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

Forrest G. Hall and Shelaine Curd, Editors

Volume 143
BOREAS TE-6 1994 Soil and
Air Temperatures in the NSA

J. Norman and T. Wilson

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

October 2000
Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.

- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and mission, often concerned with subjects having substantial public interest.

- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- E-mail your question via the Internet to help@sti.nasa.gov
- Fax your question to the NASA Access Help Desk at (301) 621-0134
- Telephone the NASA Access Help Desk at (301) 621-0390
- Write to:
  NASA Access Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320
Technical Report Series on the
Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall and Shelaine Curd, Editors

Volume 143
BOREAS TE-6 1994 Soil and
Air Temperatures in the NSA

John Norman and Tim Wilson, University of Wisconsin-Madison

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

October 2000
BOREAS TE-6 1994 Soil and Air Temperatures in the NSA

John M. Norman, Tim Wilson

Summary

The BOREAS TE-6 team collected several data sets to examine the influence of vegetation, climate, and their interactions on the major carbon fluxes for boreal forest species. This data set contains measurements of the air temperature at a single height and soil temperature at several depths in the NSA from 25-May to 08-Oct-1994. Chromel-Constantan thermocouple wires run by a miniprogrammable data logger (Model 21X, Campbell Scientific, Inc., Logan, UT) provided direct measurements of temperature. The data are stored in tabular ASCII files.

Table of Contents

1) Data Set Overview
2) Investigator(s)
3) Theory of Measurements
4) Equipment
5) Data Acquisition Methods
6) Observations
7) Data Description
8) Data Organization
9) Data Manipulations
10) Errors
11) Notes
12) Application of the Data Set
13) Future Modifications and Plans
14) Software
15) Data Access
16) Output Products and Availability
17) References
18) Glossary of Terms
19) List of Acronyms
20) Document Information

1. Data Set Overview

1.1 Data Set Identification
BOREAS TE-06 1994 Soil and Air Temperatures in the NSA

1.2 Data Set Introduction
Air and soil temperature data were collected in 1994 at the BOREal Ecosystem-Atmosphere Study (BOREAS) Northern Study Area (NSA) Old Aspen (OA) site. Thirty-minute measurements of soil and mean air temperature were taken below the forest canopy to understand the soil-plant-atmosphere weather conditions for modeling the forest carbon budget.

1.3 Objective/Purpose
The main objective was to measure soil and mean air mean temperature beneath a boreal forest canopy to understand the soil-plant-atmosphere weather conditions for modeling the forest carbon budget.
The temperature within the canopy and the soil relates directly to radiation transport in the canopy and heat movement in the soil. Temperature measurements are important to understand the energy transport in the soil-plant environment. The air and soil temperatures reported here are useful not only as inputs for detailed soil-plant models for energy and mass balances at the soil and canopy surfaces but also for evaluating model predictions of temperature.

1.4 Summary of Parameters
Soil temperature and air temperature.

1.5 Discussion
The mean soil and air temperature within the boreal forest was monitored from 25-May to 08-Oct-1994. In the soil, 23" gauge Chromel-Constantan thermocouples measured temperature at depths of 2, 5, 10, 20, 30, and 50 cm. Above the ground, a 3-mil Chromel-Constantan thermocouple wire, covered with a thin aluminum shield to prevent heating by direct radiation, measured the air temperature at 200 cm above the ground on the north side of a tall tree. A battery-powered miniprogrammable data logger (Model 21X, Campbell Scientific, Inc., Logan, UT) was used to record, process, and store 30-minute averages. Temperature values are expressed in degrees Celsius.

1.6 Related Data Sets
BOREAS AES READAC Surface Meteorological Data
BOREAS AES MARSII Surface Meteorological Data
BOREAS AFM-07 SRC Surface Meteorological Data

2. Investigator(s)

2.1 Investigator(s) Name and Title
John M. Norman
Department of Science
University of Wisconsin-Madison

2.2 Title of Investigation
Measurement and Scaling of Carbon Budgets for Contrasting Boreal Forest Sites

2.3 Contact Information

Contact 1:
John M. Norman
Department of Science
University of Wisconsin-Madison
Soils Building, Rm. #263
1525 Observatory Drive
Madison, WI 53706
(608) 262-4576
(608) 265-2595 (fax)
norman@calshp.cals.wisc.edu

Contact 2:
Shelaine Curd
Raytheon ITSS
Code 923
NASA GSFC
Greenbelt, MD 20771
(301) 286-2447
shelaine.curd@gsfc.nasa.gov
3. Theory of Measurements

None given.

