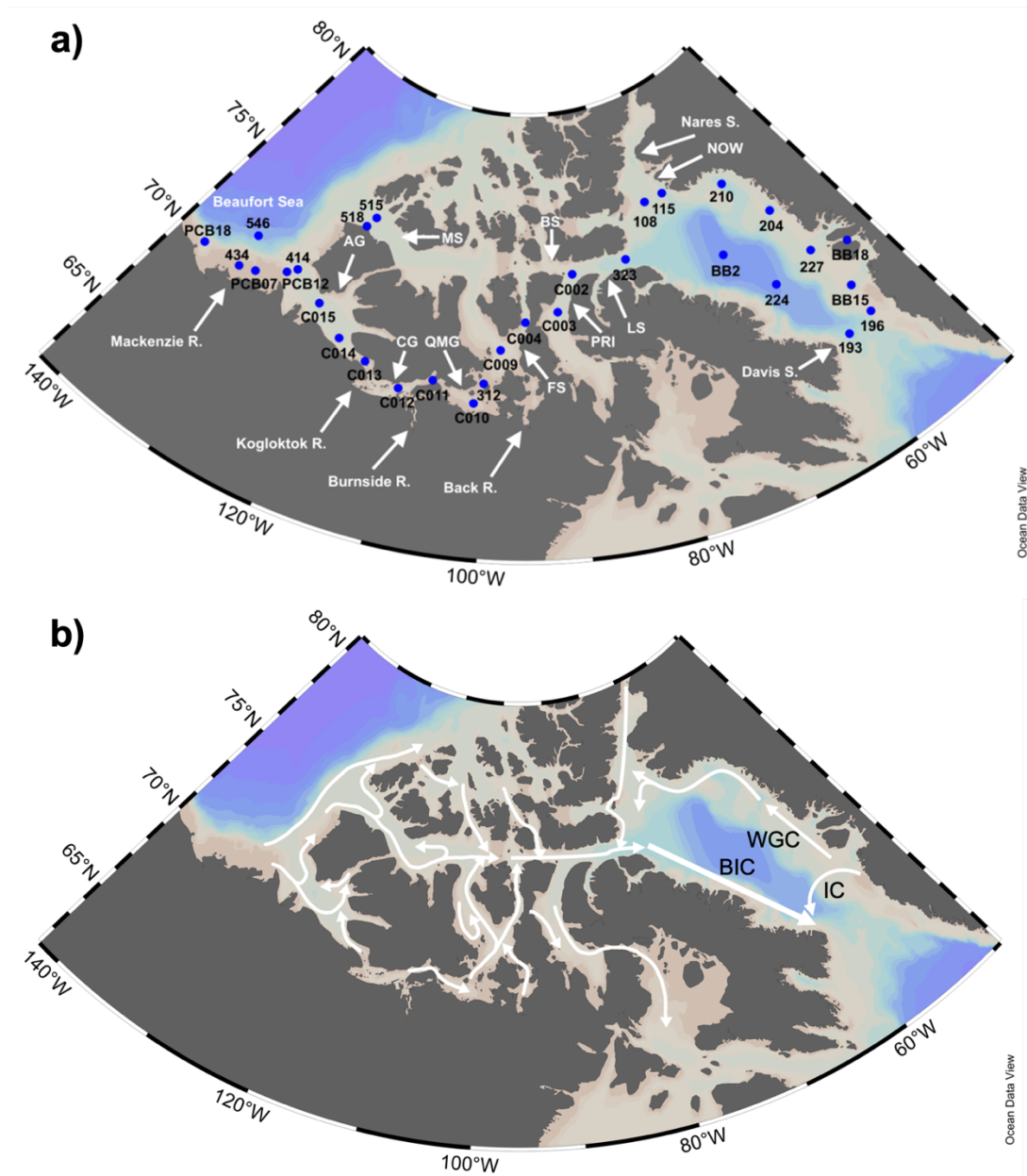


Figure S1. Sample locations and dominant current systems within the CAA and Baffin Bay. a) Locations of sampled stations (blue dots). Dominant river system locations (white arrows), and geographical locations (AG: Amundsen Gulf, MS: M'Clure Strait, CG: Coronation Gulf, QMG: Queen Maud Gulf, FS: Franklin Strait, BS: Barrow Strait, PRI: Prince Regents Inlet, LS: Lancaster Sound, Davis and Nares Straits, NOW: North Water Polynya). b) Dominant average surface currents for the Canadian Arctic (IC: Irminger Current, WGC: West Greenland Current, BIC: Baffin Island Current), adapted from MacLaughlin et al., 2005.

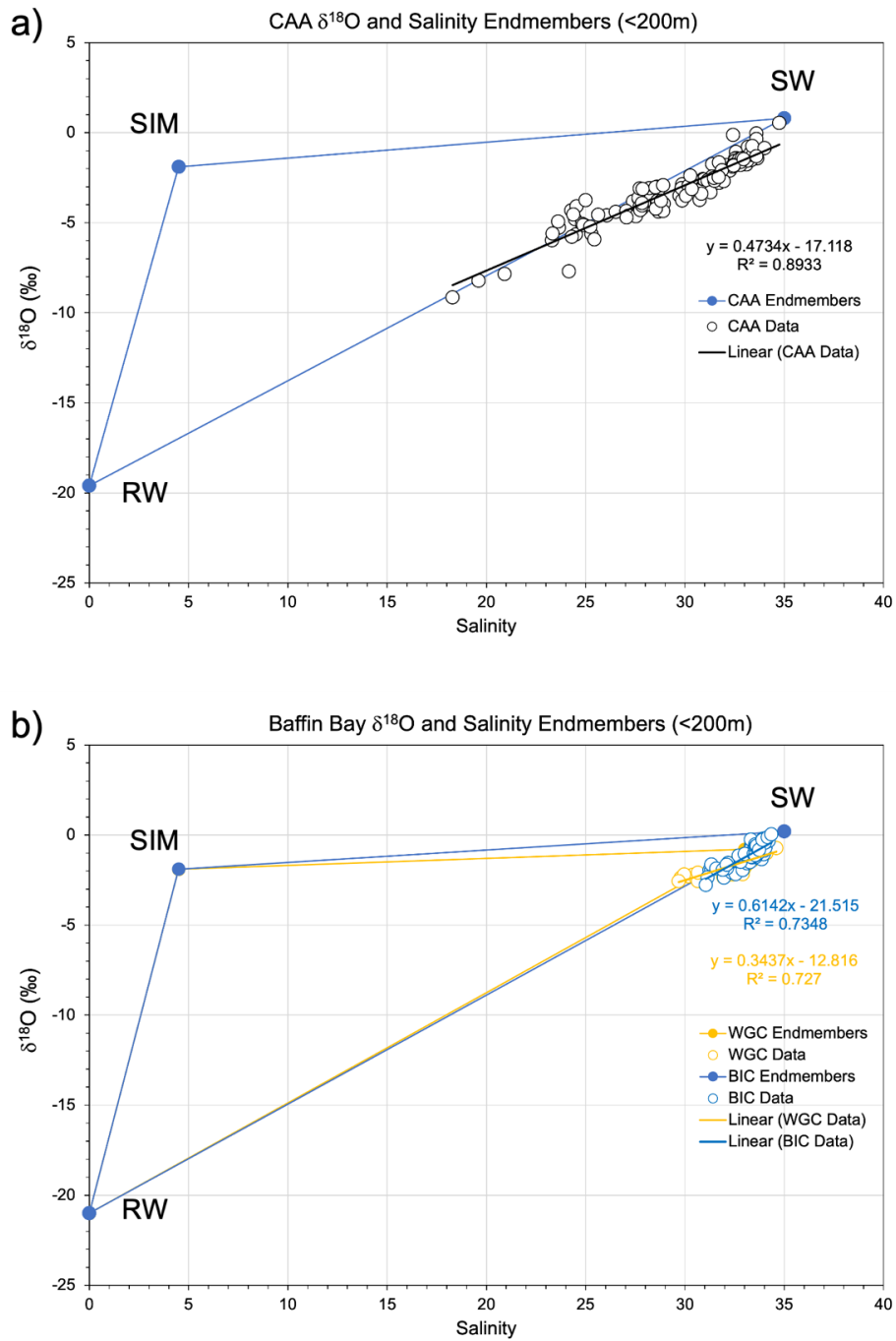


Figure S2. Salinity and $\delta^{18}\text{O}$ data for the CAA and Baffin Bay showing chosen mixing model endmembers. For a) and b) data (<200m) and least squares regressions are shown together with assumed mixing model endmembers: seawater (SW), river water (RW; includes glacial contributions), and sea-ice melt (SIM). For b) different endmembers were used for Western Greenland Current (WGC) vs. Baffin Island Current (BIC) stations.

