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Free amino acids as potential markers of oceanic primary production for paleoclimatic studies

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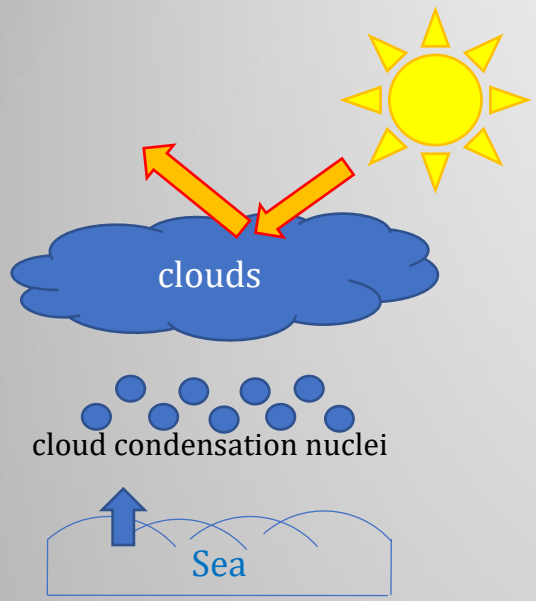
Free amino acids in the atmosphere



Free amino acids are an active component of the organic nitrogen in aerosols

Some amino acids have been shown to enhance the ice nucleating ability of atmospheric particles or to act as CCN.

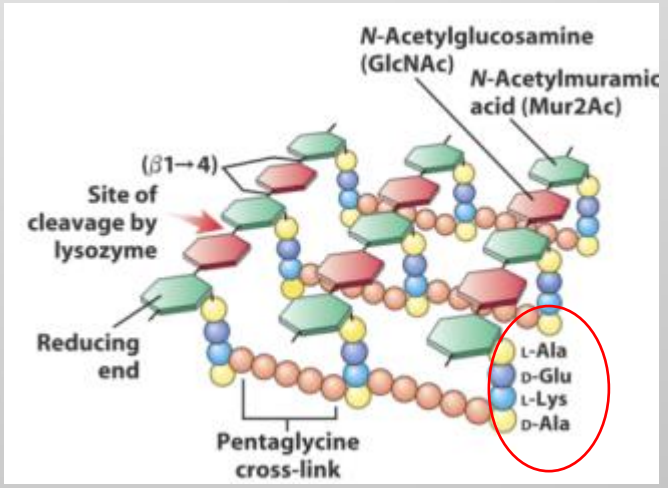
These compounds can also serve as a source of nutrients for marine ecosystems due to their high bioavailability.

Some studies [1-4] have confirmed the presence of amino acids in the condensed phase of aerosols, in rainwater, in fog, and in dew water.

1. Zhang, Q.; et al. 2003 . *Atmospheric Environment 37, 2247-2258 ; 2.* Mace, K. A.; et al. 2003. *Journal of Geophysical Research-Atmospheres , 108 (D11);*
3. Mace, K. A. et al. 2003. *Journal of Geophysical Research-Atmospheres , 108 (D16):; 4.* Scheller, E., 2001. *Atmospheric Environment , 35, 2179*-2192.

L-amino acids may result from planktonic particles that concentrate at the sea surface

The presence of free D-isomers is indicative of a larger proportion of bacteria in aerosols



Sources:
- sea surface
- volcanic emission
- biomass burning
- anthropogenic activities
- plants
- soils
- desert dust

