Abstract
During the Arctic spring freshet, the Mackenzie River releases large amounts of dissolved and particulate carbon into the Canadian Beaufort Shelf Sea. The accompanying pulse of nutrients fuels phytoplankton blooms and together with under ice production, contributes a pulse of organic carbon. Regional carbon budgets suggest both may contribute to benthic production. We examined a sediment transect across the western Mackenzie coastal shelf in fall 2016 and the relationship of organic sources with meiofaunal diversity and abundance. Organic biomarker analysis via tandem mass spectrometry constrained the amount and types of organic sources together with total hydrolysable amino acids (THAA) as markers of organic matter lability and cycling. Lipids and amino acids were compared to meiofaunal abundance and diversity. Both organic proxies and meiofauna abundance showed enrichment at mid-shelf stations with dominant taxa seen as Foraminifera, Polychaeta, Crustacea, and Nematoda. Lipid biomarkers showed significant algal carbon remained in late fall with major contributions by both diatom and dinoflagellates. Total hydrolysable amino acids show increased breadth of structures and contributions were elevated at the mid-shelf stations. Current results suggest that mid-shelf waters receive relatively higher contributions of labile marine carbon than shallow sites along the eastern Beaufort Sea shelf and despite the large input of terrestrial organic material exiting the delta drive increased meiofauna diversity and abundance.

Study Area and Sampling
Sample were collected in early October 2016 on the MARES mooring cruise from a transect off the Canadian Mackenzie delta. A sample was also collected further offshore (AIM monitoring site) as comparison with more open ocean Arctic conditions.

Water column particles and sediments (via box core) were collected at each station for analysis of carbon, grain size, organic biomarkers and meiofaunal abundances.

In the Water column, Samples were taken at the same location for all stations. This included the chlorophyll maximum, and the bottom water right about the sediments.

All Sediments were taken using a box core in which the samples were sliced from. This research focuses on the top 1 cm of sediment.

Methods

Results

The most abundant meiofauna are not majority of the biomass
Diatom frustules were highest at the mid-shelf stations (M2 and M3)

Contribution by forams increased further offshore
Station M3 showed most diverse meiofauna. Detrital grazers as copepods, Polychaetes, and Nematodes were most common at M3.

Terrestrial biomarkers are highest at the station closest to shore (M1). Mid-shelf stations are highest in marine biomarkers and continue elevated offshore. Diatom specific markers are highest at shelf edge.

Observations and Summary (so far!)

- Organic carbon, total THAA and detrital grazers are highest at the mid-shelf stations (M2, M3)
- Sediment THAA and carbon show highly degraded (high non-protein amino acids) low carbon content materials that reflect diatom inputs (GLY, SER, THR)
- Foraminifera phyla increases across the shelf to deeper waters
- In early October (mid-fall), sedimentary organic carbon reflects significant water column production input with lowered terrestrial materials.
- Lipid and fatty acid biomarkers reflect increased algal inputs to mid-shelf sediments, the majority of which appears as diatoms with lower inputs from other phytoplankton.

References

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Table: Meiofaunal diversity and abundance

<table>
<thead>
<tr>
<th>Station</th>
<th>Meiofauna Diversity</th>
<th>Meiofauna Abundance</th>
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<tbody>
<tr>
<td>M1</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>M2</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>M3</td>
<td>Very High</td>
<td>Very High</td>
</tr>
</tbody>
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Figure: Distributions of THAA showed increases in GLY and other diatom marker amino acids in the sediment.
The low carbon content suggests that all non-protein amino acids were produced in-situ rather than an indication of degradation state in sediments.

Figure: Terrestrial biomarkers are highest at the station closest to shore (M1). Mid-shelf stations are highest in marine biomarkers and continue elevated offshore. Diatom specific markers are highest at shelf edge.

Figure: Organic carbon, total THAA and detrital grazers are highest at the mid-shelf stations (M2, M3).

Figure: Sediment THAA and carbon show highly degraded (high non-protein amino acids) low carbon content materials that reflect diatom inputs (GLY, SER, THR).

Figure: Foraminifera phyla increases across the shelf to deeper waters.

Figure: In early October (mid-fall), sedimentary organic carbon reflects significant water column production input with lowered terrestrial materials.

Figure: Lipid and fatty acid biomarkers reflect increased algal inputs to mid-shelf sediments, the majority of which appears as diatoms with lower inputs from other phytoplankton.