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Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall and Jeffrey A. Newcomer, Editors

Volume 126

BOREAS TE-1 CH_4 Flux Data over the SSA-OA

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BOREAS TE-1 CH_4 Flux Data over the SSA-OA

Darwin Anderson, Andrea Papagno

Summary

The BOREAS TE-1 team collected various data to characterize the soil-plant systems in the BOREAS SSA. Particular emphasis was placed on nutrient biochemistry, the stores and transfers of organic carbon, and how the characteristics were related to measured methane fluxes. The overall transect in the Prince Albert National Park (Saskatchewan, Canada) included the major plant communities and related soils that occurred in that section of the boreal forest. Soil physical, chemical, and biological measurements along the transect were used to characterize the static environment, which allowed them to be related to methane fluxes. Chamber techniques were used to provide a measure of methane production/uptake. Chamber measurements coupled with flask sampling were used to determine the seasonality of methane fluxes. This particular data set contains methane flux and soil profile methane concentration values from the SSA-OA site. The data were collected from 29-May to 17-Sep-1994. The data are stored in tabular ASCII files.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

BOREAS TE-01 CH_4 Flux Data over the SSA-OA

1.2 Data Set Introduction

This data set contains methane flux and soil profile methane concentration measurements taken at the BOReal Ecosystem-Atmosphere Study (BOREAS) Southern Study Area (SSA) Old Aspen (OA) flux tower site. Chamber techniques were used to provide a measure of methane production/uptake. Chamber measurements coupled with flask sampling were used to determine the seasonality of methane fluxes.

1.3 Objective/Purpose

The objective of the research was to characterize the various soil-plant systems along a transect in one of the ecosystems selected for study at the SSA.

1.4 Summary of Parameters

The main parameters are soil methane fluxes and concentrations.

1.5 Discussion

None given.

1.6 Related Data Sets

BOREAS TGB-01 CH4 Tower flux data over NSA
BOREAS TGB-01 CO2 and CH4 Chamber Flux data over the NSA
BOREAS TGB-01/TGB-03 NEE Data over the NSA Fen
BOREAS TGB-03 CO2 and CH4 Chamber Flux data over the NSA
BOREAS TGB-05 CO, CO2, and CH4 Chamber Flux data over the NSA

2. Investigator(s)

2.1 Investigator(s) Name and Title

Dr. Darwin Anderson
Research Professor
University of Saskatchewan

2.2 Title of Investigation

Stores and Dynamics of Organic Matter in Boreal Ecosystems

2.3 Contact Information

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Andrea.Papagno@gsfc.nasa.gov

3. Theory of Measurements

None given.

4. Equipment

4.1 Sensor/Instrument Description

4.1.1 Collection Environment
Methane fluxes were measured during all ambient environmental conditions at the sites.

4.1.2 Source/Platform
Ground.

4.1.3 Source/Platform Mission Objectives
The mission objective was to determine the methane fluxes at the SSA-OA.

4.1.4 Key Variables
The key variables measured were the methane fluxes.

4.1.5 Principles of Operation
None given.

4.1.6 Sensor/Instrument Measurement Geometry
None given.

4.1.7 Manufacturer of Sensor/Instrument
None given.

4.2 Calibration

4.2.1 Specifications
None given.

4.2.1.1 Tolerance
None given.

4.2.2 Frequency of Calibration
None given.

4.2.3 Other Calibration Information
None given.

5. Data Acquisition Methods

None given.

6. Observations

6.1 Data Notes
None given.

6.2 Field Notes
None given.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

The North American Datum of 1983 (NAD83) coordinates of the SSA-OA flux tower (site id C3B7T), close to where the measurements were taken, are 53.62889° N Lat, 106.19779° W Long, Universal Transverse Mercator (UTM) Zone 13, N: 5,942,899.9, E: 420,790.5.

7.1.2 Spatial Coverage Map

Not available.

7.1.3 Spatial Resolution

These are point source measurements along a transect near the given location.