4. Equipment

4.1 Sensor/Instrument Description

Chromel-Constantan thermocouple junctions potted in epoxy were used to measure temperature, and a battery-powered, miniprogrammable data logger (21X Model, Campbell Scientific, Inc., Logan, UT) recorded and stored the data.

4.1.1 Collection Environment

The measurement site was located in the northeast corner of Terrestrial Ecology (TE)-06 team’s allometry plot 1 under the supervision of Tom Gower, University of Wisconsin-Madison. The thermocouples were permanently placed at 5, 10, 20, 30, and 50 cm. All measurements were taken in a single vertical column, one above the other. The thermocouples were buried in the soil permanently except for the thermocouple measuring the air temperature at 2 m above the ground, which was shielded from the sun.

4.1.2 Source/Platform

The thermocouples were permanently buried in the ground, and each sensor was protected from the soil environment with RTV potting compound. The data logger was housed in a weatherproof shelter and placed on the ground several meters away from where the thermocouples were installed in the ground.

4.1.3 Source/Platform Mission Objectives

The objective was to measure temperature changes at the NSA OA site.

4.1.4 Key Variables

Temperature of soil at 2, 5, 10, 20, 30, and 50 cm. Air temperature at 200 cm height.

4.1.5 Principles of Operation

None given.

4.1.6 Sensor/Instrument Measurement Geometry

The thermocouples were installed in the forest floor in a representative location where sometimes the surface of the ground was in a sunfleck and sometimes it was in the shade of a tree crown. The understory around the location was present but sparse. TE-06 attempted to find a location that was representative of the forest floor.

4.1.7 Manufacturer of Sensor/Instrument

The miniprogrammable data logger (21X) was manufactured by Campbell Scientific, Inc., Logan, UT; the thermocouples were prepared in the lab at the Department of Science, University of Wisconsin-Madison.

4.2 Calibration

All thermocouples were calibrated to an accuracy of 0.5 °C.

4.2.1 Specifications

There were no known factors that may have affected calibration, nor operations of analysis of the data collected.
4.2.1.1 Tolerance
Reasonable temperatures should vary from -10 °C to 50 °C, but the measurement device will measure over a much wider range.

4.2.2 Frequency of Calibration
Once before installation.

4.2.3 Other Calibration Information
None.

5. Data Acquisition Methods
Data are continuous point measurements of temperature from 25-May to 08-Oct-1994. The data were downloaded at irregular intervals; weekly during Intensive Field Campaigns (IFCs), and between IFCs the data were stored in the datalogger until the next IFC.

6. Observations

6.1 Data Notes
None given.

6.2 Field Notes

7. Data Description

7.1 Spatial Characteristics
Not applicable.

7.1.1 Spatial Coverage
The North American Datum of 1983 (NAD83) coordinates of the NSA aspen site are:

<table>
<thead>
<tr>
<th>SITE</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSA-OA</td>
<td>55.88691° N</td>
<td>98.67479° W</td>
</tr>
</tbody>
</table>

7.1.2 Spatial Coverage Map
Not available.

7.1.3 Spatial Resolution
Only one profile of sensors was used; it would be reasonable to say that all the measurements were taken within 1 m².

7.1.4 Projection
Not applicable.

7.1.5 Grid Description
Not applicable.
7.2 Temporal Characteristics

7.2.1 Temporal Coverage

The temperature measurements reported here consist of 30-minute averages calculated from 1-minute data measured from 25-May to 08-Oct-1994.

7.2.2 Temporal Coverage Map

Not applicable.