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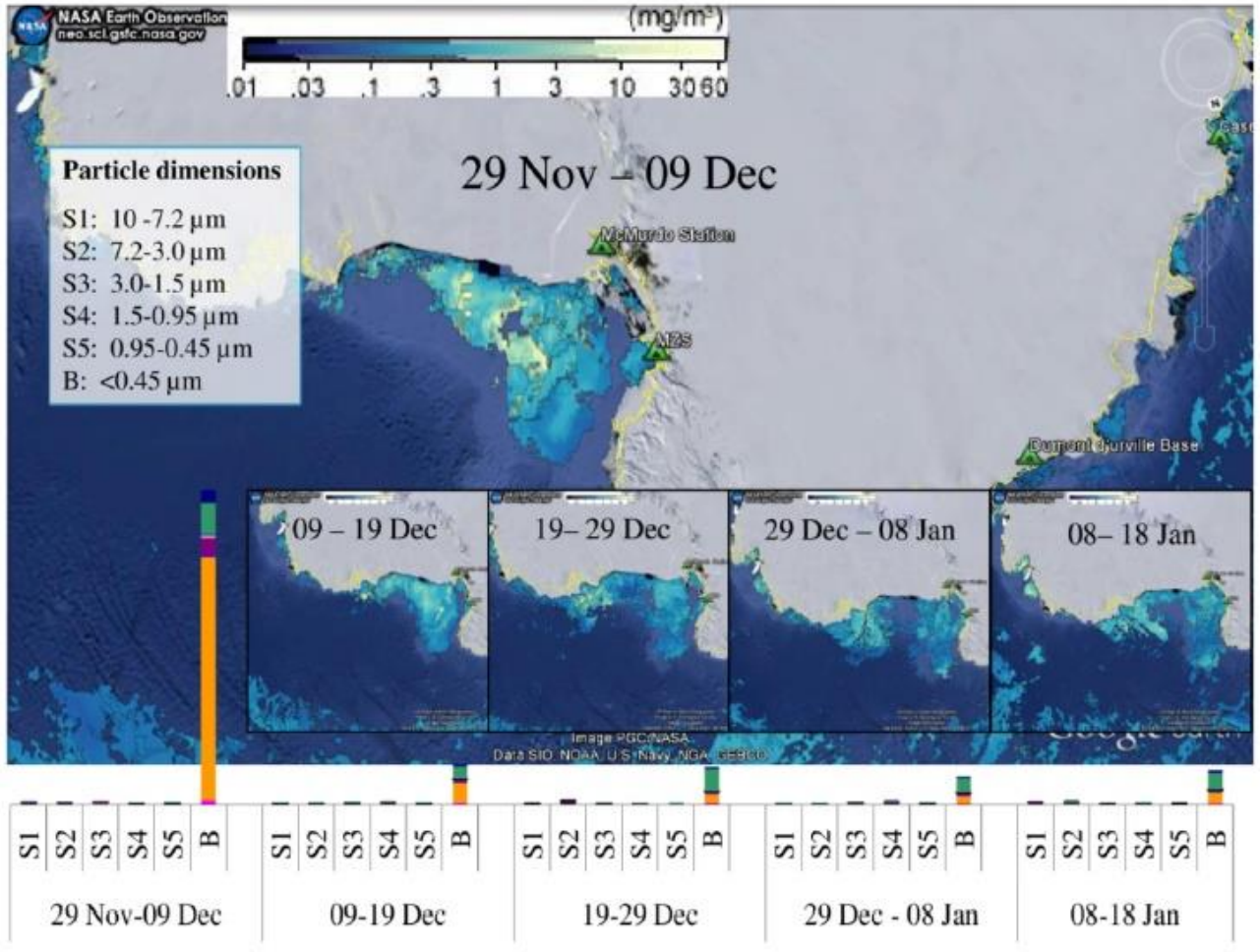
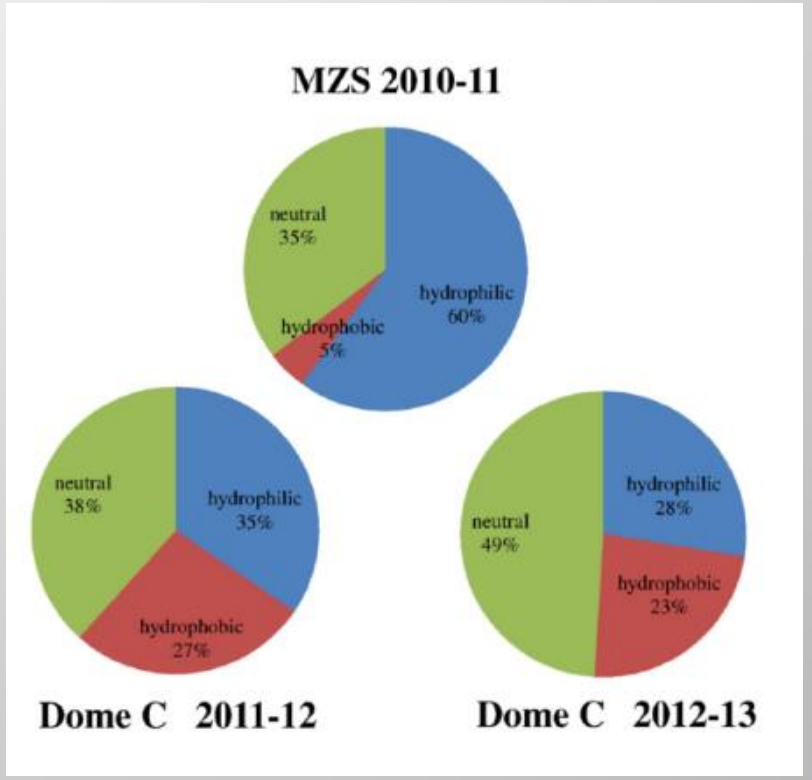
Free amino acids in Antarctic aerosol: potential markers for the evolution and fate of marine aerosol