7.1.4 Projection

Not applicable.

7.1.5 Grid Description

Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage

The data were collected from 29-May to 17-Sep-1994.

7.2.2 Temporal Coverage Map

Not available.

7.2.3 Temporal Resolution

Measurements were taken on a daily basis. Three methane flux measurements, one obtained from each of the closed chambers, were averaged every 2 days from 29-May to 17-Sep-1994.

7.3 Data Characteristics

7.3.1 Parameter/Variable

The parameters contained in the data files on the CD-ROM are:

```
          Column Name
------------------------------
SITE_NAME
SUB_SITE
DATE_OBS
MEAN_CH4_FLUX
SDEV_CH4_FLUX
MEDIAN_CH4_FLUX
FIRST_QUARTILE
FOURTH_QUARTILE
CH4_CONC_5CM
CH4_CONC_9_TO_16CM
CH4_CONC_31CM
CH4_CONC_26_TO_28CM
CH4_CONC_43_TO_46CM
CH4_CONC_79_TO_93CM
```

CRTFCN_CODE
REVISION_DATE

7.3.2 Variable Description/Definition

The descriptions of the parameters contained in the data files on the CD-ROM are:

Column Name	Description
SITE_NAME	The identifier assigned to the site by BOREAS, in the format SSS-TTT-CCCCC, where SSS identifies the portion of the study area: NSA, SSA, REG, TRN, and TTT identifies the cover type for the site, 999 if unknown, and CCCCC is the identifier for site, exactly what it means will vary with site type.
SUB_SITE	The identifier assigned to the sub-site by BOREAS, in the format GGGGG-IIIII, where GGGGG is the group associated with the sub-site instrument, e.g. HYD06 or STAFF, and IIIII is the identifier for sub-site, often this will refer to an instrument.
DATE_OBS	The date on which the data were collected.
MEAN_CH4_FLUX	Mean of all daily methane flux measurements.
SDEV_CH4_FLUX	The standard deviation of all daily methane flux measurements.
MEDIAN_CH4_FLUX	Median of all daily methane flux measurements.
FIRST_QUARTILE	1ST quartile of all daily methane flux measurements.
FOURTH_QUARTILE	4TH quartile of all daily methane flux measurements.
CH4_CONC_5CM	Methane concentration in the peat at 5 cm depth.
CH4_CONC_9_TO_16CM	Methane concentration in the peat at 9-16 cm depth.
CH4_CONC_31CM	Methane concentration in the peat at 31 cm depth.
CH4_CONC_26_TO_28CM	Methane concentration in the peat at 26-28 cm depth.
CH4_CONC_43_TO_46CM	Methane concentration in the peat at 43-46 cm depth.
CH4_CONC_79_TO_93CM	Methane concentration in the peat at 79-93 cm depth.
CRTFCN_CODE	The BOREAS certification level of the data. Examples are CPI (Checked by PI), CGR (Certified by Group), PRE (Preliminary), and CPI-??? (CPI but questionable).
REVISION_DATE	The most recent date when the information in the referenced data base table record was revised.

7.3.3 Unit of Measurement

The measurement units for the parameters contained in the data files on the CD-ROM are:

Column Name	Units
SITE_NAME	[none]
SUB_SITE	[none]
DATE_OBS	[DD-MON-YY]
MEAN_CH4_FLUX	[micromoles][meter^-2][second^-1]
SDEV_CH4_FLUX	[micromoles][meter^-2][second^-1]
MEDIAN_CH4_FLUX	[micromoles][meter^-2][second^-1]
FIRST_QUARTILE	[micromoles][meter^-2][second^-1]
FOURTH_QUARTILE	[micromoles][meter^-2][second^-1]
CH4_CONC_5CM	[parts per million]
CH4_CONC_9_TO_16CM	[parts per million]
CH4_CONC_31CM	[parts per million]
CH4_CONC_26_TO_28CM	[parts per million]
CH4_CONC_43_TO_46CM	[parts per million]
CH4_CONC_79_TO_93CM	[parts per million]
CRTFCN_CODE	[none]
REVISION_DATE	[DD-MON-YY]

