



BACKGROUND

- ❖ Fluorescent Dissolved Organic Matter (FDOM) is the fraction of Colour Dissolved Organic Matter (CDOM) that fluoresces. CDOM is the portion of Dissolved Organic Matter that absorbs visible and UV wavelengths (Gueguen et al., 2014).
- ❖ FDOM is used as a tracer regarding its concentration and origins in aquatic waters and serves as a proxy for DOM, providing insight into organic carbon movements across the region (Gueguen et al., 2016).
- ❖ It has distinct variations in composition and concentration from individual terrestrial water bodies that can indicate the source of water (Gueguen et al., 2016).
- ❖ FDOM also has larger concentrations in rivers, compared to ocean water, allowing individual sources to be traced through the marine system (Gueguen et al., 2014).
- ❖ The Kitikmeot Sea is a unique estuarine system in the southern central section of the Canadian Arctic Archipelago (CAA) that is part of the Northwest Passage and home to communities of Cambridge Bay and Kugluktuk (Figure 1).

THE KITIKMEOT SEA

Hydrological Characteristics

- ❖ Major freshwater input from a watershed of 288,200 km², yearly snow/ice melt, and precipitation into an ocean basin encompassing 60,100 km² (Williams et al., 2025).
- ❖ Has a large impact on summer stratification and surface salinity (William et al., 2025).

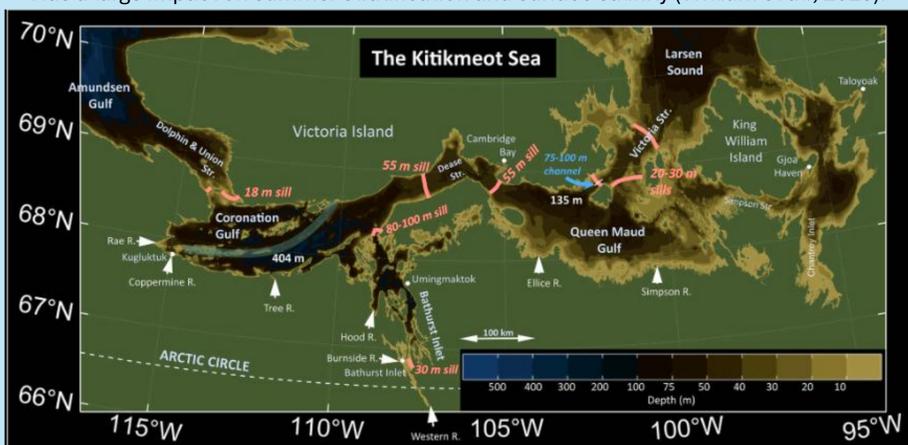


Figure 1. A Bathymetric map of the Kitikmeot Sea highlighting the shallow sills between basins and the locations of the major rivers, and a shaded blue band marking the division between the northern and southern divisions of Coronation Gulf (taken from Williams et al., 2025).

Unique Bathymetry

- ❖ A series of narrow straits (e.g. Dolphin/Union, Dease, Victoria) comprised of shallow sills 18-30m deep (Figure 1).
- ❖ Limits the exchange of water between the Kitikmeot and other Arctic basins.
- ❖ Creates an estuarine-like circulation

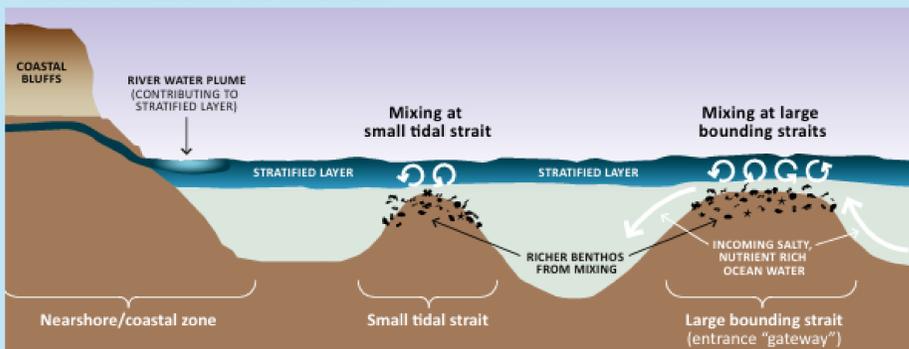


Figure 2. A simplified diagram of water circulation in the Kitikmeot (taken from Polar Knowledge Canada, 2022)

