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

Forrest G. Hall and Shelaine Curd, Editors

Volume 141
BOREAS TE-5 Surface Meteorological and Radiation Data

J. Ehleriinger, J.R. Brooks, and L. Flanagan

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

October 2000
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Boreal Ecosystem-Atmosphere Study (BOREAS)

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Volume 141
BOREAS TE-5 Surface Meteorological and Radiation Data

Jim Ehleriinger, University of Utah, Salt Lake City
J. Renee Brooks, University of South Florida, Tampa
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National Aeronautics and Space Administration
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Greenbelt, Maryland 20771

October 2000
BOREAS TE-5 Surface Meteorological and Radiation Data
Jim Ehleringer, J.Renee Brooks, Larry Flanagan

Summary
The BOREAS TE-5 team collected measurements in the NSA and SSA on gas exchange, gas composition, and tree growth. Measurements of meteorological data, including air and soil temperature, RH, and PPFD, were 30-minute intervals during the 1994 IFCs at various sites in the BOREAS NSA and SSA. The data are provided in tabular ASCII files.

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1. Data Set Overview

1.1 Data Set Identification
BOREAS TE-05 Surface Meteorological and Radiation Data

1.2 Data Set Introduction
Basic meteorological data (air and soil temperature, relative humidity (RH), and photosynthetic photon flux density (PPFD) data) were collected at varying heights in the BOREal Ecosystem-Atmosphere Study (BOREAL) Northern Study Area (NSA) and Southern Study Area (SSA) sites.

1.3 Objective/Purpose
The data were collected to provide basic meteorological information at the sampling sites during times when Terrestrial Ecology (TE)-05 team sampled canopy CO₂ for carbon and oxygen isotope analysis.
1.4 Summary of Parameters
Date, Julian Day, Time Greenwich Mean Time ((GMT) h), Temp at RH sensor (C), midcanopy RH%, 9-m PPFD micromoles/m²/s, 1-m PPFD, 9-m Tair (C), 1-m Tair (C), 10-cm Tsoil(C), and 20-cm Tsoil (C) collected at 30-min intervals.

1.5 Discussion
These measurements were made at both the NSA and the SSA during each Intensive Field Campaign (IFC) at the Old Jack Pine (OJP), Old Black Spruce (OBS), T6R5S TE Upland Black Spruce (UBS), and Old Aspen (OA).

1.6 Related Data Sets
BOREAS TE-05 Diurnal CO2 Canopy Profile Data
BOREAS TE-05 Leaf Gas Exchange Data
BOREAS TE-05 Leaf Carbon Isotope Data
BOREAS TE-05 Tree Ring and Carbon Isotope Ratio Data
BOREAS TE-05 Air Stable Isotope

2. Investigator(s)

2.1 Investigator(s) Name and Title
J. R. Ehleringer
University of Utah
TE-05
Department of Biology
Salt Lake City, UT 84112

Dr. Larry Flanagan
Department of Biological Sciences
University of Lethbridge
4401 University Drive
Lethbridge, Alberta T1K 3M4, CANADA

2.2 Title of Investigation
Vegetation-Atmosphere CO₂ and H₂O Exchange Processes: Stable Isotope Analyses

2.3 Contact Information
Contact 1:
J. Renee Brooks
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University of South Florida
Tampa, FL 33620-5150
(813) 974-7352 (Office)
(813) 974-3250 (Dept.)
(813) 974-3263 (fax)
rjbrooks@chuma.cas.usf.edu
3. Theory of Measurements

Surface meteorological and radiation data were taken in conjunction with CO$_2$ isotope data collections by TE-05.

4. Equipment

4.1 Sensor/Instrument Description

- RH: The Campbell Scientific, Inc., 207 Temperature and RH probe contains a Phys-Chem Scientific, Inc., PCRC-11 RH sensor and a Fenwal Electronics UUT51J1 thermistor. The combined RH sensor accuracy is typically better than 5% over the 12-100% RH range.
- PPFD: Hamamatsu GaAsP Photodiodes G1118 calibrated with a LI-COR Quantum sensor. Each sensor was mounted on a flat white platform and then mounted to the Rohn mast and leveled with a bubble level.
- Temperature: Copper constantan thermocouples.
- A Campbell CR-21x data logger was used to record the meteorological data.

4.1.1 Collection Environment

The data were collected under ambient conditions during the collection period.

4.1.2 Source/Platform

Meteorological data were collected from a Rohn mast extending 9 m up into the canopy.

4.1.3 Source/Platform Mission Objectives

The objective was to monitor basic meteorological data within the forest canopy at the location where the TE-05 team collected CO$_2$ for isotope analysis.