7.3.4 Data Source

The sources of the parameter values contained in the data files on the CD-ROM are:

Column Name	Data Source
SITE_NAME	[BORIS Designation]
SUB_SITE	[BORIS Designation]
DATE_OBS	[Human Observer]
MEAN_CH4_FLUX	[Laboratory Equipment]
SDEV_CH4_FLUX	[Laboratory Equipment]
MEDIAN_CH4_FLUX	[Laboratory Equipment]
FIRST_QUARTILE	[Laboratory Equipment]
FOURTH_QUARTILE	[Laboratory Equipment]
CH4_CONC_5CM	[Laboratory Equipment]
CH4_CONC_9_TO_16CM	[Laboratory Equipment]
CH4_CONC_31CM	[Laboratory Equipment]
CH4_CONC_26_TO_28CM	[Laboratory Equipment]
CH4_CONC_43_TO_46CM	[Laboratory Equipment]
CH4_CONC_79_TO_93CM	[Laboratory Equipment]
CRTFCN_CODE	[BORIS Designation]
REVISION_DATE	[BORIS Designation]

7.3.5 Data Range

The following table gives information about the parameter values found in the data files on the CD-ROM.

Column Name	Minimum Data Value	Maximum Data Value	Missng Data Value	Unrel Data Value	Below Detect Limit	Data Not Cllctd
SITE_NAME	SSA-90A-FLXTR	SSA-90A-FLXTR	None	None	None	None
SUB_SITE	9TE01-FLX01	9TE01-FLX01	None	None	None	None
DATE_OBS	29-MAY-94	17-SEP-94	None	None	None	None

```
MEAN_CH4_FLUX          0               .00042824       None    None    None    None
SDEV_CH4_FLUX          0               .00074074       -999    None    None    None
MEDIAN_CH4_FLUX        0               .00040509       None    None    None    None
FIRST_QUARTILE         0               .00619213       None    None    None    None
FOURTH_QUARTILE        0               .0084375        None    None    None    None
CH4_CONC_5CM           1.043           1.282           -999    None    None    None
CH4_CONC_9_TO_16CM     .535            1.584           -999    None    None    None
CH4_CONC_31CM          .253            .483            -999    None    None    None
CH4_CONC_26_TO_28CM    .307            .917            -999    None    None    None
CH4_CONC_43_TO_46CM    0               .524            -999    None    None    None
CH4_CONC_79_TO_93CM    0               .359            -999    None    None    None
CRTFCN_CODE            CPI             CPI             None    None    None    None
REVISION_DATE          12-NOV-96       12-NOV-96       None    None    None    None
-------------------------------------------------------------------------------
Minimum Data Value -- The minimum value found in the column.
Maximum Data Value -- The maximum value found in the column.
Missng Data Value  -- The value that indicates missing data. This is used to
                      indicate that an attempt was made to determine the
                      parameter value, but the attempt was unsuccessful.
Unrel Data Value   -- The value that indicates unreliable data.  This is used
                      to indicate an attempt was made to determine the
                      parameter value, but the value was deemed to be
                      unreliable by the analysis personnel.
Below Detect Limit -- The value that indicates parameter values below the
                      instruments detection limits.  This is used to
                      indicate that an attempt was made to determine the
                      parameter value, but the analysis personnel determined
                      that the parameter value was below the detection
                      limit of the instrumentation.
Data Not Cllctd    -- This value indicates that no attempt was made to
                      determine the parameter value.  This usually
                      indicates that BORIS combined several similar but
                      not identical data sets into the same data base table
                      but this particular science team did not
                      measure that parameter.

Blank -- Indicates that blank spaces are used to denote that type of value.
N/A   -- Indicates that the value is not applicable to the respective column.
None  -- Indicates that no values of that sort were found in the column.
-------------------------------------------------------------------------------
```