- The presence of only free L-amino acids in our samples is indicative of the prevalence of phytoplanktonic material.
- The amino acid composition and size distribution in the aerosol collected at DC had also changed compared to MZS, suggesting that chemical and physical transformations had occurred during LRAT

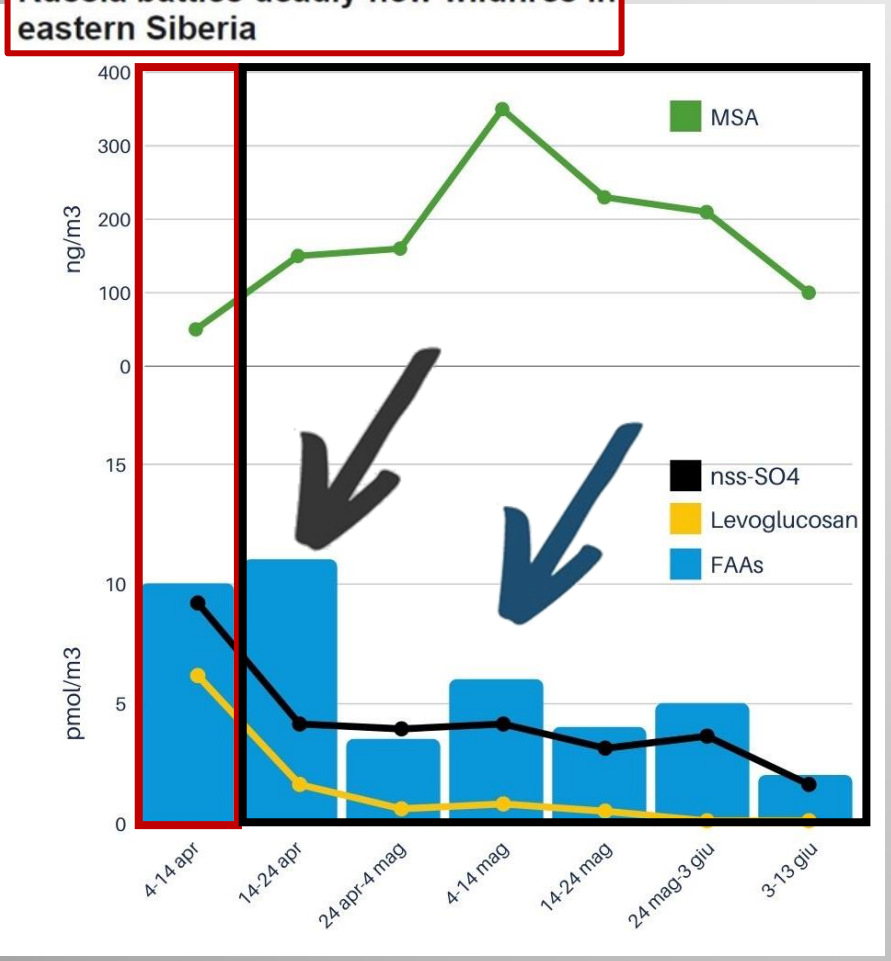


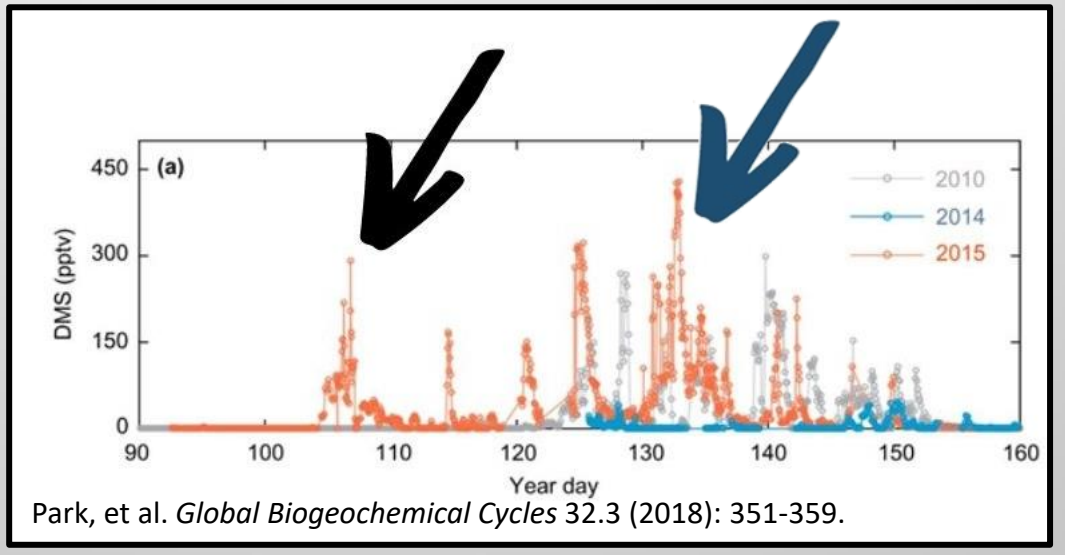


Barbaro et al. *ACP* 15.10 (2015).

