OCEAN SCIENCES MEETING | 16–21 FEBRUARY 2020 SAN DIEGO, CA, USA

HE21A-07 - Glacial Discharge and its Impact on Phytoplankton Taxonomic Composition in an Antarctic Fjord

Tuesday, 18 February 2020
09:30 - 09:45
SDCC - 1B, UL

Abstract

The influence of glacial discharge on phytoplankton community composition remains an open question. The Antarctic Peninsula fjords offer an ideal system to understand the effect of ice-ocean forcing on phytoplankton community, providing an extreme in the spatial gradient from the glacio-marine boundary to the Western Antarctic Peninsula (WAP) continental shelf. In Andvord Bay, we found that glacial meltwater input altered surface salinity and was enriched in dissolved iron and nitrate, supporting phytoplankton biomass. The three major groups of phytoplankton fueled by glacial input were: cryptophytes, diatoms, and a group of unidentified small flagellates. In December, cryptophytes dominated the phytoplankton community and were correlated with relatively warmer temperatures in the surface layer; in addition, contrary to our hypothesis, no diatom bloom was observed in the fjord in spite of dissolved iron concentration >1 nM. By April, after the growth season, the overall phytoplankton abundance had decreased by an order of magnitude. Phytoplankton, in particular diatoms, were then limited by daytime length despite abundant macro-nutrient and iron concentrations. Mixed flagellates emerged as the dominant group during April due to the decline of other major taxa. Deep-learning algorithms for predicting the abundance of each major phytoplankton group captured the effects of these environmental factors on the phytoplankton community. Our results show that the fjord, under the influence of glacial meltwater, has relatively high phytoplankton biomass combined with high macro- and trace nutrient concentrations when compared to other WAP regions influenced by sea ice melting. Based on this study, we confirm that flagellates can be the dominant taxon in Antarctic fjords and we propose that iron concentration alone is insufficient to predict diatom growth. Furthermore, buoyant meltwater plumes can enrich the fjord with nitrate even if the main circulation is not driven by glacier meltwater discharge. As glacial meltwater continues to alter the phytoplankton taxonomic composition, it will have an important implication for higher trophic levels and add significant uncertainties to the prediction of regional ecosystem dynamics and biogeochemistry.

Authors

B. Jack Pan
Scripps Institution of Oceanography

Maria Vernet
Scripps Institution of Oceanography

Lauren Manck
Scripps Institution of Oceanography

Kiefer Forsch
Scripps Institution of Oceanography

Lindsey Ekern
Scripps Institution of Oceanography

Martina Mascioni
Universidad Nacional de La Plata

Similar

A Box Model of Estuarine Amplification Within a Glacial Fjord

Theresa Morrison[1], *Frank Bryan*[2], *Gustavo M Marques*[3] *and Julie McClean*[1], *(1)Scripps Institution of Oceanography, La Jolla, CA, United States, (2)National Center for Atmospheric Research, Boulder, CO, United States, (3)National Center for Atmospheric Research, Climate and Global Dynamics, Boulder, CO, United States*

New Phytoplankton Communities Revealed in Coastal Antarctica Using a Citizen Science Approach

Allison Cusick, *Scripps Institution of Oceanography, La Jolla, CA, United States, Martina Mascioni, Universidad Nacional de La Plata, Argentina, Gastón O. Almandoz, Universidad Nacional de La Plata, La Plata, Argentina and Maria Vernet, Scripps Institution of Oceanography, Integrative Oceanography Division, La Jolla, CA, United States*

From ice to ocean: Tracking the composition, fate, and impact of submarine glacial discharge in the nearshore coastal ocean in the Canadian Arctic Archipelago

Patrick Williams[1], *Megan Roberts*[2], *Charvanaa Dhoonmoon*[1], *David Burgess*[3], *Erin Marie Bertrand*[2], *Stephanie Waterman*[4] *and Maya Bhatia*[1], *(1)University of Alberta, Department of Earth and Atmospheric Sciences, Edmonton, AB, Canada, (2)Dalhousie University, Department of Biology, Halifax, NS, Canada, (3)Natural Resources Canada, Geological Survey of Canada, Ottawa, ON, Canada, (4)University of British Columbia, Department of Earth, Ocean and Atmospheric Sciences, Vancouver, BC, Canada*

Geometric and Atmospheric Controls on Warm Water Access to Glacial Fjords

Ken Zhao, *Andrew Stewart and James C McWilliams, University of California Los Angeles, Atmospheric and Oceanic Sciences, Los Angeles, CA, United States*

How do light and iron affect phytoplankton populations in the western Antarctic Peninsula?

Hannah Joy-Warren[1], *Anne-Carlijn Alderkamp*[2], *Evan Baldonado*[3], *Molly Glickman*[3], *Gert van Dijken*[1], *Kate M Lewis*[1], *Kate E Lowry*[1], *Willem van de Poll*[4] *and Kevin R Arrigo*[1], *(1)Stanford University, Earth System Science, Stanford, CA, United States, (2)Foothill College, Department of Biology, Los Altos Hills, CA, United States, (3)Stanford University, Stanford, CA, United States, (4)University of Groningen, Groningen, Netherlands*