**14C of CO2 and bulk soil with associated surface gas flux, soil temperature, and soil moisture, Barrow, Alaska, 2012-2014**

**Review and follow the current NGEE Data and Fair-Use Policies prior to using these data (**[**http://ngee-arctic.ornl.gov/content/ngee-arctic-data-management-policies-and-plans**](http://ngee-arctic.ornl.gov/content/ngee-arctic-data-management-policies-and-plans)**).**

**Summary:**

Dataset includes 14C measurements made from CO2 that was collected and purified in 2012-2014 from surface soil chambers, soil pore space, and laboratory soil incubations. In addition to 14CO2 data, dataset includes co-located measurements of soil organic matter 14C and carbon and nitrogen concentrations; CO2 and CH4 flux; soil and air temperature; and soil moisture. Measurements and field samples were taken from intensive study site 1 areas A, B, and C, the site 0 and AB transects, and additional locations within the BEO, from specified positions in high-centered, flat-centered, and low centered polygons.

**Please use this citation to reference the data.**

Vaughn, L.S., Torn, M.S., Porras, R.C., Curtis, J.B., Chafe, O. 2017. 14C of CO2 and bulk soil with associated surface gas flux, soil temperature, and soil moisture, Barrow, Alaska, 2012-2014. Next Generation Ecosystem Experiments Arctic Data Collection, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA. Data set accessed at…

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**Data Characteristics**

Measurements from 2012-2014 sampling campaigns of 14CO2 from the soil surface, soil pore space, and laboratory incubations; 14C and carbon and nitrogen concentrations from soil organic matter; surface trace gas flux; and depth-resolved soil temperature and soil moisture. There are 4 comma-delimited data files (.csv) within this dataset.

With several of these datasets, an experimental manipulation was applied to the site.  Do we have a particular way of noting this?  Because those data don't reflect natural conditions at the site, I wouldn't want them to be mistakenly interpreted as such.

**Data Dictionary [DATA IS NOT YET AVAILABLE 2016-11-04]**

**Data Files:**

radiocarbon\_Barrow\_2012\_2014

flux\_CO2\_CH4\_Barrow\_2012\_2014

temperature \_Barrow\_2012\_2014

soil\_moisture\_Barrow\_2012\_2014

| **column\_name** | **units/format** | **Description** |
| --- | --- | --- |
| **region\*** |  |  |
| **locale\*** |  |  |
| **administrative\_area\*** |  |  |
| **site\*** |  |  |
| **area\*** |  |  |
| **plot\_type\*** |  |  |
| **pologyon** |  | individual polygon within specified area |
| **position** |  | center, edge, or trough of polygon |
| **type** |  | polygon type (low, flat, or high-centered) |
| **plot\_ID** |  | The name of the profile or plot from which the sample was collected |
| **easting** | m | location in UTM coordinates, zone 4 |
| **northing** | m | location in UTM coordinates, zone 4 |
| **observation\_date** | yyyy-mm-dd | The date at which the soil or gas sample was collected at the site |
| **time** | AKT | local time when the measurement was taken |
| **sample\_date** | yyyy-mm-dd | For CO2 samples collected from laboratory incubations, the date the sample was collected from the incubation. |
| **sample\_name** |  | A unique name for an individual sample to which Δ14C measurement corresponds |
| **sample\_type** |  | Type of material analyzed. (bulk soil or CO2) |
| **pretreatment** |  | For soil samples, description of the pretreatment method used to prior to radiocarbon analysis. |
| **collection\_loc** |  | Indicate whether the sample underwent a laboratory incubation before 14C analysis |
| **incubation\_note** |  | If sample underwent a laboratory incubation, provide incubation temperature, incubation duration, and other relevant information |
| **rc\_lab** |  | Laboratory code for radiocarbon laboratory. Complete list of past and present laboratory codes can found published in Radiocarbon in November 2011 (http://www.radiocarbon.org/Info/labcodes.html). |
| **layer\_name** |  | If analyzed sample was taken from a soil layer, the name of the soil layer as denoted on the "layer" tab |
| **layer\_top** | cm | The top (upper) depth of the layer. The surface of the non-green (i.e. non-living) surface layer is “0”. The top of the O-horizon should be 0. |
| **layer\_bot** | cm | The bottom (lower) depth of the layer. |
| **oc** | % | Percent by weight of carbon in an oven-dried soil sample with material >2 mm or 1 cm diameter removed. |
| **n\_tot** | % | Percent by weight of nitrogen (organic and inorganic) in an oven-dried soi sample. |
| **13c** | ‰ | δ13C of the sample relative to Pee Dee Belemnite. |
| **14C** | ‰ | Δ14C of the sample relative to NBS Oxalic Acid standard. |
| **14C\_sigma** | ‰ | Δ14C analytical error |
| **fraction\_modern** |  | Deviation of the sample from modern. Modern is defined as 95% of the radiocarbon concentration (in AD 1950) of NBS Oxalic Acid standard, 13C-corrected. |
| **fraction\_modern\_sigma** |  | Fraction modern analytical error |
| **rc\_year** | yyyy | Year in which radiocarbon analysis was performed on the sample. |
| **14c\_age** | BP | Uncalibrated radiocarbon age of the sample, as calculated from corrected fraction modern, using the Libby half-life value of 5568 years |
| **14c\_age\_sigma** | BP | Error estimate for the uncalibrated radiocarbon age |
| **chamber\_type** | Opq/Trns | whether the static chamber used to make the trace gas flux measurement was opaque or transparent (Opq = opaque; Trns = transparent) |
| **flux\_CO2** | umol m-2 s-1 | CO2 flux, calculated from the linear portion of the CO2 concentration vs. time regression |
| **flux\_CO2\_se** | umol m-2 s-1 | standard error of the CO2 flux regression slope |
| **flux\_CO2\_Pvalue** |  | p-value of the CO2 flux regression. If p < 0.05, flux is significantly different from 0 umol m-2 s-1 |
| **flux\_CO2\_Rsquared** |  | adjusted R squared value of the CO2 flux regression |
| **flux\_CH4** | nmol m-2 s-1 | CH4 flux, calculated from the linear portion of the CH4 concentration vs. time regression |
| **flux\_CH4\_se** | nmol m-2 s-1 | standard error of the CH4 flux regression slope |
| **CH4\_Pvalue** |  | p-value of the CH4 flux regression. If p < 0.05, flux is significantly different from 0 nmol m-2 s-1 |
| **CH4\_Rsquared** |  | adjusted R squared value of the CH4 flux regression |
| **depth\_temperature** | cm | depth of temperature measurement, measured from the top of the moss layer. If standing water present, measurement is from the water surface. |
| **instrument** |  | instrument used to make temperature measurement |
|  |  |  |
| **T\_soil** | C | soil temperature |
| **T\_soil\_n** |  | number of averaged soil temperature measurements |
| **T\_soil\_sd** | C | standard deviation of soil temperature measurements |
| **T\_air** | C | air temperature |
| **T\_air\_n** |  | number of averaged air temperature measurements |
| **T\_air\_sd** | C | standard deviation of air temperature measurements |
| **depth\_moisture** | cm | depth from surface over which the moisture measurement is integrated |
| **Ka** |  | apparent dielectric constant, measured with a Soilmoisture Minitrase TDR |
| **Ka\_n** |  | number of Ka measurements averaged in reported Ka |
| **Ka\_sd** |  | standard deviation of Ka measurements |
| **VWC** | % | volumetric water content, calculated using the intstrument's internal calibration |
| **VWC\_n** |  | number of VWC measurements averaged in reported VWC |
| **VWC\_sd** | % | standard deviaton of VWC measurements |