Scientific Monitoring

- ❖ The Kitikmeot Sea Science Study is an exploratory oceanographic study led by the Department of Fisheries and Oceans Canada and the University of Manitoba, with collaborators from the University of Alaska Fairbanks, the University of Tromsø, and the University of Calgary, and support from the Arctic Research Foundation, Polar Knowledge Canada, and the National Geographic Society. It has been underway since 2014.

PRELIMINARY RESULTS

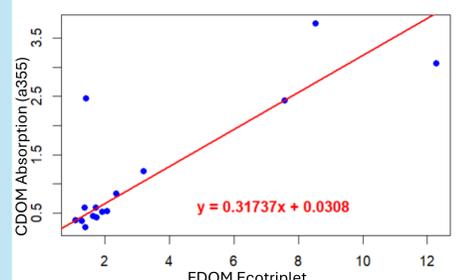


Figure 6. A Theil-Sen regression line of the correction of FDOM Ecotriplet values (x-axis) with discrete samples of CDOM absorption.

Ecotriplet correction

- ❖ Began by creating a standard moving average over 10 samples to remove negative values and show a better representation of sampled areas.
- ❖ FDOM standard moving average values were corrected to discrete samples of CDOM absorption (Figure 5). CDOM absorption is currently a placeholder and will be replaced with FDOM once provided.
- ❖ The equation of the line in the correction graph is then used to determine the new ecotriplet FDOM value with the equation $FDOM = m(ecotriplet\ measurement) + b$

Surface Plots

- ❖ The corrected variables were used to generate surface plots of the Kitikmeot Sea to understand relationships between the variables and distributions of each individual variable.