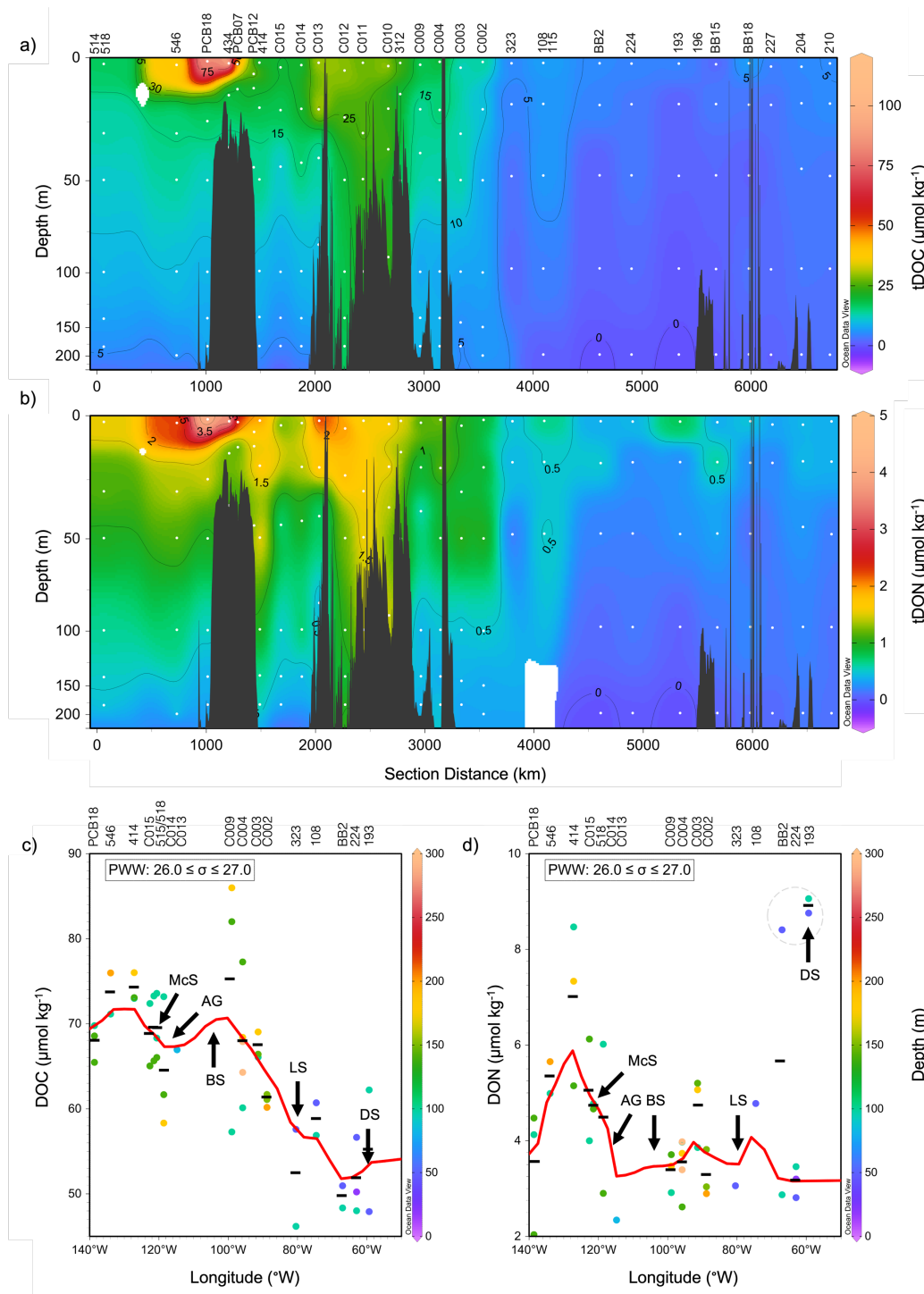


Figure S3. Terrestrial and total Pacific Winter Water (PWW) DOM in the Pan-Canadian Arctic. For a) and b), terrestrial DOC and DON (tDOC; tDON, $\mu\text{mol kg}^{-1}$) are shown to 250m (below which contributions were negligible). For c) and d), measured PWW [DOC] and [DON] ($\mu\text{mol kg}^{-1}$) are shown with advection through the CAA and along the Baffin Island Current (BIC) Extension (323, BB2, 224, 193). Red line reflects the moving average values. Black horizontal bars are the instantaneous station averages. Black arrows indicate M'Clure Strait (McS), Amundsen Gulf (AG), Barrow Strait (BS), Lancaster Sound (LS) and Davis Strait (DS). For d), the dashed circle highlights high [DON] observed at stations BB2 ($n=1$) and 193 ($n=2$) excluded from the moving average.

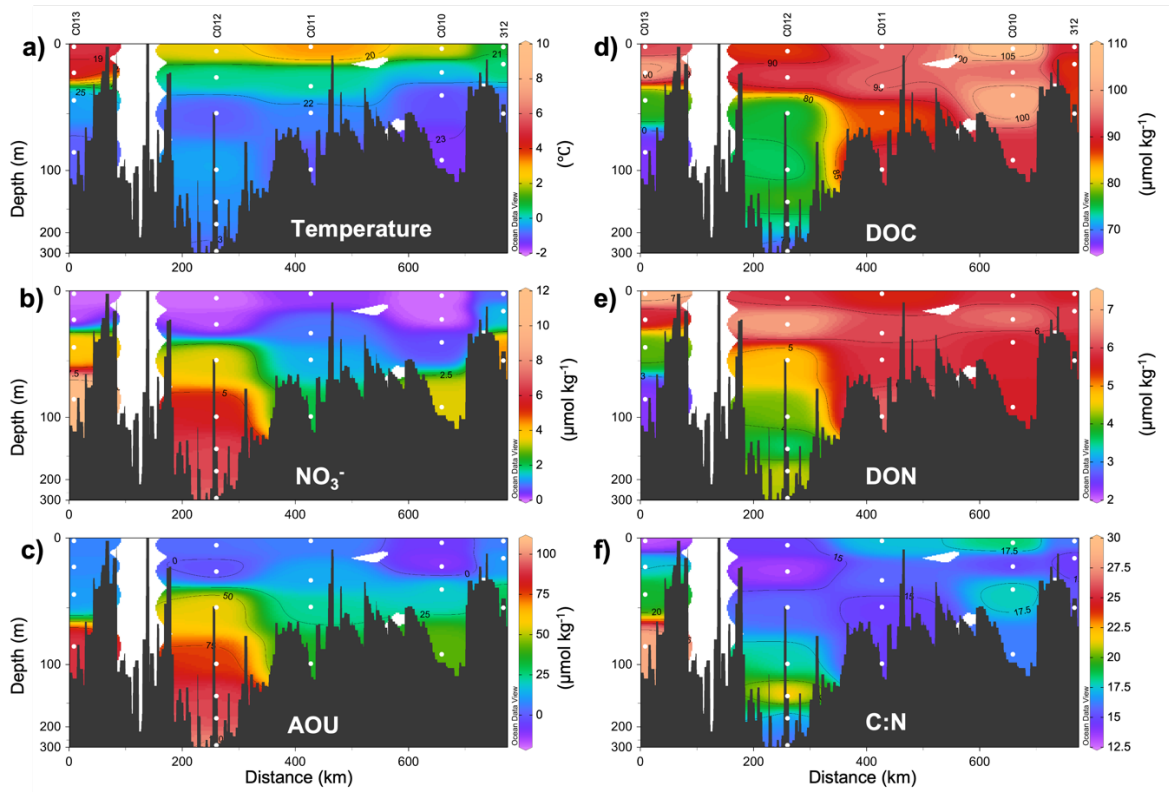


Figure S4. Section plots of Kitikmeot Sea region hydrographic and DOM parameters. a) Potential temperature ($^{\circ}\text{C}$) with potential density anomaly ($\sigma\text{-theta}$, kg m^{-3}) contours, b) nitrate (NO_3^- , $\mu\text{mol kg}^{-1}$), c) apparent oxygen utilization (AOU, $\mu\text{mol kg}^{-1}$), d) dissolved organic carbon (DOC, $\mu\text{mol kg}^{-1}$), e) dissolved organic nitrogen (DON, $\mu\text{mol kg}^{-1}$), and f) DOC:DON.

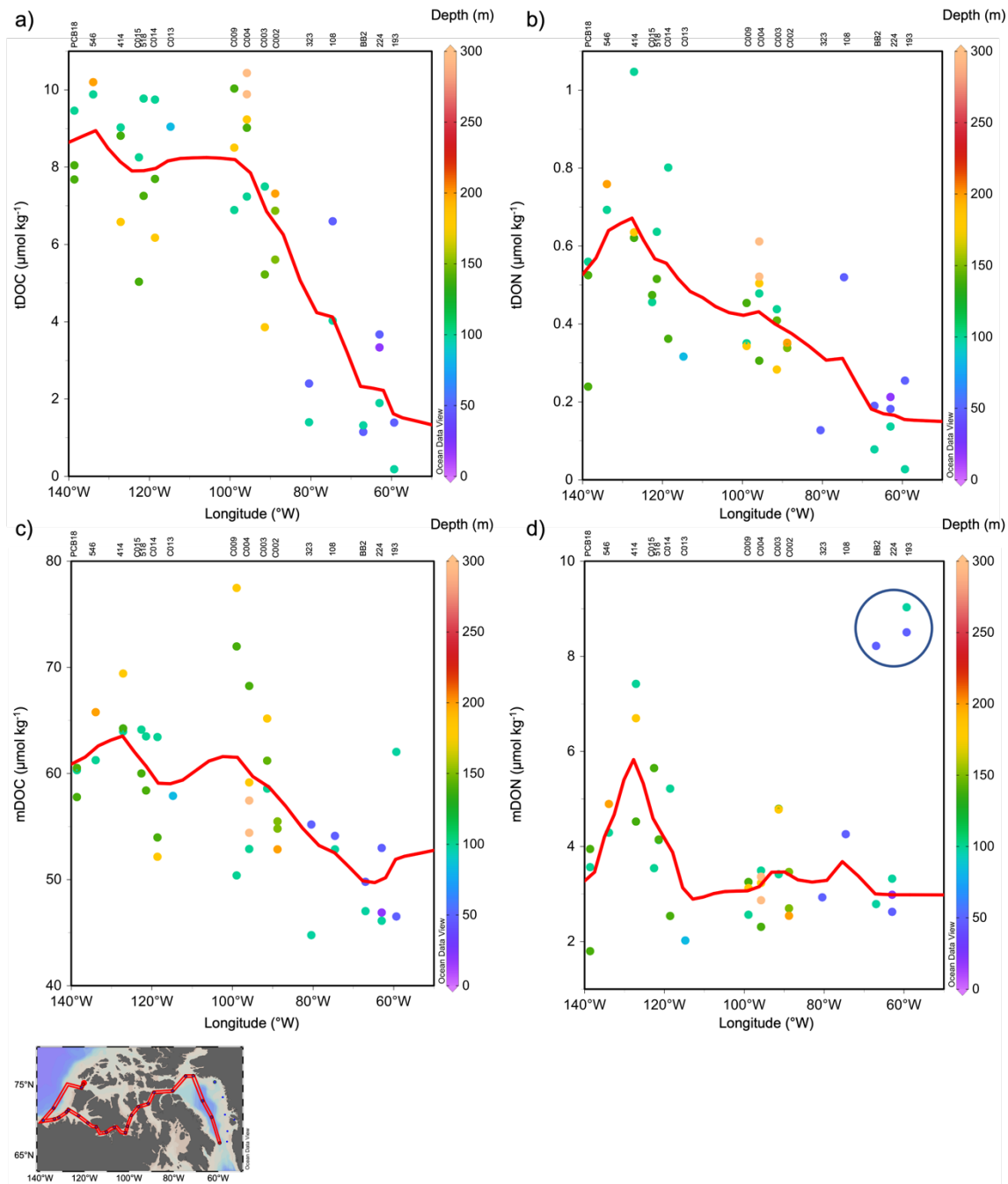


Figure S5. PWW terrestrial and marine DOM (tDOM, mDOM) concentrations from Beaufort Sea to Baffin Bay. For a) and b), the abundance of tDOC and tDON are shown. For c) and d), the abundance of mDOC and mDON are shown. Symbols are as shown for Figure 3 in the main article text. High mDON concentrations (blue circle) observed at Stations BB2 ($n=1$) and 193 ($n=2$) are excluded from the moving average.

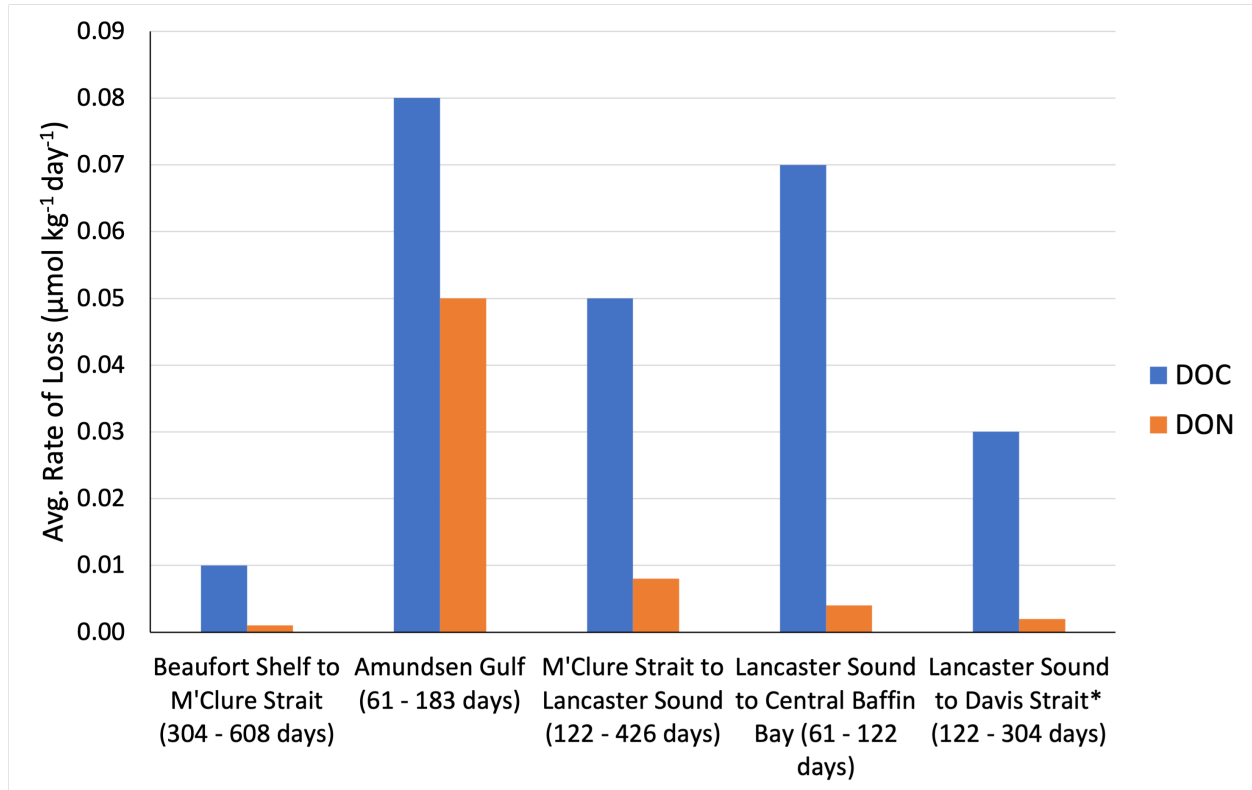


Figure S6. Pacific Winter Water DOC and DON removal rates from Beaufort Sea to Baffin Bay as reported in Table S3.

