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First results of Methane and Nitrous Oxide Isotope Ratios measurements on NEEM firn air

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Methane (CH4) and nitrous oxide (N2O) are two major greenhouse gases. In order to predict their future concentrations, their present budgets (sources and sinks) and past variations need to be understood.

Nitrous oxide plays a significant role in the tropospheric greenhouse effect and is also involved in the stratospheric chemistry, regulating the ozone layer. Despite great research effort, significant uncertainties in the quantification of sources and sinks remain. Therefore measuring its stable isotope ratios in the past will help to better understand its global budget.

Concerning methane, it is well known that its atmospheric concentration increased by about 150% since 1750, but many physical and chemical processes leading to methane emission are not well understood yet. Recent data have revealed surprising variations in the stable isotope signatures (13C(CH4)) over the past millennium. Therefore further research, notably D(CH4) measurements of firn air and air trapped in ice core over the last 1000 years are essential.

High precisions measurements of stable isotope ratios of trace gases remain a difficult task, therefore only little is known about stable isotope ratios of such gases nowadays.

We aim to present our innovative high precision stable isotope data (D, 13C, 15N and 18O) for both CH4 and N2O on the “North Greenland Eemian Ice Drilling” (NEEM). Firn air was sampled in 2008 on NEEM site and enables to obtain atmospheric concentrations and isotopes ratios data for the last decades.