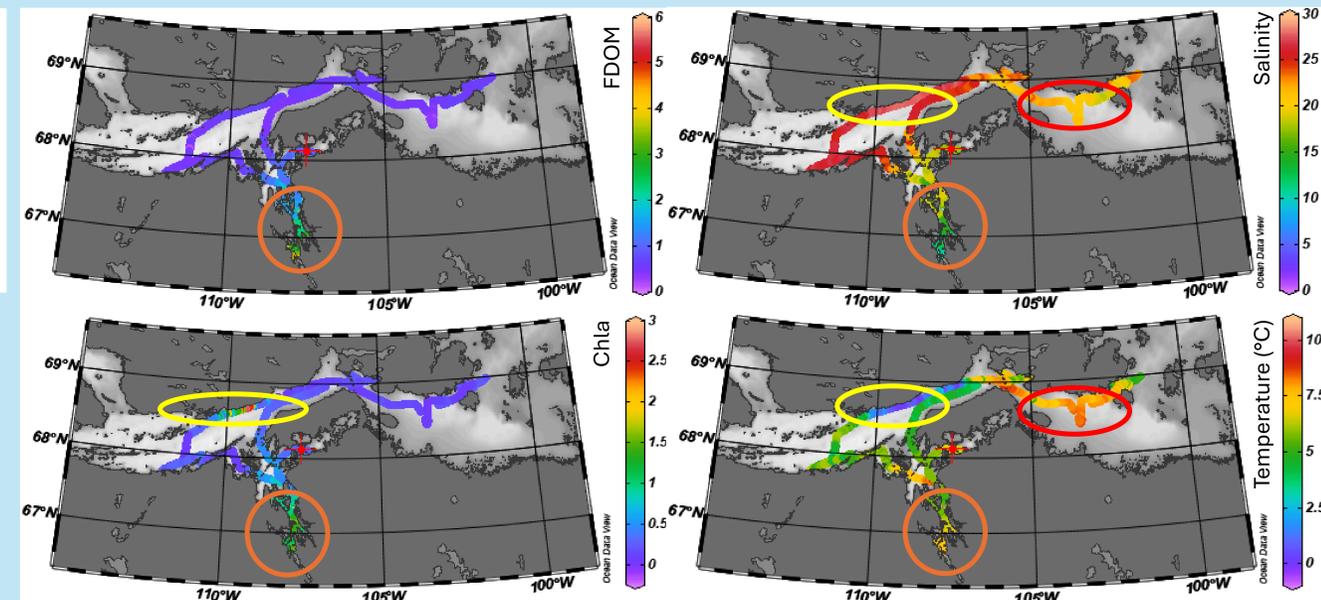


Figure 7. Surface plots of the Kitikmeot along its cruise tracks for 2019, looking at salinity (top right), FDOM (top left), temperature (bottom right), and chla (bottom left) variables.

- ❖ **Southern Bathurst Inlet:** Highest FDOM values in Kitikmeot. Chla follows FDOM patterns, with relatively lower salinity levels and temperatures ranging from 5 to 7.5°C.
- ❖ **Coronation:** High Chla, Low temperatures, and high salinity could represent upwelling and limited freshwater input.
- ❖ **Queen Maud:** Similar salinity and temperature of Southern Bathurst Inlet, but lower FDOM values (FW, but not rivers).
- ❖ FDOM-Salinity relationships show local rivers have distinct FDOM signatures, suggesting it could serve as an effective tracer of flow paths.

METHODS

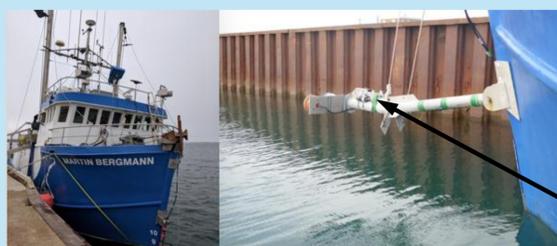


Figure 3. The R/V Martin Bergmann (left) and its forward-mounted pole (right). Photos provided by Kristina Brown.

Observation Collection

- ❖ The forward pole of the R/V Martin Bergmann collected observations 1.2m below the surface every minute.

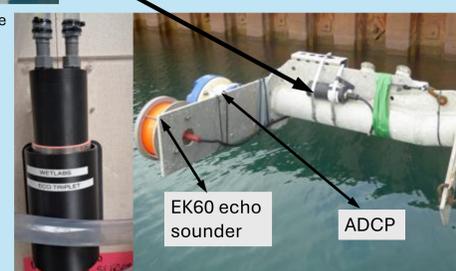


Figure 4. The Eco Triplet setup on the CCGS Sir Wilfrid Laurier (left) and on the Bergmann's forward pole, with other scientific equipment listed (right).

Discrete Samples

- ❖ Discrete samples of CDOM are collected to ground-truth the Ecotriplet observations with measured concentrations of FDOM/CDOM (Figure 6).
- ❖ Samples are taken from Rosette casts or the underway pump system along the cruise tracks.
- ❖ Discrete samples were measured with a UV spectrophotometer.



Figure 5. An Image of Nicholas Yonda (me) collecting a CDOM sample from a recently retrieved CTD/Rosette cast aboard the CCGS Sir Wilfrid Laurier.

NEXT STEPS

- ❖ Update Figure 6 with measured FDOM absorption (once available).
- ❖ Complete the same ground-truthing exercise for other years of data (e.g. 2016, 2018, 2024...)
- ❖ Look at the interannual and regional variations between 2019 and 2024 to describe temporal changes.
- ❖ Compare and contrast the available data from a chosen region of interest, including FDOM, oxygen stable isotopes, nutrients, and hydrographic parameters.
- ❖ Bring in ancillary data to provide context for FDOM distributions, including the Water Survey of Canada discharge records and Environment and Climate Change Canada weather records.
- ❖ Compare the available data with cruise datasets reported in previous academic studies.

ACKNOWLEDGEMENTS

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