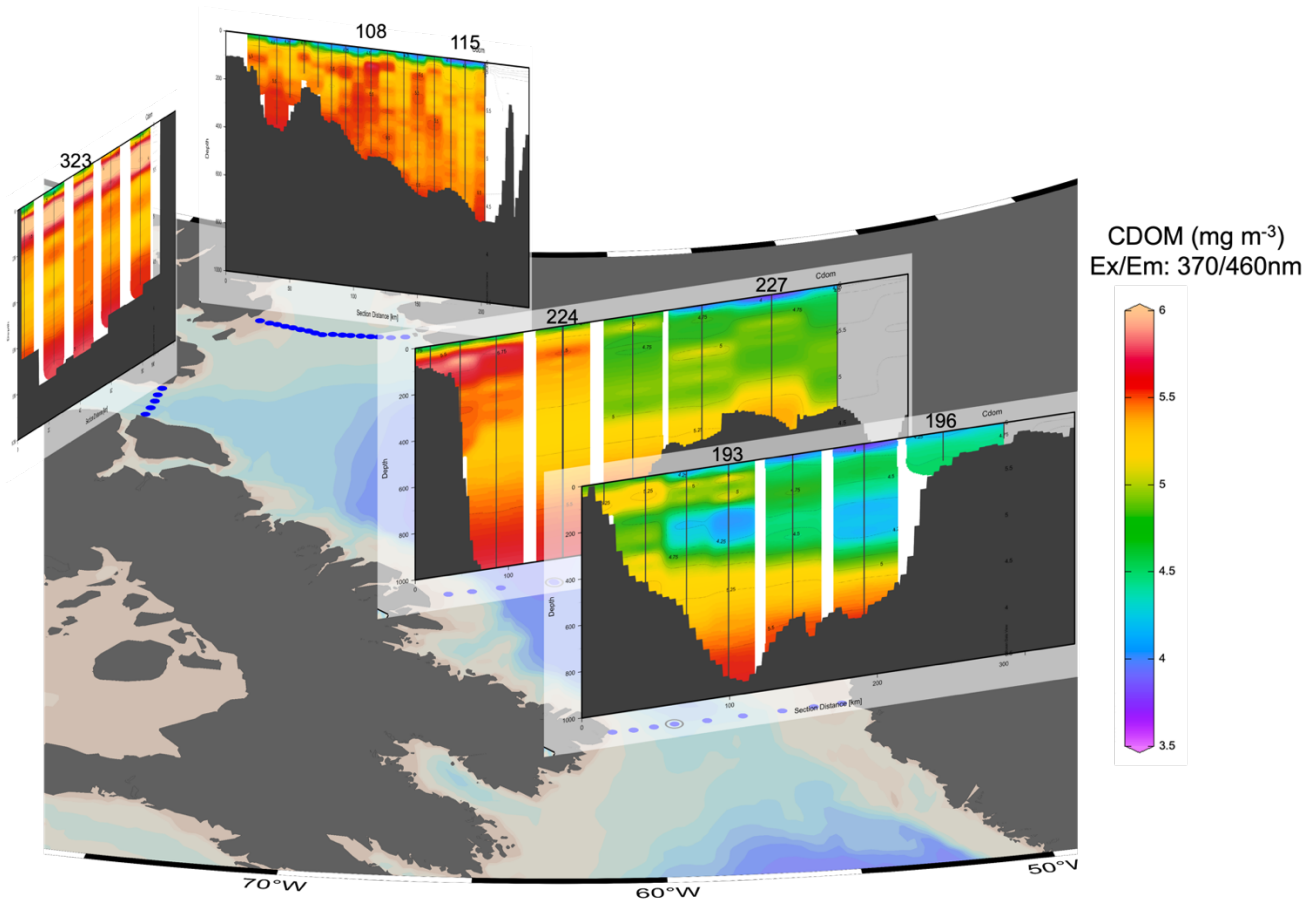


Figure S7. Sections of chromophoric dissolved organic matter (CDOM) in Baffin Bay. CDOM data shown were recorded using a Seabird Wetlabs ECO Fluorometer (FLCDRTD-2344) with DOM fluorescence measured at Ex/Em of 370/460nm. Sections were generated in Ocean Data View For Lancaster Sound (323), Smith Sound (108, 115), Central Baffin Bay (224, 227) and Davis Strait (193, 196). A clear decrease in the CDOM maximum (~100m depth) is observed along the nearshore BIC extension (<100km from shore).

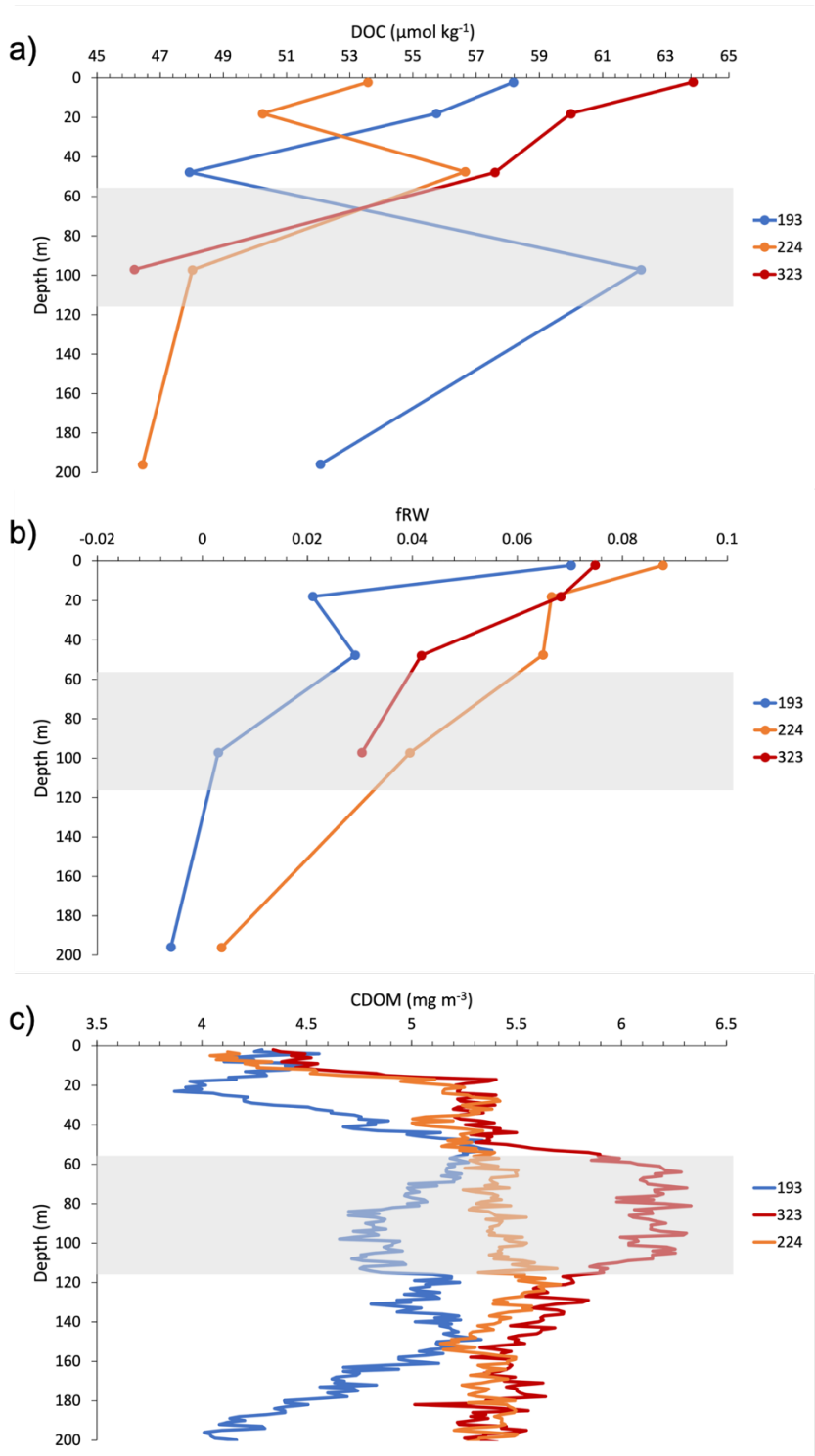


Figure S8. Depth profiles of measured DOC, f_{RW} , and CDOM depth for sampled Baffin Island Current (BIC) Stations. Grey shaded regions show the depths of the PWW/BIC CDOM anomaly within Baffin Bay.

Appendix B: Supplementary and Extended Tables

Table S1. Station and CTD data for all depths measured in the CAA and Baffin Bay. Potential density anomaly (σ_θ , kg m⁻³), dissolved oxygen (O₂, $\mu\text{mol kg}^{-1}$), Apparent Oxygen Utilization (AOU, $\mu\text{mol kg}^{-1}$), *in vivo* fluorescence of chlorophyll-a (FISP, mg m⁻³). Dissolved oxygen and FISP were measured using a Sea-Bird Scientific SBE 43 Dissolved Oxygen Sensor and Seapoint Chlorophyll Fluorometer respectively, attached to the CTD-rosette. N.D. represents no data.