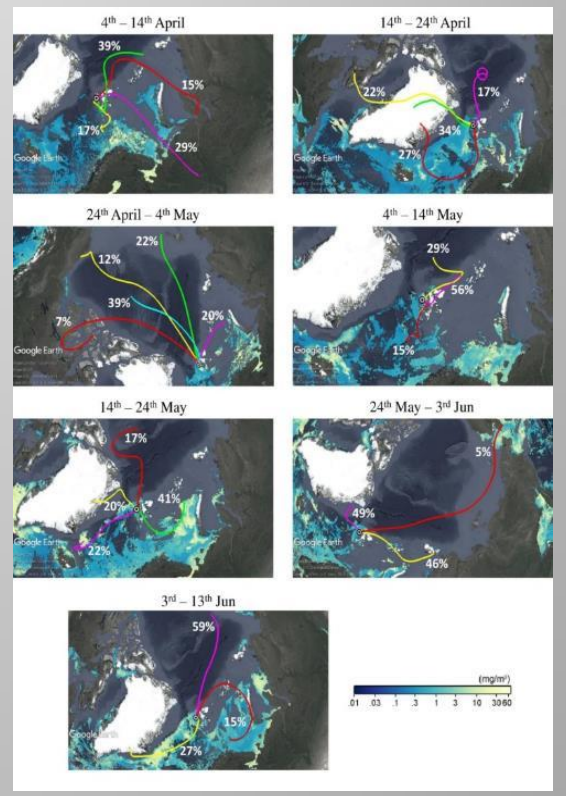
Free amino acids in Arctic aerosol: 2015 sampling campaign

The elevated load of FAAs in this period may originate from phytoplanktonic/bacterial rich sea spray, in this period, the BT changed direction towards the Greenland Sea and coincided with a large decrease in levoglucosan. MSA concentration increased from 60.9 to 154.0 pmol m^{-3} between the first and second sample.