4.1.4 Key Variables

Date, Julian Day, Time (GMT h), Temp at RH sensor (C), midcanopy RH%, 9-m PPFD micromoles/m$^2$/s, 1-m PPFD, 9-m Tair (C), 1-m Tair (C), 10-cm Tsoil(C), and 20-cm Tsoil (C) collected at 30-minute intervals.
4.1.5 Principles of Operation
All sensors were attached to a Campbell CR-21x data logger and monitored every 30 minutes.

4.1.6 Sensor/Instrument Measurement Geometry
None given.

4.1.7 Manufacturer of Sensor/Instrument
207 Temperature and RH probe
CR-21x data logger
Campbell Scientific, Inc.
P.O. Box 551
Logan, UT 84321
(801) 753-2342

Hamamatsu GaAsP Photodiodes G1118
Hamamatsu Corporation
360 Foothill Road
P.O. Box 6910
Bridgewater, NJ 08807-0910
(201) 231-0960

Copper Constantan Thermocouples
Omega Engineering
P.O. Box 1
Broughton Astley Leicestershire
LE9 6XR, England
(800) 826-6342

4.2 Calibration

4.2.1 Specifications
None given.

4.2.1.1 Tolerance
The RH probe contains a Phys-Chem Scientific, Inc., PCRC-11 RH Sensor and Fenwal Electronics UUT51J1 thermistor. The combined RH sensor accuracy is typically better than 5% over the 12-100% RH range.

4.2.2 Frequency of Calibration
All instruments were calibrated and tested in the lab prior to the first IFC.

4.2.3 Other Calibration Information
During each IFC, instruments were checked for placement and orientation but were not recalibrated.

5. Data Acquisition Methods
All sensors were attached to a Campbell CR-21x data logger and monitored every 30 minutes. Note that the 9-m Rohn mast was shorter than the canopy at the SSA-OJP, SSA-OA, and NSA-OA sites.
6. Observations

6.1 Data Notes
None given.

6.2 Field Notes
The RH sensor for NSA-OA during IFC-3 was not operational.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage
The North American Datum of 1983 (NAD83) coordinates of the sites are:
- NSA-OA canopy access tower site: auxiliary site number T2Q6A, BOREAS Experiment Plan, Version 3, Lat/Long = 55.88°N, 98.67°W.
- NSA-UBS canopy access tower site: auxiliary site number T6R5S, BOREAS Experiment Plan, Version 3, Lat/Long = 55.70°N, 98.51°W.
- SSA-OJP: Lat/Long: 53.91°N, 104.69°W, UTM Zone 13, 53.91634 N, 104.69203 W.
- SSA-OBS: Lat/Long: 53.98°N, 105.12°W, UTM Zone 13, 5982100.5 N, 492276.5 E.
- SSA-OA: Lat/Long: 53.62°N, 106.19°W. UTM Zone 13, 5942899.9 N, 420790.5 E.

7.1.2 Spatial Coverage Map
None given.

7.1.3 Spatial Resolution
These are point source measurements at the locations given.

7.1.4 Projection
None given.

7.1.5 Grid Description
None given.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage
The data were collected from 25-May-1994 to 08-Sep-1994.

7.2.2 Temporal Coverage Map

IFC-1:
7.2.3 Temporal Resolution
Meteorological measurements were made every 30 minutes.

7.3 Data Characteristics

7.3.1 Parameter/Variable
The parameters contained in the data files on the CD-ROM are:

<table>
<thead>
<tr>
<th>Column Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE_NAME</td>
</tr>
<tr>
<td>SUB_SITE</td>
</tr>
<tr>
<td>DATE_OBS</td>
</tr>
<tr>
<td>TIME_OBS</td>
</tr>
<tr>
<td>AIR_TEMP_AT_REL_HUM_SENSOR</td>
</tr>
<tr>
<td>REL_HUM_6M</td>
</tr>
<tr>
<td>REL_HUM_9M</td>
</tr>
<tr>
<td>PPFD_1M</td>
</tr>
<tr>
<td>PPFD_9M</td>
</tr>
<tr>
<td>AIR_TEMP_1M</td>
</tr>
<tr>
<td>AIR_TEMP_9M</td>
</tr>
<tr>
<td>SOIL_TEMP_10CM</td>
</tr>
<tr>
<td>SOIL_TEMP_20CM</td>
</tr>
<tr>
<td>CRTFCN_CODE</td>
</tr>
<tr>
<td>REVISION_DATE</td>
</tr>
</tbody>
</table>