Station	Lat.	Long.	Depth (m)	Temp. (°C)	Sal. (PSU)	σ_θ (kg m ⁻³)	O ₂ ($\mu\text{mol kg}^{-1}$)	AOU ($\mu\text{mol kg}^{-1}$)	FISP (mg m ⁻³)
C002	73.96	-88.82	403.7	0.50	34.23	27.46	206.55	139.54	0.10
C002	73.96	-88.82	297.9	0.03	33.99	27.29	212.81	138.23	0.07
C002	73.96	-88.82	198.4	-1.16	33.37	26.84	271.41	92.71	0.08
C002	73.96	-88.82	149.2	-1.22	32.57	26.19	272.74	94.24	0.15
C002	73.96	-88.82	149.2	-1.22	32.57	26.19	272.74	94.24	0.15
C002	73.96	-88.82	99.8	-1.32	32.13	25.83	290.26	78.97	0.18
C002	73.96	-88.82	49.8	-1.03	31.36	25.20	326.88	41.70	0.41
C002	73.96	-88.82	20.0	-0.69	28.98	23.27	388.90	-16.90	1.64
C002	73.96	-88.82	1.6	-1.01	27.46	22.05	379.32	0.33	0.59
C003	72.37	-91.41	297.3	0.19	34.07	27.34	217.69	131.72	0.06
C003	72.37	-91.41	178.4	-0.91	33.49	26.92	255.35	106.01	0.07
C003	72.37	-91.41	143.7	-1.13	33.09	26.61	264.30	100.36	0.07
C003	72.37	-91.41	99.3	-1.27	32.51	26.14	270.68	97.01	0.07
C003	72.37	-91.41	49.7	-1.36	31.90	25.65	309.37	60.91	0.17
C003	72.37	-91.41	29.9	-0.95	31.66	25.44	350.74	16.20	1.12
C003	72.37	-91.41	3.8	1.65	30.35	24.27	343.35	2.82	0.19
C004	71.96	-95.84	411.4	-1.15	33.00	26.53	242.83	122.28	0.08
C004	71.96	-95.84	297.2	-1.17	32.94	26.49	248.66	116.74	0.08
C004	71.96	-95.84	297.2	-1.17	32.94	26.49	248.66	116.74	0.08
C004	71.96	-95.84	178.2	-1.20	32.77	26.36	259.48	106.71	0.08
C004	71.96	-95.84	138.7	-1.21	32.70	26.29	262.51	103.97	0.08
C004	71.96	-95.84	99.1	-1.20	32.48	26.12	273.28	93.79	0.09
C004	71.96	-95.84	49.6	-0.90	31.22	25.09	324.16	43.45	0.32
C004	71.96	-95.84	20.3	-0.01	28.91	23.20	390.96	-25.44	0.71
C004	71.96	-95.84	1.6	0.41	24.28	19.45	374.69	-0.18	0.52
C009	70.71	-98.96	178.4	-1.09	33.29	26.77	240.70	122.97	0.09
C009	70.71	-98.96	138.5	-1.16	33.12	26.64	249.67	115.14	0.08
C009	70.71	-98.96	99.3	-1.23	32.84	26.41	261.62	104.71	0.08
C009	70.71	-98.96	37.9	-1.06	31.00	24.91	371.57	-1.73	2.49
C009	70.71	-98.96	20.1	-0.44	29.26	23.49	397.57	-28.83	0.25
C009	70.71	-98.96	20.1	-0.44	29.26	23.49	397.57	-28.83	0.25
C009	70.71	-98.96	2.7	-0.21	23.96	19.20	376.91	4.79	0.18
312	69.17	-100.70	49.9	-0.84	29.87	23.99	342.23	28.71	0.89

312	69.17	-100.70	14.0	0.40	26.77	21.45	357.43	10.08	0.83
312	69.17	-100.70	2.0	0.85	26.00	20.82	359.52	5.83	0.85
312	69.17	-100.70	2.0	0.85	26.00	20.82	359.52	5.83	0.85
C010	68.25	-101.64	89.8	-1.50	28.65	23.02	338.58	42.73	0.17
C010	68.25	-101.64	36.3	-1.13	27.78	22.30	360.04	19.94	0.60
C010	68.25	-101.64	19.8	-0.07	27.11	21.74	382.08	-10.83	0.49
C010	68.25	-101.64	3.2	2.11	25.29	20.20	362.97	-7.50	0.29
C011	69.02	-106.61	99.1	-1.05	27.72	22.25	344.05	35.28	0.18
C011	69.02	-106.61	49.3	-0.67	27.51	22.08	352.69	23.35	0.25
C011	69.02	-106.61	29.6	0.27	26.97	21.62	352.17	13.17	0.26
C011	69.02	-106.61	1.9	3.18	24.68	19.65	340.87	6.55	0.38
C012	68.33	-110.27	281.9	-0.97	28.66	23.02	274.09	101.66	0.07
C012	68.33	-110.27	178.2	-0.57	28.62	22.97	279.59	92.24	0.07
C012	68.33	-110.27	138.7	-0.50	28.58	22.94	279.84	91.40	0.07
C012	68.33	-110.27	99.2	-0.31	28.35	22.75	293.48	76.52	0.08
C012	68.33	-110.27	49.6	-0.96	27.84	22.35	322.14	55.96	0.55
C012	68.33	-110.27	23.3	0.28	26.88	21.55	369.91	-1.74	0.54
C012	68.33	-110.27	4.9	2.24	25.16	20.08	351.30	3.46	0.37
C013	69.06	-114.79	82.3	-0.96	32.46	26.09	275.22	89.54	0.10
C013	69.06	-114.79	40.0	-0.40	31.53	25.32	351.11	10.82	0.59
C013	69.06	-114.79	40.0	-0.40	31.53	25.32	351.11	10.82	0.59
C013	69.06	-114.79	20.1	4.62	24.31	19.25	328.49	7.73	0.54
C013	69.06	-114.79	1.9	5.08	23.41	18.50	326.74	7.00	0.47
C014	69.62	-118.61	495.3	0.38	34.73	27.86	222.01	123.85	0.07
C014	69.62	-118.61	396.5	0.34	34.70	27.85	226.88	119.47	0.07
C014	69.62	-118.61	396.5	0.34	34.70	27.85	226.88	119.47	0.07
C014	69.62	-118.61	296.9	0.16	34.59	27.77	233.32	114.92	0.07
C014	69.62	-118.61	178.4	-0.93	33.45	26.89	241.62	120.00	0.07
C014	69.62	-118.61	138.8	-1.24	32.82	26.39	266.66	99.77	0.07
C014	69.62	-118.61	98.9	-1.10	32.41	26.06	283.21	82.98	0.09
C014	69.62	-118.61	42.0	-0.78	31.29	25.14	380.34	-13.92	1.10
C014	69.62	-118.61	19.9	-0.24	30.73	24.67	390.07	-27.50	0.34
C014	69.62	-118.61	2.8	4.37	28.67	22.72	326.00	1.42	0.31
C015	70.66	-122.62	495.6	0.41	34.74	27.87	237.78	107.80	0.06
C015	70.66	-122.62	495.6	0.41	34.74	27.87	237.78	107.80	0.06
C015	70.66	-122.62	396.0	0.38	34.72	27.86	236.48	109.47	0.06
C015	70.66	-122.62	297.6	0.28	34.66	27.82	237.05	109.95	0.06
C015	70.66	-122.62	178.1	-0.52	34.00	27.32	228.70	127.44	0.07
C015	70.66	-122.62	138.5	-0.95	33.41	26.86	241.47	120.49	0.07
C015	70.66	-122.62	99.4	-1.13	32.84	26.41	262.31	103.02	0.08

C015	70.66	-122.62	43.7	-0.68	31.91	25.64	326.36	37.23	0.07
C015	70.66	-122.62	20.4	0.28	30.58	24.53	385.01	-26.95	0.34
C015	70.66	-122.62	3.7	2.93	27.85	22.19	335.88	5.58	0.27
414	71.50	-127.14	293.5	0.30	34.65	27.81	257.41	89.36	0.07
414	71.50	-127.14	293.5	0.30	34.65	27.81	257.41	89.36	0.07
414	71.50	-127.14	178.0	-0.94	33.45	26.89	240.40	121.30	0.07
414	71.50	-127.14	137.6	-1.16	32.91	26.46	260.57	104.84	0.07
414	71.50	-127.14	98.8	-1.07	32.48	26.11	278.89	86.84	0.10
414	71.50	-127.14	49.4	-1.21	31.22	25.10	386.41	-15.80	0.53
414	71.50	-127.14	19.4	0.10	28.56	22.90	368.95	-3.51	0.23
414	71.50	-127.14	1.9	1.05	27.84	22.29	353.41	4.93	0.18
PCB07	70.42	-131.54	42.0	-1.04	31.71	25.49	252.50	115.16	0.24
PCB07	70.42	-131.54	12.2	2.09	30.15	24.08	344.28	-3.34	1.24
PCB07	70.42	-131.54	12.2	2.09	30.15	24.08	344.28	-3.34	1.24
PCB07	70.42	-131.54	2.5	3.08	28.23	22.48	331.36	7.81	0.67
434	70.18	-133.55	35.5	-0.98	31.65	25.44	295.83	71.00	0.18
434	70.18	-133.55	35.5	-0.98	31.65	25.44	295.83	71.00	0.18
434	70.18	-133.55	14.5	0.40	30.81	24.71	386.76	-26.04	0.37
434	70.18	-133.55	2.1	5.38	18.24	14.39	333.67	11.33	0.99
PCB18	70.00	-138.63	178.2	-1.21	33.59	27.02	271.90	92.03	0.07
PCB18	70.00	-138.63	138.8	-1.38	32.94	26.49	282.79	84.69	0.06
PCB18	70.00	-138.63	138.8	-1.38	32.94	26.49	282.79	84.69	0.06
PCB18	70.00	-138.63	99.3	-1.29	32.48	26.12	287.51	80.40	0.07
PCB18	70.00	-138.63	49.7	-0.85	31.48	25.30	331.26	35.15	0.21
PCB18	70.00	-138.63	24.8	-0.52	30.47	24.47	380.09	-14.06	0.38
PCB18	70.00	-138.63	1.4	3.39	19.60	15.60	344.35	14.76	0.83
PCB12	71.16	-128.17	44.0	-0.85	31.48	25.29	325.11	41.34	0.16
PCB12	71.16	-128.17	11.8	1.02	29.69	23.78	368.23	-13.83	0.36
PCB12	71.16	-128.17	11.8	1.02	29.69	23.78	368.23	-13.83	0.36
PCB12	71.16	-128.17	6.3	1.99	28.54	22.80	353.13	8.78	0.37
546	71.74	-133.95	1597.7	-0.37	34.92	28.06	279.89	72.37	0.05
546	71.74	-133.95	1479.6	-0.28	34.89	28.04	285.40	66.08	0.05
546	71.74	-133.95	1479.6	-0.28	34.89	28.04	285.40	66.08	0.05
546	71.74	-133.95	1184.3	-0.09	34.87	28.01	288.35	61.41	0.05
546	71.74	-133.95	988.2	0.07	34.86	27.99	288.23	60.08	0.05
546	71.74	-133.95	790.3	0.34	34.85	27.96	286.10	59.83	0.05
546	71.74	-133.95	593.1	0.60	34.83	27.94	281.78	61.90	0.05
546	71.74	-133.95	395.8	0.54	34.74	27.87	269.56	74.90	0.05
546	71.74	-133.95	296.9	-0.25	34.39	27.63	263.59	88.94	0.06
546	71.74	-133.95	198.1	-1.29	33.08	26.61	308.84	57.35	0.07