\* Values for these location fields have been standardized for NGEE Arctic and are required fields for all data dictionaries. (<http://ngee-arctic.ornl.gov/content/metadata-entry-data-upload-and-data-management-help>)

**Example Data Records:**

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**Data Acquisition Materials and Methods**

* 14C analysis and sample collection
  + CO2 for 14C measurements was purified from gas samples collected in the field or from laboratory incubations.
  + Field samples were collected from either surface soil chambers or soil pore space. Soil chambers were scrubbed of CO2 using a soda lime trap, then allowed to accumulate soil-emitted CO2. Gas within the chamber was then collected in evacuated stainless steel sampling canisters or glass vials. Soil pore space samples were collected through ¼” stainless steel tubes, directly into evacuated stainless steel sampling canisters or glass vials.
  + Soil cores for laboratory incubations were collected using manual push corers and held at 5 °C until beginning of incubation. Soils were then divided into depth increments, living vegetation was removed from surface layer, and increments were incubated individually in glass jars at specified temperatures. For anoxic incubations, jar headspace was purged 3 times over 3 days with N2 gas. Gas samples for 14C analysis were collected from incubation jars, maintaining headspace CO2 concentrations below 20,000 ppm.
  + For all 14CO2 measurements, CO2 was cryogenically purified and reduced to graphite prior to 14C analysis with accelerator mass spectrometry (AMS).
  + Soil organic matter from soil incubations was combusted to CO2, which was then processed for 14C as CO2 from gas samples.
  + 13C analyses for use in 14C calculations were performed at the UC Davis Stable Isotope Laboratory.
* Fluxes of CO2 and CH4 were measured using opaque or transparent static chambers (25 cm diameter, 15-20 cm height). Chambers were tall enough to enclose vegetation and were vented according to Xu *et al.*, (2006) to minimize pressure excursions due to the Venturi effect. In inundated plots, a floating chamber was used whose base extended 4 cm below the water surface. In all other plots, chambers were seated on PVC bases extending ~15 cm below the soil surface. To minimize disturbance, bases were installed at the beginning of the sampling season and left in place throughout the remainder of the season season. For each flux measurement, the chamber was seated in a 3 cm-deep, water-filled trench in the base’s top rim to create an airtight seal. A Los Gatos Research, Inc. (LGR) portable Greenhouse Gas Analyzer was used to record CO2 and CH4 concentrations within the chamber over 4-8 minutes, and the flux rate of each gas was calculated from the slope of the linear portion of the concentration vs. time curve.

## Volumetric water content was measured with a MiniTrase TDR (Soilmoisture Equipment Corp). Soil temperature was measured with a thermistor or thermocouple probe, as indicated. As vegetation and inundation status varied between plots, depths of moisture and temperature measurements were determined from the top of the moss layer, bare soil, or water surface.

**References**

Xu L, Furtaw MD, Madsen RA, Garcia RL, Anderson DJ, McDermitt DK (2006) On maintaining pressure equilibrium between a soil CO 2 flux chamber and the ambient air. *Journal of Geophysical Research*, **111**.

**Supplemental Files:**

[*Insert any additional contextual information for describing and understanding the dataset such as pictures, maps, etc.]*

## Data Access:

*Example: This data set is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).*

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