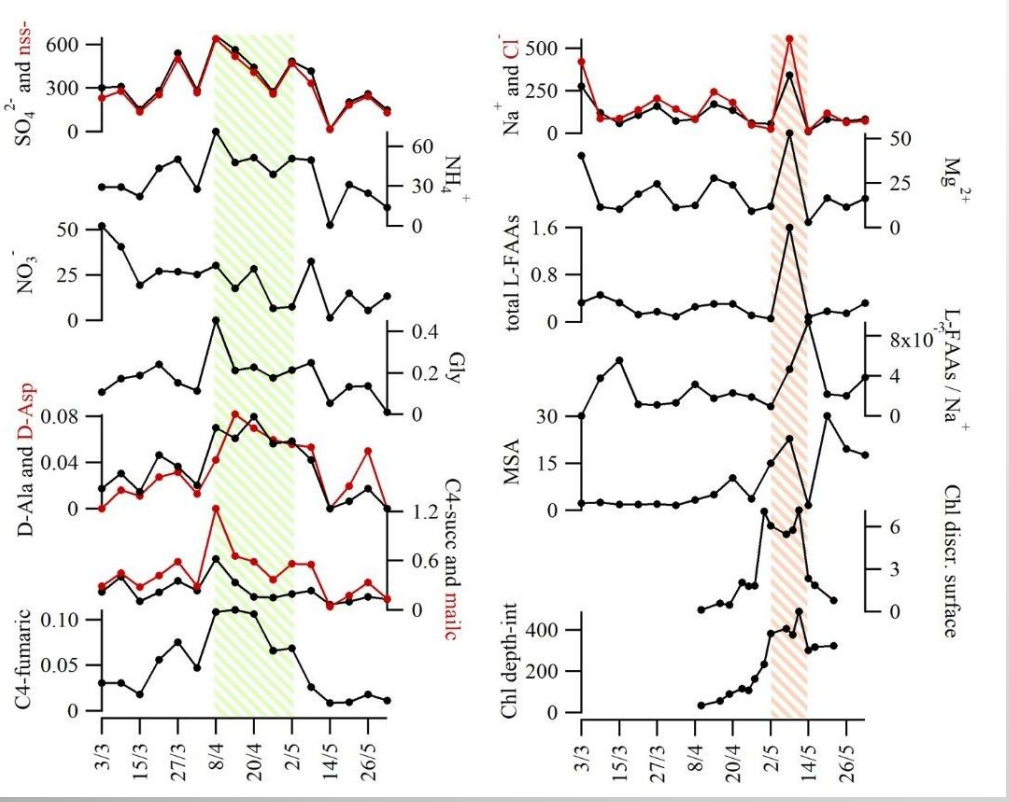


Park, et al. *Global Biogeochemical Cycles* 32.3 (2018): 351-359.



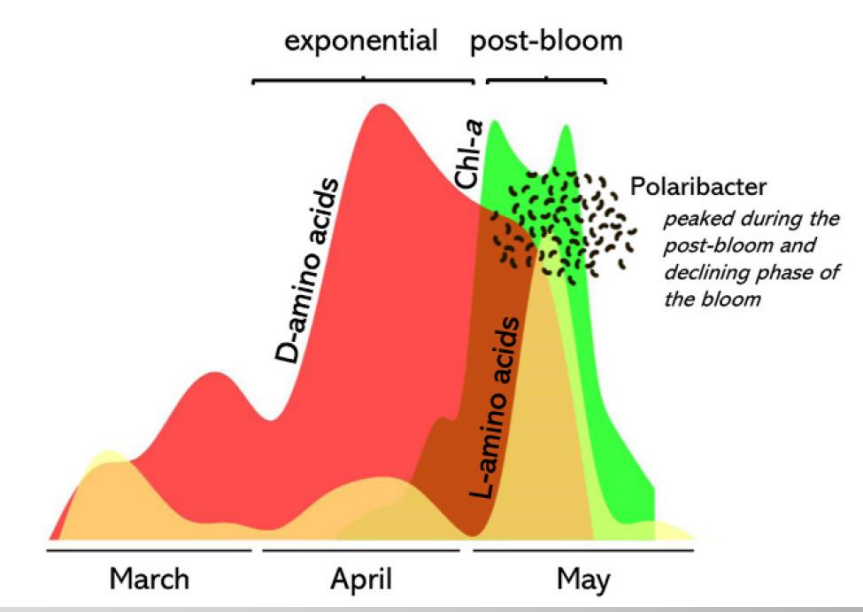
Feltracco et al. *Chemosphere* 220 (2019): 412-421.