546	71.74	-133.95	99.1	-1.22	32.41	26.06	279.76	87.71	0.08
546	71.74	-133.95	49.6	-0.76	31.04	24.94	366.49	0.29	0.33
546	71.74	-133.95	29.7	-0.93	29.99	24.09	384.28	-12.82	0.34
546	71.74	-133.95	2.8	-0.94	23.64	18.96	374.63	15.79	0.16
514	75.10	-120.63	395.5	0.46	34.79	27.91	243.38	101.65	0.05
514	75.10	-120.63	297.2	0.23	34.65	27.81	240.22	107.26	0.06
514	75.10	-120.63	178.2	-0.81	33.91	27.27	245.49	113.66	0.07
514	75.10	-120.63	138.5	-1.35	33.11	26.63	261.85	104.81	0.07
514	75.10	-120.63	99.2	-1.35	32.49	26.13	279.93	88.59	0.10
514	75.10	-120.63	34.6	-1.10	31.08	24.98	388.43	-18.39	0.48
514	75.10	-120.63	24.4	-1.19	30.38	24.41	387.75	-14.78	0.42
514	75.10	-120.63	1.6	-1.42	28.43	22.84	370.97	10.10	0.36
518	74.60	-121.45	395.6	0.46	34.80	27.92	235.66	109.36	0.06
518	74.60	-121.45	300.0	0.39	34.76	27.89	238.68	107.01	0.06
518	74.60	-121.45	179.3	-0.77	33.83	27.20	239.34	119.72	0.07
518	74.60	-121.45	139.3	-1.29	33.23	26.73	260.39	105.41	0.07
518	74.60	-121.45	99.5	-1.39	32.59	26.21	275.90	92.67	0.08
518	74.60	-121.45	49.6	-1.08	31.58	25.39	349.29	19.09	0.26
518	74.60	-121.45	29.7	-0.96	30.96	24.88	384.69	-15.71	0.49
518	74.60	-121.45	2.4	-1.39	28.55	22.93	373.03	7.38	0.14
193	66.77	-59.34	786.9	1.00	34.50	27.64	193.89	146.85	0.06
193	66.77	-59.34	591.9	1.48	34.50	27.61	207.04	129.90	0.05
193	66.77	-59.34	392.6	2.97	34.55	27.53	239.24	86.81	0.05
193	66.77	-59.34	195.8	4.35	34.61	27.44	264.33	46.82	0.05
193	66.77	-59.34	97.2	-0.85	33.57	26.99	316.17	43.94	0.18
193	66.77	-59.34	47.8	-1.26	33.16	26.67	284.97	81.61	0.09
193	66.77	-59.34	18.0	2.80	32.83	26.17	348.70	-22.76	0.59
193	66.77	-59.34	2.2	-0.07	30.40	24.40	360.59	3.16	0.30
196	66.99	-56.06	96.3	1.38	33.75	27.01	308.10	30.79	0.14
196	66.99	-56.06	47.4	1.68	33.68	26.93	310.85	26.19	0.19
196	66.99	-56.06	18.0	2.56	33.59	26.80	324.33	-1.00	1.90
196	66.99	-56.06	3.3	3.98	30.40	26.59	330.94	-10.55	1.29
BB15	68.45	-55.90	393.4	3.67	34.57	27.48	245.88	72.99	0.07
BB15	68.45	-55.90	196.0	3.02	34.36	27.37	252.16	72.37	0.08
BB15	68.45	-55.90	97.5	0.92	33.92	27.18	267.08	76.74	0.17
BB15	68.45	-55.90	47.6	-0.18	33.62	27.00	347.92	6.48	0.52
BB15	68.45	-55.90	18.0	5.05	33.54	26.51	315.71	-7.24	0.18
BB15	68.45	-55.90	2.5	5.76	33.54	26.43	305.35	1.32	0.14
BB18	70.09	-52.74	395.0	1.85	34.26	27.39	231.72	102.78	0.11
BB18	70.09	-52.74	195.7	1.28	34.03	27.24	250.20	89.45	0.25

BB18	70.09	-52.74	97.2	0.68	33.72	27.04	267.58	78.10	0.21
BB18	70.09	-52.74	47.6	0.86	33.32	26.70	279.37	65.66	0.42
BB18	70.09	-52.74	18.2	1.21	32.70	26.18	302.73	39.15	6.03
BB18	70.09	-52.74	2.1	4.39	31.06	24.61	380.78	N.D.	1.98
227	70.80	-56.99	393.9	2.16	34.51	27.57	214.90	116.40	0.06
227	70.80	-56.99	196.4	1.76	34.22	27.36	239.77	94.88	0.08
227	70.80	-56.99	97.7	0.21	33.83	27.15	264.95	83.87	0.18
227	70.80	-56.99	18.3	5.40	33.34	26.32	309.49	-1.48	0.20
227	70.80	-56.99	3.4	5.41	33.34	26.31	309.47	-1.42	0.14
224	70.44	-62.98	1968.6	-0.30	34.50	27.72	110.66	243.01	0.06
224	70.44	-62.98	1772.1	-0.26	34.49	27.71	115.60	237.56	0.06
224	70.44	-62.98	1575.5	-0.12	34.49	27.70	121.53	230.24	0.06
224	70.44	-62.98	1379.2	0.15	34.49	27.69	135.59	213.62	0.06
224	70.44	-62.98	1182.3	0.49	34.49	27.67	161.39	184.58	0.06
224	70.44	-62.98	985.4	0.80	34.49	27.65	185.55	157.66	0.06
224	70.44	-62.98	788.6	1.30	34.52	27.64	193.69	144.80	0.06
224	70.44	-62.98	591.3	1.69	34.52	27.61	210.28	123.97	0.06
224	70.44	-62.98	394.0	1.87	34.43	27.53	223.62	110.25	0.06
224	70.44	-62.98	196.1	-0.61	33.78	27.15	261.56	94.97	0.06
224	70.44	-62.98	97.3	-1.67	33.13	26.66	300.82	69.21	0.07
224	70.44	-62.98	47.6	-1.66	32.90	26.47	321.73	48.64	1.06
224	70.44	-62.98	18.1	-1.36	32.41	26.07	345.75	22.82	0.72
224	70.44	-62.98	2.3	0.00	29.68	23.81	361.77	N.D.	0.39
BB2	72.75	-67.00	2261.9	-0.30	34.50	27.72	112.17	241.61	0.06
BB2	72.75	-67.00	1967.5	-0.30	34.49	27.72	117.04	236.64	0.06
BB2	72.75	-67.00	1772.0	-0.23	34.49	27.71	119.51	233.35	0.06
BB2	72.75	-67.00	1575.3	-0.03	34.49	27.70	127.39	223.48	0.06
BB2	72.75	-67.00	1379.3	0.36	34.49	27.68	148.14	199.35	0.06
BB2	72.75	-67.00	1182.1	0.71	34.49	27.66	174.68	169.40	0.06
BB2	72.75	-67.00	985.3	1.18	34.51	27.64	187.65	152.12	0.05
BB2	72.75	-67.00	788.3	1.74	34.53	27.62	205.52	129.37	0.05
BB2	72.75	-67.00	591.2	1.41	34.43	27.56	214.66	123.34	0.06
BB2	72.75	-67.00	393.8	1.40	34.36	27.51	198.88	139.15	0.06
BB2	72.75	-67.00	196.0	0.19	34.00	27.29	236.20	111.72	0.06
BB2	72.75	-67.00	97.0	-1.37	33.42	26.89	285.52	80.64	0.08
BB2	72.75	-67.00	47.6	-1.68	33.04	26.58	303.35	66.85	0.59
BB2	72.75	-67.00	18.4	-0.92	31.94	25.67	385.39	-23.97	0.35
BB2	72.75	-67.00	2.1	2.23	29.81	23.80	337.36	5.12	0.16
204	73.27	-58.00	788.7	1.27	34.50	27.63	198.13	140.79	0.07
204	73.27	-58.00	591.0	1.49	34.49	27.60	204.49	132.48	0.07

204	73.27	-58.00	395.6	1.55	34.40	27.53	210.01	126.62	0.10
204	73.27	-58.00	195.8	0.74	34.03	27.28	232.82	111.96	0.14
204	73.27	-58.00	97.1	-0.46	33.69	27.07	264.49	91.69	0.35
204	73.27	-58.00	44.6	-0.84	33.39	26.84	291.04	69.94	1.75
204	73.27	-58.00	17.7	2.77	32.81	26.15	363.73	-32.50	0.25
204	73.27	-58.00	3.4	7.30	32.17	25.15	298.48	-3.47	0.22
210	75.42	-61.56	1062.2	1.33	34.51	27.63	188.36	150.20	0.06
210	75.42	-61.56	788.3	1.46	34.52	27.63	188.28	148.99	0.06
210	75.42	-61.56	590.8	1.73	34.52	27.61	193.09	141.69	0.06
210	75.42	-61.56	590.8	1.73	34.52	27.61	193.09	141.69	0.06
210	75.42	-61.56	393.9	1.85	34.42	27.52	201.85	132.17	0.06
210	75.42	-61.56	196.4	0.41	33.98	27.26	235.51	112.86	0.11
210	75.42	-61.56	97.3	-0.46	33.68	27.06	258.84	97.35	0.31
210	75.42	-61.56	47.8	-0.90	33.45	26.90	276.84	84.83	0.40
210	75.42	-61.56	17.8	0.01	33.13	26.60	384.23	-33.53	0.16
210	75.42	-61.56	2.2	9.47	32.94	25.43	279.15	3.63	0.17
115	76.33	-71.20	541.4	0.67	34.44	27.62	N.D.	N.D.	N.D.
115	76.33	-71.20	541.4	0.67	34.44	27.62	N.D.	N.D.	N.D.
115	76.33	-71.20	541.4	0.67	34.44	27.62	N.D.	N.D.	N.D.
108	76.26	-74.60	393.8	-0.06	34.34	27.57	255.72	95.22	0.22
108	76.26	-74.60	294.7	-0.07	34.25	27.50	254.59	96.63	0.24
108	76.26	-74.60	294.7	-0.07	34.25	27.50	254.59	96.63	0.24
108	76.26	-74.60	196.0	-0.41	33.94	27.27	257.39	97.93	0.22
108	76.26	-74.60	97.1	-1.28	32.92	26.47	304.22	62.30	0.61
108	76.26	-74.60	47.6	-1.53	32.36	26.03	322.06	48.62	1.89
108	76.26	-74.60	18.0	1.76	31.58	25.25	352.55	-10.58	0.09
108	76.26	-74.60	2.0	3.12	31.14	24.80	343.70	-12.17	0.07
323	74.16	-80.47	739.2	0.59	34.46	27.64	207.37	137.63	0.08
323	74.16	-80.47	591.5	0.86	34.46	27.62	217.02	125.80	0.06
323	74.16	-80.47	393.4	0.87	34.35	27.53	227.50	115.52	0.07
323	74.16	-80.47	393.4	0.87	34.35	27.53	227.50	115.52	0.07
323	74.16	-80.47	97.1	-1.34	32.91	26.47	288.60	78.45	0.22
323	74.16	-80.47	47.9	-1.66	32.57	26.20	315.15	56.25	1.23
323	74.16	-80.47	18.1	-1.01	32.16	25.85	383.79	-18.12	4.91
323	74.16	-80.47	18.1	-1.01	32.16	25.85	383.79	-18.12	4.91
323	74.16	-80.47	2.1	2.05	30.16	24.09	346.04	-2.19	0.11

Table S2. Station DOM and nutrient measurements with hydrographic data. Measured dissolved organic carbon (DOC, $\mu\text{mol kg}^{-1}$) and total nitrogen (TN, $\mu\text{mol kg}^{-1}$) with measurement standard deviations (DOC SD, TN SD, $\mu\text{mol kg}^{-1}$), and nutrients nitrite (NO_2^- , $\mu\text{mol kg}^{-1}$), nitrate (NO_3^- , $\mu\text{mol kg}^{-1}$), and ammonium (NH_4^+ , $\mu\text{mol kg}^{-1}$). Calculated dissolved organic nitrogen (DON, $\mu\text{mol kg}^{-1}$), DOC:DON ratio, stable oxygen ($\delta^{18}\text{O}$, ‰), calculated fraction of river water (f_{RW}), sea-ice melt (f_{SIM}), and seawater (f_{SW}), and calculated terrestrial DOC and DON (tDOC, tDON, $\mu\text{mol kg}^{-1}$). $\delta^{18}\text{O}$, f_{RW} , f_{SIM} , f_{SW} , tDOC and tDON not reported below 200m. N.D. represents no data.