7.3.2 Variable Description/Definition
The descriptions of the parameters contained in the data files on the CD-ROM are:

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE_NAME</td>
<td>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.</td>
</tr>
</tbody>
</table>
7.3.3 Unit of Measurement

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

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE_NAME</td>
<td>[none]</td>
</tr>
<tr>
<td>SUB_SITE</td>
<td>[none]</td>
</tr>
<tr>
<td>DATE_OBS</td>
<td>[DD-MON-YY]</td>
</tr>
<tr>
<td>TIME_OBS</td>
<td>[HHMM GMT]</td>
</tr>
<tr>
<td>AIR_TEMP_AT_REL_HUM_SENSOR</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>REL_HUM_6M</td>
<td>[percent]</td>
</tr>
<tr>
<td>REL_HUM_9M</td>
<td>[percent]</td>
</tr>
<tr>
<td>PPFD_1M</td>
<td>[micromoles][meter^-2][second^-1]</td>
</tr>
<tr>
<td>PPFD_9M</td>
<td>[micromoles][meter^-2][second^-1]</td>
</tr>
<tr>
<td>AIR_TEMP_1M</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>AIR_TEMP_9M</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>SOIL_TEMP_10CM</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>SOIL_TEMP_20CM</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>CRTFCN_CODE</td>
<td>[none]</td>
</tr>
<tr>
<td>REVISION_DATE</td>
<td>[DD-MON-YY]</td>
</tr>
</tbody>
</table>
7.3.4 Data Source

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

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE_NAME</td>
<td>[BORIS Designation]</td>
</tr>
<tr>
<td>SUB_SITE</td>
<td>[BORIS Designation]</td>
</tr>
<tr>
<td>DATE_OBS</td>
<td>[Human Observer]</td>
</tr>
<tr>
<td>TIME_OBS</td>
<td>[Human Observer]</td>
</tr>
<tr>
<td>AIR_TEMP_AT_REL_HUM_SENSOR</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>REL_HUM_6M</td>
<td>[Field Equipment]</td>
</tr>
<tr>
<td>REL_HUM_9M</td>
<td>[Field Equipment]</td>
</tr>
<tr>
<td>PPDF_1M</td>
<td>[Field Equipment]</td>
</tr>
<tr>
<td>PPDF_9M</td>
<td>[Field Equipment]</td>
</tr>
<tr>
<td>AIR_TEMP_1M</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>AIR_TEMP_9M</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>SOIL_TEMP_10CM</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>SOIL_TEMP_20CM</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>CRTFCN_CODE</td>
<td>[BORIS Designation]</td>
</tr>
<tr>
<td>REVISION_DATE</td>
<td>[BORIS Designation]</td>
</tr>
</tbody>
</table>

7.3.5 Data Range

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

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Minimum Data Value</th>
<th>Maximum Data Value</th>
<th>Missng Data Value</th>
<th>Unrel Data Value</th>
<th>Below Data Value</th>
<th>Detect Data Value</th>
<th>Not Detect Data Value</th>
<th>Limit Data Value</th>
<th>Collect Data Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE_NAME</td>
<td>NSA-9BS-9TETR</td>
<td>SSA-OJP-FLXTR</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>NSA-9BS-9TETR</td>
</tr>
<tr>
<td>SUB_SITE</td>
<td>9TE05-MET01</td>
<td>9TE05-MET01</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>9TE05-MET01</td>
</tr>
<tr>
<td>DATE_OBS</td>
<td>25-MAY-94</td>
<td>08-SEP-94</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>25-MAY-94</td>
</tr>
<tr>
<td>TIME_OBS</td>
<td>0</td>
<td>2330</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>2330</td>
</tr>
<tr>
<td>AIR_TEMP_AT_REL_HUM_SENSOR</td>
<td>-3.08</td>
<td>29.81</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>-3.08</td>
</tr>
<tr>
<td>REL_HUM_6M</td>
<td>24.04</td>
<td>102.1</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>24.04</td>
</tr>
<tr>
<td>REL_HUM_9M</td>
<td>13.57</td>
<td>103</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>13.57</td>
</tr>
<tr>
<td>PPDF_1M</td>
<td>-1.949</td>
<td>1387</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>-1.949</td>
</tr>
<tr>
<td>PPDF_9M</td>
<td>-5.677</td>
<td>1827</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>-5.677</td>
</tr>
<tr>
<td>AIR_TEMP_1M</td>
<td>-3.521</td>
<td>30.92</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>-3.521</td>
</tr>
<tr>
<td>AIR_TEMP_9M</td>
<td>.62</td>
<td>33.37</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>.62</td>
</tr>
<tr>
<td>SOIL_TEMP_10CM</td>
<td>-.244</td>
<td>21.92</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>-.244</td>
</tr>
<tr>
<td>SOIL_TEMP_20CM</td>
<td>-.138</td>
<td>18.55</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>-.138</td>
</tr>
<tr>
<td>CRTFCN_CODE</td>
<td>CPI</td>
<td>CPI</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>CPI</td>
</tr>
<tr>
<td>REVISION_DATE</td>
<td>07-DEC-97</td>
<td>07-DEC-97</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>07-DEC-97</td>
</tr>
</tbody>
</table>

