

SESSION – OCEAN 1-SEA ICE

MARS Themes:

Earth systems observations

Title:

Winter biogeochemical activity is enhanced by rafting in growing Antarctic sea ice

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Abstract:

The study of Antarctic first-year sea-ice biogeochemistry has been limited by samples mostly being collected in pack ice during summer, with few winter data available. Measurements from the Antarctic marginal ice zone (AMIZ) have proven even more difficult to obtain. The AMIZ is a broad, circumpolar feature of the Southern Ocean found at different latitudes during the year where light and nutrients are high enough to sustain primary production and influence ecosystem functioning. We present the first biogeochemical dataset from growing ice collected in the AMIZ during winter 2019. Measurements of sea-ice physical and biogeochemical properties were used to investigate the winter sea-ice habitat and decipher the conditions under which the ice formed and grew. Model simulations support the hypothesis that nutrient accumulation in advancing sea ice cannot be explained by passive seawater entrainment and thermodynamics alone. Our data confirm that winter sea ice is biogeochemically active by accumulating remineralized nutrients, and further propose that rafting processes enhances the reservoir of concentrated nutrients during sea ice growth. The biogeochemical transition from YI to FYI does not appear to be a linear progression of thickness with habitat space reduction as sea ice consolidates. Instead, FYI bulk biogeochemistry results from multiple cycles of rafting of YI, which conserves the biogeochemical properties of YI in the FYI, ultimately increasing the overall content.

Format:

Poster

Keywords: (add ; between keywords)

Antarctica; Sea Ice; Antarctic Marginal Ice Zone; Biogeochemistry; Numerical Modelling