

NEEM continuous methane data obtained during the 2010 field season.

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Details about the site, the data acquisition, and corrections can be found in the publication.

Three instruments for measurements of methane mixing ratios were installed in series downstream of the CFA (Continuous Flow Analysis) gas extraction system: a prototype laser spectrometer using optical-feedback cavity-enhanced absorption spectroscopy (OF-CEAS; SARA instrument, LIPhy, Grenoble, France), a WS-CRDS (Picarro Inc., CFADS36 analyser) and a GC.

We provide here the data from the two laser spectrometers. Due to the nature of the measurements (details in the publication) the data is not entirely continuous. Continuous measurement sections are divided by Rows showing NaN. Also the two raw laser spectroscopic CH₄ data sets differ from each other on an absolute scale, and are in general lower than discrete measurements on parallel ice sticks. It mostly reflects the larger solubility coefficient of methane versus nitrogen and oxygen in water. We provide both the raw and corrected data.

The OF-CEAS instrument – and to a lesser extent the WS-CRDS, which sees a smoother signal – registered periodic CH₄ changes at a typical scale of 10–15 cm, with an amplitude of 1 to 5 ppbv. In some extreme and rare cases, the peak amplitude could reach 20 ppbv. These changes are not due to the instrument, and do not reflect real structures in the ice core record. Instead they may result from changes in the permeation conditions during on-line gas extraction. Unfortunately we could not define an exact way to correct for these periodic changes using, for example, the pressure or the flow rate measurements. To avoid over-interpretation of the record, we therefore smoothed out the periodic changes by averaging each laser spectrometer data set in the depth domain on 20 cm increments. We thus warn future users of these datasets not to over-interpret changes in the raw data on depth scales smaller than 20 cm.

Time scale:

The data is on the official NEEM gas time scale published in: Rasmussen, S.O., Abbott, P.M., Blunier, T., Bourne, A.J., Brook, E., Buchardt, S.L., Buizert, C., Chappellaz, J., Clausen, H.B., Cook, E., Dahl-Jensen, D., Davies, S.M., Guillevic, M., Kipfstuhl, S., Laepple, T., Seierstad, I.K., Severinghaus, J.P., Steffensen, J.P., Stowasser, C., Svensson, A., Vallelonga, P., Vinther, B.M., Wilhelms, F., Winstrup, M., 2013. A first chronology for the North Greenland Eemian Ice Drilling (NEEM) ice core. *Clim Past* 9, 2713-2730.

Data files:*Original continuous data.*

NEEM2010_CH4_WS-CRDS_cont.txt

NEEM2010_CH4_OF-CEAS_cont.txt

Column	Header	Comment
Column 1	Age (year b2k)	Years before the year 2000.
Column 2	Depth (m)	Depth below surface.
Column 3	Raw_CH4 (ppbv)	Raw data uncorrected for solubility effects
Column 4	RawCalib_CH4 (ppbv)	Raw data concentration corrected.
Column 5	Smoothed_CH4 (ppbv)	Raw data smoothed with a Gauss filter via depth where one sigma was chosen as 20cm.
Column 6	Calib_CH4 (ppbv)	Concentration corrected values (from the Gaussian filtered raw data.

Mean values over intervals

NEEM2010_CH4_WS-CRDS_mean.txt

NEEM2010_CH4_OF-CEAS_mean.txt

For each section of continuous measurements we calculated mean values. Where the continuous section is longer than 20cm it is divided into even intervals closest to 20cm. I.e. resulting in the longest interval being 30cm. The data is given as a step function where both beginning and end of the interval is given. Original sections are divided by a row of NaN.

Column	Header	Comment
Column 1	Age (year b2k)	Years before the year 2000.
Column 2	Depth (m)	Depth below surface.

Column 3	RawMethaneMean (ppbv)	Mean of raw data over the interval uncorrected for solubility effects
Column 4	StdError (ppbv)	Standard error of the mean
Column 5	N	Number of data points used for calculating the mean value
Column 6	Calib_CH4 (ppbv)	Mean concentration corrected values (from the Gaussian filtered raw data.

Mean values over common intervals of OF-CEAS and WS-CRDS measurements

NEEM2010_CH4_OF-CEAS_WS-CRDS_SameSectionMean.txt

Same procedure as for individual mean values but restricted to the exact sections where both analyzers produced data.

Column WS-CRDS/ OF-CEAS	Header	Comment
Column 1/8	Age (year b2k)	Years before the year 2000.
Column 2/9	Depth (m)	Depth below surface.
Column 3/10	RawMethaneMean (ppbv)	Mean of raw data over the interval uncorrected for solubility effects
Column 4/11	StdError (ppbv)	Standard error of the mean
Column 5/12	N	Number of data points used for calculating the mean value
Column 6/13	Calib_CH4 (ppbv)	Mean concentration corrected values (from the Gaussian filtered raw data.
Column 15	Diff WS-CRDS-OF-CEAS Raw (ppbv)	Difference between WS-CRDS and OF-CEAS for the mean values of the raw data.
Column 16	Diff WS-CRDS-OF-CEAS Corr (ppbv)	Difference between WS-CRDS and OF-CEAS for the mean values of the corrected data.

Note: Between 1494.67 -1494.33, and 1808.95 - 1817.75 we do not have enough data from other ice cores to make a correction of the raw data. Therefore the Calib_CH4 column in that section shows NaN for all datasets.

OSU Offline Data

The data has been published separately in: Rosen, J.L., Brook, E.J., Severinghaus, J.P., Blunier, T., Mitchell, L.E., Lee, J.E., Edwards, J.S., Gkinis, V., 2014. An ice core record of near-synchronous global climate changes at the Bolling transition. Nature Geosci 7, 459-463. It can be found under: www.aoncadis.org/dataset/NEEM_CH4_and_15N_data.html