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 Cllected -- 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, TIME_OBS, AIR_TEMP_AT_REL_HUM_SENSOR, REL_HUM_6M, REL_HUM_9M, PPFD_1M, PPFD_9M, AIR_TEMP_1M, AIR_TEMP_9M, SOIL_TEMP_10CM, SOIL_TEMP_20CM, CRTFCN_CODE, REVISION_DATE
'NSA-OJP-FLXTR', '9TE05-MET01', 02-JUN-94, 100, 18.64, 40.94, 38.92, 515.1, 19.98, 17.77, 7.59, 7.46, 'CPI', 07-DEC-97
```

8. Data Organization

8.1 Data Granularity
The smallest unit of orderable data is data collected on one day at one site.

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
None.

9.1.1 Derivation Techniques and Algorithms
None.

9.2 Data Processing Sequence
None given.

9.2.1 Processing Steps
None given.

9.2.2 Processing Changes
None given.

9.3 Calculations
None.

9.3.1 Special Corrections/Adjustments
The millivolt signal from the photodiodes was converted into PPFD using the following equation:

$$\text{PPFD} = -1.4 + 71.3 \text{ mv} \quad R^2=0.999$$

This equation was derived from a comparison between a LI-COR quantum sensor and all the photodiodes used in the field. The same equation was used for all photodiode sensors.

9.3.2 Calculated Variables
$$\text{PPFD} = -1.4 + 71.3 \text{ mv} \quad R^2=0.999$$

9.4 Graphs and Plots
None given.

10. Errors

10.1 Sources of Error
The Rohn masts that the light sensors were attached to were not perfectly vertical, so 9-m PPFD sensors were not perfectly horizontal.

10.2 Quality Assessment
None given.

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
All known problems have been removed.

11.3 Usage Guidance
None given.

11.4 Other Relevant Information
None.

12. Application of the Data Set
The data can be used for meteorological and radiation comparison during IFCs, particularly when TE-05 sampled canopy CO₂ for carbon and oxygen isotope analysis.

13. Future Modifications and Plans
None given.

14. Software

14.1 Software Description
None given.

14.2 Software Access
None given.

15. Data Access
The surface meteorological and radiation 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:
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 given.

17.2 Journal Articles and Study Reports


17.3 Archive/DBMS Usage Documentation
None.

18. Glossary of Terms
None.

19. List of Acronyms
- ASCII - American Standard Code for Information Interchange
- BOREAS - Boreal Ecosystem-Atmosphere Study
- BORIS - BOREAS Information System
- CD-ROM - Compact Disk-Read-Only Memory
- DAAC - Distributed Active Archive Center
- EOS - Earth Observing System
- EOSDIS - EOS Data and Information System
- GIS - Geographic Information System
- GSFC - Goddard Space Flight Center
- HTML - HyperText Markup Language
- NASA - National Aeronautics and Space Administration
- NSA - Northern Study Area
- OA - Old Aspen
- OBS - Old Black Spruce
- OJP - Old Jack Pine
- ORNL - Oak Ridge National Laboratory
- PANP - Prince Albert National Park
- PPFD - Photosynthetic Photon Flux Density
- RH - Relative Humidity
- SSA - Southern Study Area
- TE - Terrestrial Ecology
- UBS - Upland Black Spruce
- URL - Uniform Resource Locator
- UTM - Universal Transverse Mercator
20. Document Information

20.1 Document Revision Date
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20.2 Document Review Date(s)
Science Review: 

20.3 Document ID

20.4 Citation
When using these data, please contact the investigators listed in Section 2.3 as well as citations of relevant papers in Section 17.2.

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


Also, cite the BOREAS CD-ROM set as:


20.5 Document Curator

20.6 Document URL
### Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

**BOREAS TE-5 Surface Meteorological and Radiation Data**

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**Abstract:**
The BOREAS TE-5 team collected measurements in the NSA and SSA on gas exchange, gas composition, and tree growth. Measurements of meteorological data, including air and soil temperature, RH, and PPFD, were 30-minute intervals during the 1994 IFCs at various sites in the BOREAS NSA and SSA. The data are provided in tabular ASCII files.