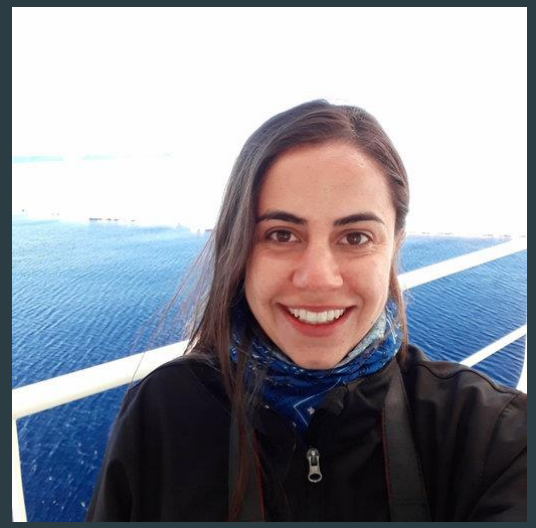
Phytoplankton's role in the biological pump during the growth season across the Atlantic Southern Ocean

By Dr. Raquel Flynn

UCT Oceanography Department



UCT-SANCOR Webinar

- Date: Monday, 31 July 2023
- Time: 13h00 SAST
- RSVP here by 28 July to receive the online link.

About the speaker

Raquel Flynn just completed her PhD in Ocean and Atmospheric Science at the University of Cape Town. Raquel has been in the Oceanography Department since 2016 in Dr. Sarah Fawcett's lab. During her graduate career, Raquel's research focused on the role of physical and chemical drivers in controlling phytoplankton community dynamics in order to understand the role of these drivers on the biological carbon pump. In July 2023, Raquel will begin her postdoctoral fellowship at the University of North Carolina at Chapel Hill with Dr. Adrian Marchetti where she will use the knowledge gained during her graduate career coupled with metatranscriptomics to investigate the role of small eukaryotes on carbon export.

Overview

Southern Ocean phytoplankton growth is seasonally co-limited by light and iron availability. In winter, iron and macronutrients such as nitrate are supplied to surface waters during deep mixing events. Sea-ice melt and increased solar radiation in spring drive rapid stratification of surface waters, alleviating phytoplankton from light limitation and allowing them to consume the nutrients supplied in winter.

In contrast to previous suggestions, although summer is the period of maximum biomass accumulation in the Southern Ocean, it may not be the season of highest carbon export. This finding can be explained by the increasing reliance of phytoplankton on regenerated nitrogen sources as the season progresses. In ice-adjacent waters, this shift is largely due to elevated ammonium availability rather than iron limitation, which may (partially) inhibit nitrate uptake. By contrast, in the open Southern Ocean, iron limitation drives the seasonal shift towards regenerated production because of the high iron requirement of nitrate uptake. In addition, we show that different phytoplankton groups are better adapted to different physicochemical conditions (e.g., *Phaeocystis antarctica* to deep mixed-layers versus diatoms to recently-stratified waters), with the dominance of one group over another acting to strengthen or weaken the Southern Ocean's biological pump. Understanding the drivers of phytoplankton community composition is essential if we are to predict how phytoplankton will respond to a changing climate, and the implications of their response for the Southern Ocean's biological pump.