

Future North Atlantic nutrient supply at risk?

Southern Ocean nutrient, carbon and oxygen supply in the Pliocene warm world; consequences for primary productivity and carbon sink efficiency

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Background and motivation

My previous PhD and PostDoc paleoceanographic research at Utrecht University, the Netherlands, showed fundamentally different Southern Ocean surface ocean conditions and Antarctic ice-volume during past periods of high CO₂-concentrations. As a UiB SEAS fellow I will study the Southern Ocean and North Atlantic interconnectivity and the consequences for carbon and nutrient cycling in a warm world. I wish to collaborate with the multidisciplinary Bergen research institutes and industries with their great North Atlantic knowledge and draw more attention to the rapidly changing Southern Ocean.

Project description

Marine nutrient supply, oxygen ventilation and the Atlantic meridional overturning circulation (AMOC) is projected to slow down under future warming, with devastating consequences of primary productivity, marine food webs and CO₂ uptake. Models have shown that a decrease in the Southern Ocean export of nutrients to the North Atlantic can lead to a potential 60% decrease in North Atlantic fishery yields and a 41% decrease in carbon export. The Pliocene (5.3–2.6 Ma) is the most suitable recent analog to a future warm climate. I will study benthic foraminifera (stable isotope) in Pliocene marine sediment deposits to reconstruct Southern Ocean and North Atlantic structure, nutrient and oxygen availability and primary productivity in comparison with available multiproxy data and model simulations to elucidate the interactions between climate, oceanographic and biological processes.

Main questions

- The Pliocene Southern Ocean circulation and preformed nutrient, carbon and oxygen export to the global thermocline.
- The stability of ocean ventilation in a warmer world.

Aims (and/or milestones)

- Local and international collaborations (IODP LEAP) and research visits (e.g. Lamont, US).
- Plan and execute science cruise to the Southern Ocean.

Marine sustainability

I aim to improve our understanding of the Southern Ocean role in the climate system and marine productivity, inspire action, and mobilize diverse policymakers/stakeholders to work collectively towards a more sustainable Ocean.

Highlighted results (and/or activities)

Since I started the SEAS program this week, I don't have any results yet.

I sailed as a biostratigrapher on the famous International Ocean Discovery Program (IODP) drilling ship JOIDES resolution to the Southern Oceans Iceberg Alley in 2019. Marine sediment cores retrieved on this expedition will be part of my study material.

Supervisory team

Ulysses S. Ninnemann, UiB Earth Science
Are Olsen, UiB Geophysical Institute
Jerry Tjiputra, NORCE



SCAN ME



SEAS