Station	Depth (m)	DOC ($\mu\text{mol kg}^{-1}$)	DOC SD ($\mu\text{mol kg}^{-1}$)	TN ($\mu\text{mol kg}^{-1}$)	TN SD ($\mu\text{mol kg}^{-1}$)	NO_2^- ($\mu\text{mol kg}^{-1}$)	NO_3^- ($\mu\text{mol kg}^{-1}$)	NH_4^+ ($\mu\text{mol kg}^{-1}$)	DON ($\mu\text{mol kg}^{-1}$)	C:N ratio	$\delta^{18}\text{O}$ (‰)	f_{RW}	f_{SIM}	f_{SW}	tDOC ($\mu\text{mol kg}^{-1}$)	tDON ($\mu\text{mol kg}^{-1}$)
C002	403.7	54.6	2.0	18.5	0.3	0.03	15.29	0.02	3.1	17.4	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C002	297.9	53.3	1.8	18.8	0.4	0.02	14.96	0.00	3.8	14.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C002	198.4	60.2	1.0	14.6	1.0	0.02	11.30	0.39	2.9	20.8	-1.52	0.12	-0.09	0.97	7.3	0.4
C002	149.2	61.7	1.1	15.0	0.2	0.03	11.90	0.04	3.0	20.3	-1.41	0.11	-0.05	0.94	6.9	0.3
C002	149.2	61.1	0.4	15.8	0.2	0.03	11.90	0.04	3.8	16.0	-1.07	0.09	-0.03	0.94	5.6	0.4
C002	99.8	61.0	1.3	13.0	0.6	0.02	8.91	0.14	3.9	15.7	-1.80	0.13	-0.06	0.93	8.0	0.5
C002	49.8	60.1	1.0	10.6	0.6	0.02	1.87	0.30	8.4	7.1	-1.75	0.13	-0.03	0.90	7.5	1.1
C002	20.0	59.6	2.9	5.2	0.3	0.00	0.00	0.00	5.2	11.5	-2.92	0.18	-0.01	0.83	10.8	0.9
C002	1.6	74.8	1.5	4.8	0.2	0.00	0.00	0.11	4.7	16.0	-3.10	0.18	0.02	0.79	13.8	0.9
C003	297.3	58.6	2.8	19.4	0.6	0.00	14.76	0.04	4.6	12.8	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C003	178.4	69.0	4.7	17.5	0.1	0.01	12.45	0.00	5.1	13.6	-0.04	0.06	-0.02	0.97	3.9	0.3
C003	143.7	66.4	4.2	17.2	0.3	0.01	12.03	0.00	5.2	12.8	-0.79	0.08	-0.03	0.95	5.2	0.4
C003	99.3	66.1	2.8	15.2	0.3	0.01	11.32	0.02	3.9	17.1	-1.45	0.11	-0.05	0.94	7.5	0.4
C003	49.7	76.6	0.7	13.2	0.6	0.08	6.59	0.55	6.0	12.9	-2.69	0.18	-0.11	0.93	14.0	1.1
C003	29.9	77.5	1.5	7.2	0.2	0.04	1.82	0.32	5.0	15.4	-2.44	0.16	-0.07	0.91	12.8	0.8
C003	3.8	71.4	2.8	5.6	0.2	0.00	0.00	0.02	5.5	12.9	-2.65	0.17	-0.05	0.88	12.3	1.0
C004	411.4	63.7	1.9	19.0	0.2	0.02	14.96	N.D.	4.0	15.9	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C004	297.2	67.9	2.0	18.0	0.2	0.02	14.61	N.D.	3.4	20.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C004	297.2	64.3	7.4	18.6	0.4	0.02	14.61	N.D.	4.0	16.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C004	178.2	68.4	2.1	17.6	0.4	0.02	13.88	N.D.	3.7	18.3	-1.80	0.14	-0.09	0.95	9.2	0.5
C004	138.7	77.3	6.4	16.3	0.4	0.02	13.64	N.D.	2.6	29.5	-1.49	0.12	-0.06	0.95	9.0	0.3
C004	99.1	60.1	2.4	16.7	0.1	0.02	12.67	N.D.	4.0	15.1	-1.57	0.12	-0.06	0.94	7.2	0.5
C004	49.6	77.2	3.1	12.0	0.3	0.10	6.42	N.D.	5.5	14.1	-2.66	0.18	-0.08	0.90	13.6	1.0

C004	20.3	85.4	20.2	6.5	0.6	0.02	0.00	N.D.	6.4	13.3	-2.95	0.19	-0.06	0.87	16.1	1.2
C004	1.6	82.3	6.6	5.2	0.3	0.02	0.00	N.D.	5.2	15.9	-4.32	0.24	0.08	0.69	19.6	1.2
C009	178.4	86.0	22.4	19.3	0.2	0.02	15.77	0.02	3.5	24.8	-1.13	0.10	-0.06	0.96	8.5	0.3
C009	138.5	82.0	0.8	19.1	0.2	0.02	15.20	0.17	3.7	22.1	-1.47	0.12	-0.08	0.96	10.0	0.5
C009	99.3	57.3	2.6	17.4	0.5	0.02	14.45	0.05	2.9	19.6	-1.54	0.12	-0.07	0.95	6.9	0.4
C009	37.9	110.4	11.6	9.1	0.2	0.15	4.78	0.18	4.0	27.8	-1.66	0.12	-0.03	0.91	13.4	0.5
C009	20.1	87.0	5.8	5.8	0.0	0.02	0.00	0.15	5.6	15.5	-2.38	0.16	-0.03	0.87	13.6	0.9
C009	20.1	93.5	4.9	5.7	0.2	0.02	0.00	0.15	5.5	17.0	-2.38	0.16	-0.03	0.87	14.6	0.9
C009	2.7	73.7	5.4	4.9	0.1	0.03	0.00	0.11	4.8	15.5	-4.09	0.23	0.08	0.69	16.7	1.1
312	49.9	87.0	3.9	10.5	0.2	0.03	4.39	0.34	5.7	15.3	-2.88	0.18	-0.04	0.86	15.9	1.0
312	14.0	87.4	5.6	7.6	0.3	0.01	1.37	0.26	6.0	14.6	-3.82	0.22	-0.01	0.79	19.7	1.3
312	2.0	87.6	1.7	6.1	0.2	0.01	0.76	0.11	5.2	16.9	-4.59	0.26	-0.01	0.75	23.0	1.4
312	2.0	93.1	0.6	7.0	0.1	0.01	0.76	0.11	6.1	15.3	-4.59	0.26	-0.01	0.75	24.5	1.6
C010	89.8	91.7	3.1	9.2	0.2	0.04	3.37	0.10	5.7	16.1	-4.38	0.26	-0.10	0.83	24.2	1.5
C010	36.3	102.2	16.0	6.6	0.5	0.02	0.61	0.20	5.7	17.8	-4.20	0.25	-0.05	0.80	25.5	1.4
C010	19.8	95.1	3.7	6.5	0.2	0.00	0.00	0.10	6.4	15.0	-4.35	0.25	-0.03	0.78	24.1	1.6
C010	3.2	107.7	6.7	6.0	0.3	0.00	0.00	0.11	5.9	18.3	-5.14	0.29	0.00	0.72	31.1	1.7
C011	99.1	91.8	11.0	8.7	0.2	0.11	2.03	0.29	6.3	14.6	-4.12	0.24	-0.04	0.80	22.4	1.5
C011	49.3	86.3	3.7	7.5	0.4	0.10	1.29	0.27	5.9	14.7	-4.64	0.27	-0.07	0.80	23.6	1.6
C011	29.6	95.3	10.7	7.2	0.3	0.08	0.88	0.23	6.1	15.7	-4.61	0.27	-0.05	0.79	25.7	1.6
C011	1.9	94.9	3.4	5.8	0.2	0.02	0.24	0.07	5.5	17.4	-5.07	0.28	0.01	0.71	27.0	1.6
C012	281.9	67.9	2.2	11.5	0.3	0.01	7.22	0.00	4.3	15.8	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C012	178.2	73.5	2.4	11.1	0.5	0.01	6.64	0.01	4.5	16.4	-4.04	0.23	-0.06	0.83	16.9	1.0
C012	138.7	77.5	3.8	10.2	0.3	0.02	6.61	0.06	3.5	22.2	-3.89	0.23	-0.06	0.83	18.2	0.8
C012	99.2	74.2	2.1	10.0	0.2	0.02	5.54	0.23	4.2	17.8	-4.04	0.24	-0.06	0.82	18.0	1.0
C012	49.6	75.2	2.3	8.4	0.3	0.09	3.45	0.10	4.8	15.7	-4.31	0.26	-0.06	0.80	19.2	1.2
C012	23.3	92.3	4.4	7.2	0.4	0.04	0.09	0.19	6.8	13.5	-4.71	0.27	-0.06	0.78	25.4	1.9
C012	4.9	87.3	4.9	6.0	0.2	0.03	0.00	0.04	5.9	14.8	-5.93	0.34	-0.08	0.74	29.4	2.0

C013	82.3	67.0	0.8	13.9	0.4	0.02	11.58	0.00	2.3	28.6	-1.83	0.14	-0.07	0.94	9.0	0.3
C013	40.0	76.4	0.5	9.2	0.1	0.21	3.87	0.53	4.6	16.7	-2.49	0.17	-0.08	0.91	12.9	0.8
C013	40.0	77.3	3.2	8.2	0.3	0.21	3.87	0.53	3.6	21.5	-2.49	0.17	-0.08	0.91	13.0	0.6
C013	20.1	101.1	3.9	5.9	0.1	0.00	0.03	0.06	5.8	17.5	-5.79	0.32	-0.02	0.70	32.7	1.9
C013	1.9	93.5	3.0	7.2	0.9	0.00	0.00	0.05	7.1	13.1	-5.98	0.33	0.00	0.67	30.8	2.3
C014	495.3	56.2	0.8	17.8	0.3	0.00	15.45	0.14	2.2	25.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C014	396.5	55.3	2.7	16.9	0.4	0.00	15.15	0.03	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C014	396.5	53.7	2.0	18.0	0.2	0.00	15.15	0.03	2.8	19.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C014	296.9	55.4	2.1	16.1	0.6	0.00	14.67	0.09	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C014	178.4	58.3	0.9	16.6	0.7	0.00	14.97	0.04	N.D.	N.D.	-1.24	0.11	-0.07	0.97	6.2	N.D.
C014	138.8	61.7	1.8	17.1	0.4	0.00	14.11	0.04	2.9	21.3	-1.62	0.12	-0.08	0.95	7.7	0.4
C014	98.9	73.2	1.9	18.1	2.9	0.00	12.07	0.04	6.0	12.2	-1.80	0.13	-0.07	0.94	9.8	0.8
C014	42.0	76.6	2.6	6.1	0.3	0.13	1.06	0.08	4.8	16.0	-3.32	0.22	-0.13	0.91	16.5	1.0
C014	19.9	84.9	1.3	6.0	0.4	0.00	0.00	0.08	5.9	14.5	-3.74	0.24	-0.14	0.90	20.1	1.4
C014	2.8	81.3	3.9	5.4	0.3	0.01	0.00	0.11	5.3	15.4	-4.00	0.24	-0.08	0.84	19.7	1.3
C015	495.6	54.4	0.7	18.6	0.5	0.00	14.60	N.D.	4.0	13.7	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C015	495.6	52.3	0.8	17.4	0.1	0.00	14.60	N.D.	2.8	18.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C015	396.0	58.8	0.3	17.7	0.6	0.01	14.67	N.D.	3.0	19.4	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C015	297.6	56.6	0.9	17.8	1.1	0.01	14.56	N.D.	3.2	17.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C015	178.1	61.3	2.0	19.7	0.3	0.01	15.15	N.D.	4.5	13.6	-0.86	0.09	-0.07	0.98	5.3	0.4
C015	138.5	65.1	2.0	21.3	0.7	0.01	15.05	0.15	6.1	10.6	-0.75	0.08	-0.04	0.96	5.0	0.5
C015	99.4	72.4	2.8	18.2	0.5	0.00	13.92	0.29	4.0	18.1	-1.43	0.11	-0.06	0.95	8.3	0.5
C015	43.7	73.9	2.0	11.0	0.2	0.23	5.99	0.43	4.4	16.9	-2.09	0.15	-0.07	0.92	10.9	0.6
C015	20.4	81.0	2.6	7.5	0.5	0.00	0.00	0.49	N.D.	N.D.	-3.39	0.22	-0.12	0.90	17.6	N.D.
C015	3.7	82.2	1.6	5.1	0.3	0.00	0.00	0.20	4.9	16.8	-4.04	0.24	-0.04	0.80	19.7	1.2
414	293.5	65.5	0.9	20.0	0.4	0.00	13.20	N.D.	6.8	9.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
414	293.5	68.7	2.3	20.3	0.3	0.00	13.20	N.D.	7.1	9.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
414	178.0	76.0	1.2	22.3	0.2	0.00	14.97	N.D.	7.3	10.4	-0.87	0.09	-0.06	0.98	6.6	0.6
414	137.6	73.1	2.2	19.3	0.4	0.01	14.13	N.D.	5.1	14.2	-1.54	0.12	-0.07	0.95	8.8	0.6