7.4 Sample Data Record

The following are wrapped versions of data record from a sample data file on the CD-ROM.

```
SITE_NAME,SUB_SITE,DATE_OBS,MEAN_CH4_FLUX,SDEV_CH4_FLUX,MEDIAN_CH4_FLUX,
FIRST_QUARTILE,FOURTH_QUARTILE,CH4_CONC_5CM,CH4_CONC_9_TO_16CM,CH4_CONC_31CM,
CH4_CONC_26_TO_28CM,CH4_CONC_43_TO_46CM,CH4_CONC_79_TO_93CM,CRTFCN_CODE,
REVISION_DATE
'SSA-90A-FLXTR','9TE01-FLX01',29-MAY-94,.00016204,.00008102,.00016204,.00217593,
.00347222,-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,'CPI',12-NOV-96
'SSA-90A-FLXTR','9TE01-FLX01',29-MAY-94,.0000463,-999.0,.0000463,.00069444,
.00069444,-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,'CPI',12-NOV-96
```

8. Data Organization

8.1 Data Granularity

The smallest unit of data tracked by the BOREAS Information System (BORIS) was the data collected at a given site on a given date.

8.2 Data Format(s)

The Compact Disk-Read-Only Memory (CD-ROM) files contain American Standard Code for Information Interchange (ASCII) numerical and character fields of varying length separated by commas. The character fields are enclosed with single apostrophe marks. There are no spaces between the fields.

Each data file on the CD-ROM has four header lines of Hyper-Text Markup Language (HTML) code at the top. When viewed with a Web browser, this code displays header information (data set title, location, date, acknowledgments, etc.) and a series of HTML links to associated data files and related data sets. Line 5 of each data file is a list of the column names, and line 6 and following lines contain the actual data.

9. Data Manipulations

9.1 Formulae

9.1.1 Derivation Techniques and Algorithms

None given.

9.2 Data Processing Sequence

9.2.1 Processing Steps

None given.

9.2.2 Processing Changes

None given.

9.3 Calculations

9.3.1 Special Corrections/Adjustments

None given.

9.3.2 Calculated Variables

None given.

9.4 Graphs and Plots

None.

10. Errors

10.1 Sources of Error

None given.

10.2 Quality Assessment

10.2.1 Data Validation by Source
None given.

10.2.2 Confidence Level/Accuracy Judgment
None given.

10.2.3 Measurement Error for Parameters
None given.

10.2.4 Additional Quality Assessments
None given.

10.2.5 Data Verification by Data Center
Data were examined for general consistency and clarity.

11. Notes

11.1 Limitations of the Data
None given.

11.2 Known Problems with the Data
None given.

11.3 Usage Guidance
None given.

11.4 Other Relevant Information
None given.

12. Application of the Data Set

None given.

13. Future Modifications and Plans

This data set is in its final format.

14. Software

14.1 Software Description
None given.

14.2 Software Access
None given.

15. Data Access

The CH_4 flux data are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information

For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification

Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics http://www-eosdis.ornl.gov/.

15.3 Procedures for Obtaining Data

Users may obtain data directly through the ORNL DAAC online search and order system [http://www-eosdis.ornl.gov/] and the anonymous FTP site [ftp://www-eosdis.ornl.gov/data/] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans

The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.

16. Output Products and Availability

16.1 Tape Products

None.

16.2 Film Products

None.

16.3 Other Products

These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation

None.

17.2 Journal Articles and Study Reports

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. 2000. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM.

Sellers, P. and F. Hall. 1994. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1994-3.0, NASA BOREAS Report (EXPLAN 94).

Sellers, P. and F. Hall. 1996. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1996-2.0, NASA BOREAS Report (EXPLAN 96).

Sellers, P., F. Hall, and K.F. Huemmrich. 1996. Boreal Ecosystem-Atmosphere Study: 1994 Operations. NASA BOREAS Report (OPS DOC 94).