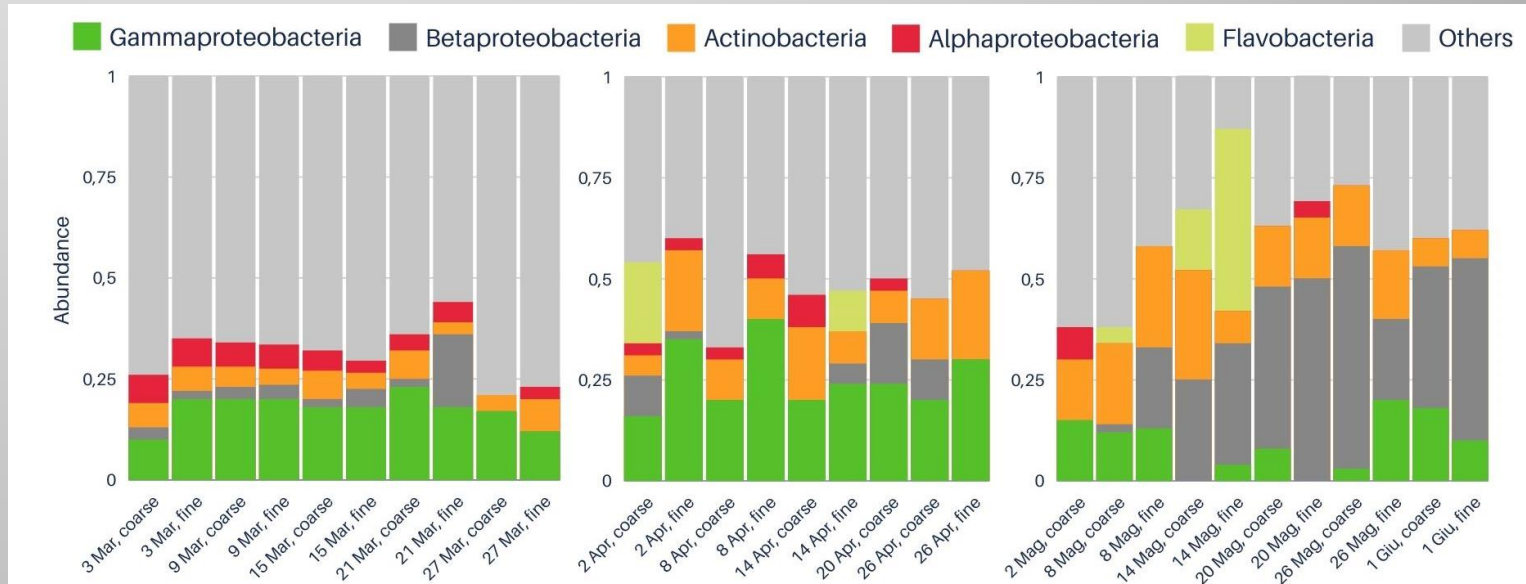
Airborne bacteria and particulate chemistry capture Phytoplankton bloom dynamics in an Arctic fjord



Feltracco, et al. *Atmospheric Environment* 256 (2021): 118458.

