Geophysical Research Abstracts
Vol. 13, EGU2011-13781, 2011
EGU General Assembly 2011

Understanding the CH4 and N2O budget over the last 50 years with stable isotope measurement of firn air

Celia Sapart (1), Patricia Martinerie (2), Thomas Röckmann (1), and the NEEM firn air collaborators Team

(1) Institute of Marine and Atmospheric Research, Utrecht University, Princetonplein 5, 3584CC Utrecht, THE NETHERLANDS, (2) Institute of Marine and Atmospheric Research, Utrecht University, Princetonplein 5, 3584CC Utrecht, THE NETHERLANDS, (3) Earth and Environmental Systems Institute, Geoscience, 237 Deike Building, Penn State University, University Park, PA 16802, USA., (4) Center for Ice and Climate, Niels Bohr Institute, University of Copenhagen, Juliane Maries Vej 30, 2100 Copenhagen, DENMARK., (5) Physics Institute, University of Berne, Sidlerstr.5, 3012 Bern, Switzerland

Methane (CH4) is the second most important anthropogenic greenhouse gas. Its concentration in the atmosphere has increased by about 150% since 1750, but many physical and chemical processes leading to methane emission are not well understood yet. In order to reliably predict its future concentrations, its present budget (sources and sinks) and past variations are being examined with various techniques.
A useful tool to detect changes of sources/sinks of trace gases is the analysis of their stable isotope ratios. For CH4, isotope data have recently elucidated the origin of the observed variations on millennial timescales. For N2O, only a very limited amount of data has been published.
Information about the more recent past can be obtained from measurements on polar firn air. Firn is the porous and permeable surface layer of polar ice sheets. This layer becomes gradually impermeable with depth, but the air enclosed is still partially mixed with the atmosphere till the close-off depth at 50 to 100 m. Due to the gradual close-off of the air bubbles and the fact that the porosity decreases with depth, several corrections using firn transport modeling need to be applied to interpret firn air data.
We will present a new high precision concentration and stable isotope dataset for methane and nitrous oxide of firn air from the “North Greenland Eemian Ice Drilling program” (NEEM) and firn model data on several Arctic and Antarctic sites.