

PROGRAM SCHEDULE

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FIELD-BASED NITRATE ASSIMILATION ISOTOPE EFFECT ESTIMATES FROM THE ATLANTIC SECTOR OF THE SOUTHERN OCEAN

Category

Scientific Session > CT - Chemical Tracers, Organic Matter and Trace Elements > CT05 The Marine Nitrogen Cycle

Presentation Preference: Oral

Student or Profesional? I am a Student

Presenter: Rachel Thomas (Florida Statue University)

Description:

In regions of the surface ocean with significant concentrations of unconsumed nitrate (NO_3^-), such as the Southern Ocean, phytoplankton preferentially assimilate the ^{14}N -bearing form of NO_3^- during NO_3^- assimilation. This discrimination against the heavier, ^{15}N -bearing form of NO_3^- is quantified by the NO_3^- assimilation isotope effect ($^{15}\epsilon$). While a $^{15}\epsilon$ of 5 per mil is commonly assumed for phytoplankton NO_3^- assimilation, previous field-based observations of the $^{15}\epsilon$ have ranged from 4 to 11 per mil, and even wider variations in $^{15}\epsilon$ have been

observed in culture studies that have subjected phytoplankton to iron and/or light stress. In spite of this prior work, we lack a mechanistic explanation for variations in $\delta^{15}\text{N}$, yet this information is required for interpreting modern water column NO_3^- $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ measurements as well as paleoceanographic $\delta^{15}\text{N}$ records. Here we report $\delta^{15}\text{N}$ estimates from springtime water column NO_3^- isotope profiles collected across four major zones (Subantarctic, Polar Frontal, Antarctic, and Marginal Ice Zones) in the Atlantic sector of the Southern Ocean on the SCALE cruise (Southern Ocean Seasonal Experiment; Oct.-Nov. 2019). Consistent with prior austral summer observations, we generally find higher values of $\delta^{15}\text{N}$ in the Subantarctic compared to the Antarctic; however, variations exist within each zone. These data are interpreted in the context of seasonal mixing (closed vs. open system models), phytoplankton community composition, and physiological markers of iron and light stress.

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