414	98.8	73.0	1.5	20.7	0.4	0.00	12.19	N.D.	8.5	8.6	-1.63	0.12	-0.06	0.94	9.0	1.0
414	49.4	81.5	1.7	11.0	0.5	0.08	1.59	N.D.	9.4	8.7	-2.89	0.19	-0.10	0.91	15.5	1.8
414	19.4	94.4	2.3	9.7	0.2	0.01	0.03	N.D.	9.6	9.8	-3.00	0.18	0.00	0.82	17.3	1.8
414	1.9	83.2	2.6	9.4	0.3	0.00	0.03	N.D.	9.4	8.9	-3.66	0.22	-0.01	0.79	18.1	2.0
PCB07	42.0	77.3	2.1	10.7	0.4	0.21	4.06	1.04	5.4	14.3	-2.47	0.17	-0.09	0.92	13.0	0.9
PCB07	12.2	89.5	2.2	6.6	0.2	0.10	1.39	0.21	4.9	18.2	-3.13	0.20	-0.08	0.88	17.9	1.0
PCB07	12.2	89.2	2.7	7.3	0.1	0.10	1.39	0.21	5.6	15.9	-3.13	0.20	-0.08	0.88	17.8	1.1
PCB07	2.5	106.5	4.7	6.9	0.3	0.01	0.00	0.01	6.9	15.4	-4.22	0.25	-0.08	0.83	27.0	1.8
434	35.5	79.3	2.6	10.7	0.2	0.13	4.08	0.51	6.0	13.2	-2.80	0.19	-0.11	0.92	14.9	1.1
434	35.5	76.5	2.2	10.5	0.2	0.13	4.08	0.51	5.8	13.1	-2.80	0.19	-0.11	0.92	14.3	1.1
434	14.5	85.8	2.6	6.2	0.3	0.01	0.00	0.11	6.0	14.2	-2.89	0.19	-0.08	0.90	16.2	1.1
434	2.1	246.4	10.1	9.8	0.3	0.02	0.00	0.04	9.7	25.4	-9.14	0.49	-0.01	0.53	119.9	4.7
PCB18	178.2	70.3	2.3	16.7	0.4	0.01	13.83	N.D.	2.8	25.1	-1.32	0.11	-0.09	0.97	7.8	0.3
PCB18	138.8	65.5	2.4	16.3	0.8	0.04	14.19	N.D.	2.0	32.1	-1.48	0.12	-0.07	0.95	7.7	0.2
PCB18	138.8	68.6	2.6	18.7	0.1	0.04	14.19	N.D.	4.5	15.3	-1.48	0.12	-0.07	0.95	8.1	0.5
PCB18	99.3	69.8	2.7	17.6	0.4	0.01	13.50	N.D.	4.1	16.9	-1.84	0.14	-0.08	0.94	9.5	0.6
PCB18	49.7	69.2	2.2	10.7	0.2	0.09	4.96	N.D.	5.7	12.2	-2.52	0.17	-0.08	0.91	11.8	1.0
PCB18	24.8	74.9	3.1	6.9	0.2	0.05	0.05	N.D.	6.8	11.0	-3.51	0.22	-0.09	0.87	16.5	1.5
PCB18	1.4	193.7	1.7	9.9	0.1	0.01	0.00	N.D.	9.9	19.5	-8.22	0.44	0.00	0.56	85.3	4.4
PCB12	44.0	78.2	1.5	10.5	0.2	0.15	2.87	0.81	6.7	11.7	-2.68	0.18	-0.09	0.91	14.0	1.2
PCB12	11.8	84.4	2.0	6.6	0.4	0.01	0.00	0.12	6.5	12.9	-3.76	0.23	-0.10	0.87	19.7	1.5
PCB12	11.8	84.0	1.1	6.8	0.5	0.01	0.00	0.12	6.7	12.5	-3.76	0.23	-0.10	0.87	19.6	1.6
PCB12	6.3	116.3	3.2	7.1	0.7	0.01	0.00	0.09	7.0	16.5	-4.55	0.26	-0.10	0.84	30.6	1.9
546	1597.7	52.9	0.4	17.3	0.5	0.00	13.58	N.D.	3.7	14.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	1479.6	57.1	1.7	17.3	0.3	0.01	12.99	N.D.	4.3	13.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	1479.6	54.0	2.2	17.1	0.3	0.01	12.99	N.D.	4.1	13.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	1184.3	54.5	1.2	15.8	0.6	0.01	12.57	N.D.	3.2	17.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	988.2	56.0	1.9	16.2	0.3	0.00	12.44	N.D.	3.7	15.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

546	790.3	53.9	1.4	16.3	0.6	0.01	12.42	N.D.	3.8	14.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	593.1	54.5	1.5	17.3	0.3	0.01	12.56	N.D.	4.7	11.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	395.8	57.9	2.0	16.0	0.3	0.01	12.79	N.D.	3.2	18.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	296.9	59.7	2.3	15.2	0.3	0.01	12.38	N.D.	2.8	21.4	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
546	198.1	76.0	2.1	18.6	0.3	0.02	12.93	N.D.	5.7	13.4	-1.76	0.13	-0.09	0.96	10.2	0.8
546	99.1	71.2	0.7	17.8	1.2	0.02	12.83	N.D.	5.0	14.3	-1.90	0.14	-0.08	0.94	9.9	0.7
546	49.6	79.8	3.4	8.7	0.4	0.13	1.79	0.16	6.6	12.1	-2.59	0.17	-0.07	0.90	13.7	1.1
546	29.7	79.2	6.3	7.3	0.3	0.03	0.00	0.05	7.2	10.9	-3.08	0.19	-0.06	0.86	15.4	1.4
546	2.8	120.0	7.2	7.4	0.1	0.01	0.00	0.37	7.0	17.2	-5.66	0.32	-0.02	0.71	38.0	2.2
514	395.5	59.5	0.9	18.3	0.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	297.2	59.6	1.2	17.1	0.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	178.2	62.9	1.4	17.7	0.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	138.5	66.0	1.4	17.9	0.1	N.D.	N.D.	0.04	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	99.2	68.3	2.5	18.6	0.5	N.D.	N.D.	0.07	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	34.6	77.8	0.7	8.1	0.2	N.D.	N.D.	0.17	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	24.4	76.3	3.1	8.0	0.2	N.D.	N.D.	0.16	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
514	1.6	77.2	2.3	6.8	0.1	N.D.	N.D.	0.10	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
518	395.6	54.1	1.3	18.5	0.3	0.04	15.01	N.D.	3.4	15.8	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
518	300.0	58.7	1.2	19.7	0.2	0.04	14.56	N.D.	5.0	11.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
518	179.3	64.4	2.0	20.5	0.5	0.03	14.86	N.D.	5.7	11.4	-0.93	0.09	-0.07	0.98	5.8	0.5
518	139.3	65.7	1.3	19.8	0.4	0.04	15.07	N.D.	4.7	14.1	-1.34	0.11	-0.07	0.96	7.3	0.5
518	99.5	73.3	2.5	19.4	0.4	0.03	14.53	0.06	4.8	15.3	-1.79	0.13	-0.08	0.94	9.8	0.6
518	49.6	74.8	1.6	11.3	0.2	0.09	4.67	0.09	6.5	11.6	-2.19	0.15	-0.06	0.91	11.3	1.0
518	29.7	79.5	2.3	7.6	0.1	0.13	0.68	0.01	6.8	11.7	-2.58	0.17	-0.06	0.89	13.6	1.2
518	2.4	84.9	2.3	8.1	0.2	0.04	0.00	0.14	7.9	10.7	-3.18	0.19	-0.02	0.82	16.5	1.5
193	786.9	43.3	2.6	21.6	0.6	0.01	17.29	0.00	4.3	10.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
193	591.9	41.1	3.5	23.4	0.8	0.01	16.88	0.00	6.5	6.4	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
193	392.6	42.5	0.0	20.9	0.5	0.01	14.93	0.00	6.0	7.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
193	195.8	52.1	6.5	19.8	0.3	0.01	13.31	0.00	6.4	8.1	-0.72	-0.01	-0.05	1.05	-0.3	0.0

