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Paleo Arctic sea ice evolution during DO events 7 to 10: a multidisciplinary approach.

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In the last four decades, Arctic sea ice is experiencing an overall decrease with a notably faster rate than projected by numerical models. Despite a huge amount of observations has been acquired since the advent of satellite era (1979) there are very few information about past sea ice. Thus, in order to enhance future scenarios predictions, the record of past sea ice conditions represents a crucial information. In particular, a focus on the mechanisms controlling sea ice dynamics during abrupt temperature shifts is essential to improve climate models and better reproduce current changes.
Several studies (Spolaor et al. (2013); (2016)) link bromine in ice cores as potential proxy of past sea ice conditions. In particular, at polar latitudes the photochemical recycling of bromine is extremely efficient over first year sea ice (FYSI), resulting in enhanced concentrations of gas phase bromine (e.g. BrO) compared to the ocean surface, multi-year sea ice or snow-covered land. The net effect of this process (referred as "Bromine explosion") can be detected in snow and ice samples as enrichment in bromine (Br_enr) compared to the seawater Br/Na ratio. The Bromine enrichment record of the NEEM core has been linked to sea ice conditions in the Canadian Arctic (Spolaor et al., 2016). It lacks, however, the time resolution needed to resolve D-O events.
Here we present a new high resolution (multi-annual) measurements across the transitions of D-O 7, 8, 9 and 10 (34-41 kyr) for Br_enr from NEEM core samples. The increased resolution (2-3 cm for each sample) might allow to better distinguish the amplitude of each transition, while the comparison with stable oxygen isotopes will provide information about the time lag between atmospheric warming and sea ice response. In conclusion, pursuing a multidisciplinary approach, the experimental results will be used to constrain a chemical-transport numerical model for Br_enr that will help to deepen the insight about sea ice extent variations during rapid climate fluctuations.