# Continuous carbon monoxide measurements along the NEEM-2011-S1 ice core: *In situ*-production and potential for atmospheric reconstruction

X. FAÏN[1*], J. CHAPPELLAZ[1], R. H. RHODES[2], C. STOWASSER[3], T. BLUNIER[3], J. R. MCCONNELL[4], E. J. BROOK[2], M. LEGRAND[1], T. DEBOIS[5] AND D. ROMANINI[5]

[1]UJF - Grenoble 1 / CNRS, LGGE-UMR 5183, Grenoble, F-38041, France ([*]correspondence : fain@lgge.obs.ujf-grenoble.fr)
[2]College of Earth, Ocean and Atmospheric Sciences, Oregon State University, Corvallis OR, USA
[3]Center for Ice and Climate, Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark
[4]Division of Hydrologic Sciences, Desert Research Institute, Reno NV, USA
[5]UJF - Grenoble 1 / CNRS, LIPhy-UMR 5588, Grenoble, F-38041, France

We present results of a 4-week laboratory-based campaign to measure CO mixing ratios in the North Greenland Eemian (NEEM) S1 ice core (410 m long) using an OF-CEAS spectrometer (Optical Feedback-Cavity Enhanced Absorption Spectrometry) coupled to a continuous melter system. This analytical setup generates highly precise (0.3 ppbv 1 sigma) and stable measurements of CO mixing ratios. The NEEM-2011-S1 CO record spans 1800 yr and exhibits highly variable concentrations at the scale of annual layers, ranging from 75 to 1327 ppbv. Although the most recent section of this record (i.e., since 1700 AD) agrees with existing discrete CO measurements from the Eurocore ice core and the deep NEEM firn, it is difficult to interpret in terms of atmospheric CO variation due to high frequency, high amplitudes spikes features. 68% of the elevated CO spikes are observed in ice layers enriched with pyrogenic aerosols. Such aerosols, originating from boreal biomass burning emissions, contain organic compounds, which can be oxidized or photodissociated to produce CO in-situ. We suggest that elevated CO concentration features could present a new integrative proxy for past biomass burning history. However, the NEEM-2011-S1 record also reveals an increase in baseline CO level prior to 1700 AD (129 m depth), with the mixing ratio remaining high even for ice layers depleted in dissolved organic carbon (DOC). Overall, the processes driving in-situ production of CO within the NEEM ice are complex and may involve multiple chemical, or biological, pathways.

# High sulfur isotopic fractionations in a low-sulfate environment

MARIANELA FALLAS DOTTI* AND DONALD E. CANFIELD

Nordic Center for Earth Evolution (NordCEE) and Institute of Biology, University of Southern Denmark, 5230 Odense M, Denmark (*corr: nela@biology.sdu.dk)

Meromictic Lake Cadagno in Switzerland is an euxinic environment which draws scientific attention because it can be used as a proxy of early oceans. Two sites in the lake have been chosen to study the sedimentary isotopic geochemistry of sulfur. Site 1 is located in the oxic part of the lake with low sulfate concentrations (~0.5 mM). Site 2 is euxinic and it has higher sulfate concentrations than site 1 (~2mM). We explored isotopic fractionation between sulfate and sulfides and evaluated the role that disproportionation could play in these two types of environment. Canfield *et al* 2010[1] have already reported very high fractionations during sulfate reduction in the water column at site 2. However, they did not attribute these results to disproportionation. We show here higher fractionations in the sediments of site 1 than in those of site 2. The low sulfate concentrations at site 1 make it unrealistic to attribute these high fractionations to sulfate reduction alone. Thus, disproportionation seems to influence the distribution of the $\delta^{34}S$ signals in this site.

[1] Canfield *et al*, 2010. *Geology* **38**, 415-418.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.6