193	97.2	62.2	6.3	15.2	0.4	0.05	5.98	0.10	9.1	6.9	-0.88	0.00	-0.02	1.02	0.2	0.0
193	47.8	47.9	3.7	17.5	0.9	0.04	8.63	0.10	8.8	5.5	-1.42	0.03	-0.04	1.01	1.4	0.3
193	18.0	55.7	1.7	11.4	0.3	0.02	0.54	0.10	10.7	5.2	-1.24	0.02	-0.02	1.00	1.2	0.2
193	2.2	65.0	1.1	10.6	0.1	0.02	0.21	0.10	10.3	6.3	-2.21	0.07	0.01	0.92	4.6	0.7
196	96.3	54.0	0.2	15.3	0.5	0.12	5.80	0.10	9.3	5.8	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
196	47.4	52.1	4.8	14.8	0.1	0.11	4.73	0.10	9.9	5.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
196	18.0	52.7	5.4	12.8	0.5	0.06	2.07	0.10	10.5	5.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
196	3.3	63.1	0.5	10.7	0.1	0.02	0.09	0.10	10.5	6.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB15	393.4	45.0	3.4	20.5	0.5	0.03	14.55	0.00	6.0	7.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB15	196.0	46.7	1.1	19.8	0.3	0.04	13.84	0.00	5.9	7.9	0.04	0.01	0.01	0.98	0.3	0.0
BB15	97.5	49.1	1.9	18.3	0.5	0.18	11.52	0.10	6.5	7.5	-0.27	0.02	0.01	0.97	1.1	0.1
BB15	47.6	49.7	1.2	11.2	0.2	0.07	1.83	0.10	9.2	5.4	-0.60	0.04	0.00	0.96	1.9	0.3
BB15	18.0	57.1	0.8	10.2	0.2	0.02	0.00	0.10	10.1	5.6	-1.11	0.06	-0.02	0.96	3.5	0.6
BB15	2.5	56.4	1.6	10.1	0.1	0.02	0.00	0.10	10.0	5.6	-0.54	0.03	0.01	0.96	2.0	0.3
BB18	395.0	46.4	1.0	16.6	1.1	0.02	14.62	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB18	195.7	50.0	0.7	16.4	0.3	0.07	13.45	0.00	2.8	17.7	-0.44	0.03	0.00	0.97	1.5	0.1
BB18	97.2	47.4	1.1	15.9	0.6	0.11	11.75	0.10	3.9	12.1	-1.05	0.06	-0.02	0.96	2.8	0.2
BB18	47.6	45.3	2.4	13.3	0.8	0.10	9.08	0.10	4.1	11.2	-0.26	0.02	0.03	0.95	1.0	0.1
BB18	18.2	47.8	1.5	10.7	0.1	0.07	6.76	0.10	3.8	12.6	-1.15	0.06	0.00	0.93	3.0	0.2
BB18	2.1	49.9	1.3	3.6	0.2	0.02	0.00	0.10	3.5	14.3	-2.78	0.14	-0.03	0.89	7.0	0.5
227	393.9	43.6	0.9	18.7	0.8	0.02	16.18	0.00	2.5	17.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
227	196.4	45.3	2.9	17.0	0.3	0.03	14.44	0.00	2.6	17.7	-0.33	0.03	0.00	0.98	1.1	0.1
227	97.7	50.0	3.0	15.8	0.3	0.15	12.17	0.10	3.4	14.9	-0.62	0.04	-0.01	0.97	1.9	0.1
227	18.3	58.6	0.5	4.3	0.3	0.02	0.00	0.10	4.2	14.0	-0.74	0.04	0.00	0.95	2.6	0.2
227	3.4	58.7	1.0	4.8	0.2	0.03	0.00	0.10	4.6	12.6	-1.21	0.07	-0.02	0.96	3.9	0.3
224	1968.6	48.0	1.5	26.6	0.7	0.01	23.12	0.00	3.4	14.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	1772.1	42.7	0.8	23.1	0.7	0.00	22.67	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	1575.5	46.0	1.0	23.4	0.2	0.00	22.01	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

224	1379.2	47.7	0.3	22.7	0.3	0.01	21.00	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	1182.3	40.0	1.5	22.6	0.4	0.01	19.16	0.00	3.4	11.7	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	985.4	49.2	1.9	21.1	0.6	0.01	17.82	0.00	3.3	15.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	788.6	45.0	1.1	19.3	0.6	0.01	17.33	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	591.3	43.1	0.6	17.6	0.4	0.01	16.46	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	394.0	44.1	0.5	16.8	0.6	0.01	15.42	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
224	196.1	46.4	1.3	14.8	1.0	0.01	12.14	0.00	2.7	17.5	-0.90	0.00	-0.03	1.03	0.2	0.0
224	97.3	48.0	4.6	12.3	0.2	0.02	8.69	0.10	3.5	13.9	-1.64	0.04	-0.05	1.01	1.9	0.1
224	47.6	56.7	1.4	9.0	0.5	0.15	5.90	0.10	2.8	20.2	-2.17	0.06	-0.07	1.01	3.7	0.2
224	18.1	50.2	0.9	8.0	0.1	0.10	4.59	0.10	3.2	15.7	-2.19	0.07	-0.06	0.99	3.3	0.2
224	2.3	53.6	1.7	4.8	0.2	0.01	0.08	0.10	4.6	11.6	-2.56	0.09	0.01	0.90	4.7	0.4
BB2	2261.9	51.9	1.8	28.1	1.0	0.00	23.82	0.00	4.3	12.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	1967.5	46.8	1.3	24.2	0.5	0.01	22.40	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	1772.0	43.4	2.2	23.6	1.3	0.00	22.09	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	1575.3	51.3	0.7	24.7	0.6	0.00	21.33	0.00	3.4	15.1	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	1379.3	41.8	0.3	23.0	1.1	0.00	19.80	0.00	3.2	13.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	1182.1	41.3	0.0	20.8	0.5	0.00	18.06	0.00	2.8	14.9	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	985.3	44.3	2.1	20.5	0.9	0.01	17.50	0.00	3.0	14.7	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	788.3	42.3	1.8	20.3	0.4	0.00	16.70	0.00	3.6	11.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	591.2	48.8	1.7	21.2	0.3	0.01	15.50	0.00	5.7	8.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	393.8	43.0	1.9	17.0	0.4	0.01	16.04	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BB2	196.0	56.5	1.7	19.5	0.5	0.01	13.79	0.00	5.7	10.0	-0.73	0.00	-0.03	1.03	-0.3	0.0
BB2	97.0	48.4	0.5	12.6	0.1	0.03	9.56	0.10	2.9	16.8	-1.39	0.03	-0.05	1.02	1.3	0.1
BB2	47.6	51.0	1.9	16.3	0.4	0.17	7.59	0.10	8.4	6.1	-1.28	0.02	-0.03	1.00	1.2	0.2
BB2	18.4	62.9	0.4	7.0	0.3	0.04	0.18	0.10	6.7	9.4	-2.36	0.08	-0.05	0.97	4.7	0.5
BB2	2.1	62.5	1.1	4.8	0.3	0.01	0.00	0.10	4.7	13.4	-2.37	0.08	0.02	0.90	4.9	0.4
204	788.7	50.2	0.9	22.6	0.2	0.03	16.90	0.00	5.7	8.9	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
204	591.0	49.4	1.0	21.0	0.4	0.03	16.36	0.00	4.6	10.7	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
204	395.6	48.1	2.5	21.9	0.3	0.03	16.01	0.00	5.9	8.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

204	195.8	50.9	1.6	17.2	0.5	0.04	13.50	0.00	3.7	13.8	-0.71	0.04	-0.02	0.97	2.2	0.2
204	97.1	53.6	2.4	14.9	0.5	0.07	11.28	0.10	3.5	15.5	-1.02	0.06	-0.02	0.97	3.1	0.2
204	44.6	53.6	1.2	11.7	0.4	0.13	7.37	0.10	4.1	13.1	-1.24	0.07	-0.02	0.96	3.6	0.3
204	17.7	58.0	1.6	5.6	0.1	0.03	0.00	0.10	5.4	10.7	-1.49	0.08	-0.02	0.94	4.6	0.4
204	3.4	58.3	2.9	5.1	0.3	0.03	0.00	0.10	4.9	11.8	-1.55	0.08	0.00	0.92	4.8	0.4
210	1062.2	45.9	0.0	19.2	0.3	0.01	17.34	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
210	788.3	49.9	2.9	18.4	0.3	0.01	17.52	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
210	590.8	48.5	0.6	18.7	0.5	0.01	17.28	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
210	590.8	45.6	1.6	18.6	0.3	0.01	17.28	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
210	393.9	42.6	1.1	15.6	0.2	0.02	16.78	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
210	196.4	53.3	0.2	16.0	0.4	0.03	13.74	0.00	2.2	24.3	-0.87	0.05	-0.02	0.97	2.7	0.1
210	97.3	55.4	0.6	13.6	0.2	0.04	11.35	0.10	2.1	25.9	-0.94	0.05	-0.02	0.96	3.0	0.1
210	47.8	54.4	2.0	12.6	0.3	0.11	9.75	0.10	2.6	20.9	-1.08	0.06	-0.02	0.96	3.3	0.2
210	17.8	62.9	0.2	4.2	0.2	0.01	0.00	0.10	4.1	15.4	-1.57	0.08	-0.03	0.95	5.3	0.3
210	2.2	61.2	0.8	4.6	0.1	0.02	0.00	0.10	4.5	13.7	-1.55	0.08	-0.03	0.94	5.1	0.4
115	541.4	50.0	1.0	17.0	0.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
115	541.4	50.5	0.9	17.2	0.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
115	541.4	51.2	1.0	17.4	0.6	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
108	393.8	50.7	1.0	15.8	0.2	N.D.	12.93	0.10	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
108	294.7	50.4	1.0	15.5	0.0	0.05	12.97	0.10	2.4	21.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
108	294.7	49.3	1.5	15.7	0.3	0.05	12.97	0.10	2.6	19.3	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
108	196.0	52.9	1.1	15.3	0.4	N.D.	12.62	0.10	N.D.	N.D.	-0.20	0.02	0.01	0.97	1.0	N.D.
108	97.1	56.9	1.4	11.4	0.3	N.D.	7.71	0.00	N.D.	N.D.	-1.30	0.07	-0.01	0.94	4.0	N.D.
108	47.6	60.7	1.2	10.9	0.1	0.14	6.00	0.00	4.8	12.7	-2.10	0.11	-0.04	0.93	6.6	0.5
108	18.0	64.8	2.0	5.3	0.1	0.04	0.03	0.00	5.2	12.5	-1.87	0.10	0.00	0.90	6.3	0.5
108	2.0	57.1	0.8	5.6	0.3	0.04	0.01	0.00	5.5	10.4	-2.36	0.12	-0.01	0.89	6.9	0.7
323	739.2	36.6	1.2	14.0	0.5	0.01	15.45	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
323	591.5	44.6	0.4	17.3	0.1	0.01	15.52	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
323	393.4	44.6	1.8	16.3	0.2	0.00	14.73	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

323	393.4	44.5	1.1	16.4	0.3	0.00	14.73	0.00	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
323	97.1	46.2	0.8	10.1	0.3	0.07	10.32	0.10	N.D.	N.D.	-1.44	0.03	-0.03	1.00	1.4	N.D.
323	47.9	57.6	0.6	11.1	0.5	0.10	7.85	0.10	3.1	18.8	-1.67	0.04	-0.03	0.99	2.4	0.1
323	18.1	59.6	1.1	6.7	0.2	0.02	0.82	0.10	5.8	10.3	-2.22	0.07	-0.05	0.98	4.1	0.4
323	18.1	60.4	0.7	7.1	0.1	0.02	0.82	0.10	6.2	9.8	-2.22	0.07	-0.05	0.98	4.1	0.4
323	2.1	63.9	2.0	5.8	0.2	0.00	0.00	0.10	5.7	11.3	-2.30	0.07	0.01	0.91	4.8	0.4

Table S3. Calculated DOM removal rates along specified advective pathways from PWW. PWW is defined having σ_{θ} =26.0-27.0 kg m⁻³, T=-3.0-0 °C, depth=80-200 m. Change in DOC and DON (Δ DOC, Δ DON, $\mu\text{mol kg}^{-1}$) were calculated from moving average values. Advective pathway average transit times from Tao & Myers (2022).

Advective Pathway	Transit time* (days)	ΔDOC ($\mu\text{mol kg}^{-1}$)	ΔDON ($\mu\text{mol kg}^{-1}$)	Avg. DOC loss ($\mu\text{mol kg}^{-1} \text{ day}^{-1}$)	Avg. DON loss ($\mu\text{mol kg}^{-1} \text{ day}^{-1}$)
Beaufort Shelf (546) to M'Clure Strait (518)	304 - 608	3.0	0.2	-0.01	-0.001
Amundsen Gulf (414) to (C013)	61 - 183	7.1	4.7	-0.08	-0.05
M'Clure Strait (518) to Lancaster Sound (323)	122 - 426	10.3	1.4	-0.05	-0.008
Lancaster Sound (323) to Central Baffin Bay (224)	61 - 122	5.8	0.4	-0.07	-0.004
Lancaster Sound (323) to Davis Strait (193)**	122 - 304	4.7	0.4	-0.03	-0.002

*From Tao & Myers (2022)

** Δ DON and DON loss rate calculated using moving average values excluding high DON in Davis Strait