

Title:

BE Soil Data 2009

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Summary

This data set contains soil respiration (CO₂) and related measurements taken at the Biocomplexity Experimental Site in northern Alaska during the summer of 2009. Sampling was conducted as part of a large-scale water manipulation experiment to test the effect of altered tundra moisture on ecosystem carbon exchange.

The variables measured were: soil temperature, thaw depth, water table depth, and soil respiration. Supporting information including the date and sampling position is also given.

This research was conducted as part of the Biocomplexity Program of the National Science Foundation, grant number OPP-0421588.

Citing These Data:

Oechel, W.C., C.S. Sturtevant. 2011. *Soil Respiration at the Biocomplexity Experiment Site, Barrow, AK, 2009*. Boulder, CO: National Center for Atmospheric Research, ARCSS Data Archive.

Overview Table

Category	Description
Data format	Comma-delimited ASCII text
Spatial coverage and resolution	Biocomplexity Experiment Site in northern Alaska at 71.284° N, 156.598° W; resolution typically 2 or 4 m
Temporal coverage and resolution	2009-06-15 to 2009-08-20; measurements taken weekly
File size	73.3 KB
Parameter(s)	soil temperature, soil respiration, water table height, thaw depth

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1. Contacts and Acknowledgments:

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2. Detailed Data Description:

Format:

The data are available as a comma-delimited ASCII text file.

File Size:

The file size is 73.3 KB.

Spatial Coverage:

Data were collected at the Biocomplexity Experimental Site in northern Alaska, located at 71.284° N, 156.598° W.

The Biocomplexity Experiment site is situated in the Barrow Environmental Observatory and located approximately 6 km east of Barrow village and 7 km south of the Arctic Ocean. The tundra in this region is considered wet-sedge meadow and is underlain by continuous permafrost with an average active layer of approximately 37 cm. Soils for this site are Gelisols of the suborder Histel. Mean annual temperature is -12°C, while mean summer temperature (June-August) is 3.3°C. Annual precipitation averages 106 mm.

The Biocomplexity Site is an approximately 1.5 km x 0.5 km vegetated thaw lake basin which is estimated to have drained 50-300 years ago. This basin has been divided into three sections by dikes. In 2009, water was pumped into or out of each section such that the north section represented wetter than ambient conditions, the central section drier than ambient conditions, and the southern section intermediate moisture conditions. This was the second successful year of

manipulation. Across each section, from east to west, a 300 m boardwalk exists to make surface measurements. The boardwalks are about 300 m apart in the north-south direction.

Spatial Resolution:

The resolution of measurements was 4 m apart along the boardwalk in each respective section. Measurement locations were alternated weekly such that the sample locations were offset by 2 m from the previous week. For example, in week 1 measurements were made at 0 m, 4 m, 8 m, 12 m, ... along each boardwalk while in week 2 measurements were made at 2 m, 6 m, 10 m, 14 m, ..., and in week 3 measurements were made at the same locations as week 1, and so on.

Temporal Coverage:

Data were collected from June 15, 2009 to August 20, 2009 (Julian days 166 - 232).

Temporal Resolution:

Measurements were collected once every week for each section. Only one section was measured on a given day and every attempt was made to measure remaining sections on consecutive days. For example, best effort was made to measure the entire Central section on Mondays, the South section on Tuesdays, and the North section on Wednesdays. All measurements were made during peak daylight hours.

Parameters or Variables:

Parameter Description:

The parameters measured were soil temperature, soil respiration, water table height, and thaw depth. Supporting information include the date and location where the measurement was made. Section is N, C, or S indicating the measurements correspond to the North, Central, or South section, respectively.

Distance Along Boardwalk indicates the location along the boardwalk where the measurements were made, measured in meters from the west end of each boardwalk.

Soil Temperature was measured in degrees Celcius. The probe was inserted to a depth of 10 cm or the depth of thaw (if less than 10 cm). Each soil temperature value is the average of three successive measurements.

Soil respiration ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) is the net exchange of CO_2 to/from the soil. Positive values indicate a flux from the soil to the atmosphere. Each respiration value is the average of three successive measurements.

Positive water table heights indicate water tables above the surface. Thaw depths indicate the distance from the surface to the depth of the permafrost. Values are always positive.

Entire missing records indicate that measurements could not be made at that location (i.e. snow was present). NaN values within records indicate a bad measurement was removed.

Sample Data Record:

Year	Month	Day	Section	Distance Along Boardwalk (m)	Soil Temperature (C)	Soil Respiration ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$)	Water Table Height (cm)	Thaw Depth (cm)
2009	6	15	C	0	2.16	1.0126	3	5
2009	6	15	C	8	0.22	0.6977	2	7
2009	6	15	C	12	0.94	0.2640	14	2
2009	6	15	C	44	-0.24	0.1721	12	2

2009	6	15	C	48	-0.06	0.1443	14	3
2009	6	15	C	52	-0.22	0.0877	14	3
2009	6	15	C	64	1.40	0.1093	16	3

3. Data Access and Tools:

Data Access:

Data are available for ordering from [NCAR](#).

4. Data Acquisition and Processing:

Sensor or Instrument Description:

Researchers made soil respiration measurements with a LI-COR 6200 Portable Photosynthesis System (LI-COR Biosciences, Inc., Lincoln, NE) with a LI-COR 6000-09 Soil Respiration Chamber. The LI-6200 is an infrared gas analyzer that measures the net exchange of CO₂. The LI-6000-09 is a 9.55 cm diameter dark chamber placed over the soil surface to be used with the LI-6200 and is equipped with a 10 cm soil temperature probe.

Water table depths were measured by use of permanent hollow PVC tubes located every 2 m along each boardwalk. The depth of the water table below the surface was measured by placing a measuring stick in each tube and recording the distance between the soil surface and the water table.

Thaw depths were measured by inserting a graduated metal rod into the soil with force until frozen ground was encountered, prohibiting the rod from traveling deeper. Thaw depth measurements were made in the immediately surrounding area of respiration measurements each time a location was sampled.

Processing:

The LI-6200 outputs soil temperature and soil respiration directly. No external calculations were made other than to average the three soil temperature measurements and the three soil respiration measurements per sampling time/location.

5. References and Related Publications

6. Document Information:

Document Creation Date:

2011-01-10