- Glycine, D-amino acids and C4-organic acids increased during the exponential phase of a marine bloom that occurred in Kongsfjorden and started to drop at the beginning of the main-bloom phase.
- Polaribacter together with free L-amino acids overlapped with the Chlorophyll a peak and the subsequent decline, and thus might constitute a useful marker for the main-bloom phase.





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Free amino acids in the Arctic snow and ice core samples

The main results of this work are summarized as follows:

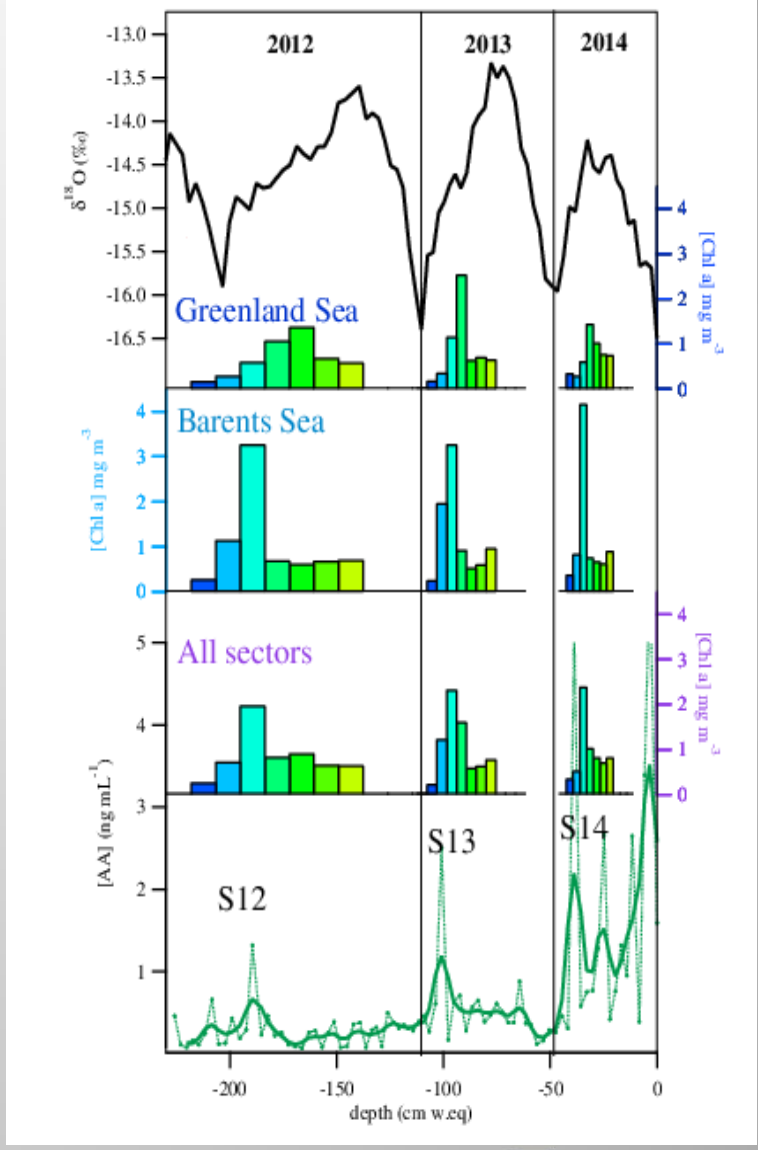
(1) glycine, alanine and proline, were detected and quantified in the firn core samples;

(2) their concentration profiles, compared with that of the stable isotope δ18O ratio, show a seasonal cycling with the highest concentrations during the spring and summer time;

(3) back-trajectories and Greenland Sea chlorophyll-a concentrations obtained by satellite measurements were compared with the amino acids profile obtained from ice core samples, this provided further insights into the present results.

This study suggests that the amino acid concentrations in the ice samples collected from the Holtedahlfonna glaciers could reflect changes in oceanic phytoplankton abundance.

Barbaro et al. STOTEN 607 (2017): 454-462.



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THANKS FOR YOUR ATTENTION

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