Sellers, P., F. Hall, and K.F. Huemmrich. 1997. Boreal Ecosystem-Atmosphere Study: 1996 Operations. NASA BOREAS Report (OPS DOC 96).

Sellers, P., F. Hall, H. Margolis, B. Kelly, D. Baldocchi, G. den Hartog, J. Cihlar, M.G. Ryan, B. Goodison, P. Crill, K.J. Ranson, D. Lettenmaier, and D.E. Wickland. 1995. The boreal ecosystem-atmosphere study (BOREAS): an overview and early results from the 1994 field year. Bulletin of the American Meteorological Society. 76(9):1549-1577.

Sellers, P.J., F.G. Hall, R.D. Kelly, A. Black, D. Baldocchi, J. Berry, M. Ryan, K.J. Ranson, P.M. Crill, D.P. Lettenmaier, H. Margolis, J. Cihlar, J. Newcomer, D. Fitzjarrald, P.G. Jarvis, S.T. Gower, D. Halliwell, D. Williams, B. Goodison, D.E. Wickland, and F.E. Guertin. 1997. BOREAS in 1997: Experiment Overview, Scientific Results and Future Directions. Journal of Geophysical Research 102(D24): 28,731-28,770.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None.

19. List of Acronyms

AES	- Atmospheric Environment Services
ASCII	- American Standard Code for Information Interchange
BOREAS	- BOReal Ecosystem-Atmosphere Study
BORIS	- BOREAS Information System
BP	- Beaver Pond
CD-ROM	- Compact Disk-Read-Only Memory
CMDL	- Climate Monitoring and Diagnostics Laboratory
DAAC	- Distributed Active Archive Center
ECD	- Electron Capture Detector

EOS - Earth Observing System
EOSDIS - EOS Data and Information System
FID - Flame Ionization Detector
GC - Gas Chromatograph
GIS - Geographic Information System
GSFC - Goddard Space Flight Center
HTML - Hypertext Markup Language
NAD83 - North American Datum of 1983
NASA - National Aeronautics and Space Administration
NSA - Northern Study Area
OBS - Old Black Spruce
ORNL - Oak Ridge National Laboratory
PANP - Prince Albert National Park
SSA - Southern Study Area
TCD - Thermal Conductivity Detector
TE - Terrestrial Ecology
TGB - Trace Gas Biogeochemistry
URL - Uniform Resource Locator
UTM - Universal Transverse Mercator

20. Document Information

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When using these data, please contact the individuals listed in Section 2.3 as well as citing relevant papers in Section 17.2.

If using data from the BOREAS CD-ROM series, also reference the data as:

Anderson, D., "Stores and Dynamics of Organic Matter in Boreal Ecosystems." In Collected Data of The Boreal Ecosystem-Atmosphere Study. Eds. J. Newcomer, D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers. CD-ROM. NASA, 2000.

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D. Anderson: University of Saskatchewan, Saskatoon, SK, Canada; A. Papagno and J.A. Newcomer: Raytheon ITSS, NASA Goddard Space Flight Center, Greenbelt, Maryland

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13. ABSTRACT *(Maximum 200 words)*

The BOREAS TE-1 team collected various data to characterize the soil-plant systems in the BOREAS SSA. Particular emphasis was placed on nutrient biochemistry, the stores and transfers of organic carbon, and how the characteristics were related to measured methane fluxes. The overall transect in the Prince Albert National Park (Saskatchewan, Canada) included the major plant communities and related soils that occurred in that section of the boreal forest. Soil physical, chemical, and biological measurements along the transect were used to characterize the static environment, which allowed them to be related to methane fluxes. Chamber techniques were used to provide a measure of methane production/uptake. Chamber measurements coupled with flask sampling were used to determine the seasonality of methane fluxes. This particular data set contains methane flux and soil profile methane concentration values from the SSA-OA site. The data were collected from 29-May to 17-Sep-1994. The data are stored in tabular ASCII files.

14. SUBJECT TERMS
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