7.2.3 Temporal Resolution

Data were sampled every minute and averaged over 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>VOLTAGE</td>
</tr>
<tr>
<td>SOIL TEMP 2CM</td>
</tr>
<tr>
<td>SOIL TEMP 5CM</td>
</tr>
<tr>
<td>SOIL TEMP 10CM</td>
</tr>
<tr>
<td>SOIL TEMP 20CM</td>
</tr>
<tr>
<td>SOIL TEMP 30CM</td>
</tr>
<tr>
<td>SOIL TEMP 50CM</td>
</tr>
<tr>
<td>AIR TEMP 2M</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>
<tr>
<td>SUB_SITE</td>
<td>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.</td>
</tr>
<tr>
<td>DATE_OBS</td>
<td>The date on which the data were collected.</td>
</tr>
<tr>
<td>TIME_OBS</td>
<td>The Greenwich Mean Time (GMT) when the data were collected.</td>
</tr>
</tbody>
</table>
The measured battery voltage.
The measured battery voltage.

Soil temperature at 2 cm depth.

Soil temperature at 5 cm depth.

Soil temperature at 10 cm depth.

Soil temperature at 20 cm depth.

Soil temperature measured at 30 cm depth.

Soil temperature measured at 50 cm depth.

The air temperature at 2 meters above the ground.

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:

<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>VOLTAGE</td>
<td>[volts]</td>
</tr>
<tr>
<td>SOIL_TEMP_2CM</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>SOIL_TEMP_5CM</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>SOIL_TEMP_30CM</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>SOIL_TEMP_50CM</td>
<td>[degrees Celsius]</td>
</tr>
<tr>
<td>AIR_TEMP_2M</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 sources 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>[Data Logger]</td>
</tr>
<tr>
<td>TIME_OBS</td>
<td>[Data Logger]</td>
</tr>
<tr>
<td>VOLTAGE</td>
<td>[Data Logger]</td>
</tr>
<tr>
<td>SOIL_TEMP_2CM</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>SOIL_TEMP_5CM</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>SOIL_TEMP_30CM</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>SOIL_TEMP_50CM</td>
<td>[Thermometer]</td>
</tr>
<tr>
<td>AIR_TEMP_2M</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 Detect Limit</th>
<th>Data Not Cllctd</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE NAME</td>
<td>NSA-9OA-9TETR</td>
<td>NSA-9OA-9TETR</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SUB SITE</td>
<td>9TE06-TMP01</td>
<td>9TE06-TMP01</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>DATE_OBS</td>
<td>25-MAY-94</td>
<td>08-OCT-94</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</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>
</tr>
<tr>
<td>VOLTAGE</td>
<td>11.17</td>
<td>12.5</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SOIL_TEMP_2CM</td>
<td>.92</td>
<td>19.32</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SOIL_TEMP_5CM</td>
<td>.91</td>
<td>15.15</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SOIL_TEMP_10CM</td>
<td>.67</td>
<td>13.72</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SOIL_TEMP_20CM</td>
<td>.12</td>
<td>11.79</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SOIL_TEMP_30CM</td>
<td>-.07</td>
<td>10.27</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SOIL_TEMP_50CM</td>
<td>-.31</td>
<td>9.27</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>AIR_TEMP_2M</td>
<td>-4.174</td>
<td>31.66</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</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>
</tr>
<tr>
<td>REVISION_DATE</td>
<td>23-APR-98</td>
<td>23-APR-98</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</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 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, TIME_OBS, VOLTAGE, SOIL_TEMP_2CM, SOIL_TEMP_5CM, SOIL_TEMP_10CM, SOIL_TEMP_20CM, SOIL_TEMP_30CM, SOIL_TEMP_50CM, AIR_TEMP_2M, CRTFCN_CODE, REVISION_DATE

'NSA-9OA-9TETR', '9TE06-TMP01', 25-MAY-94, 0, 12.21, 4.58, 3.05, 2.05, .64, .26, .03, 8.5, 'CPI', 23-APR-98

'NSA-9OA-9TETR', '9TE06-TMP01', 25-MAY-94, 30, 12.2, 4.18, 2.89, 1.98, .61, .23, 0.0, 7.76, 'CPI', 23-APR-98

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

None.

9.1.1 Derivation Techniques and Algorithms

None.

9.2 Data Processing Sequence

9.2.1 Processing Steps

The data are recorded, processed, and stored online.

9.2.2 Processing changes

None.

9.3 Calculation

The data reported here are raw temperature measurements in degrees Celsius.

9.3.1 Special Corrections/Adjustments

None.
9.3.2 Calculated Variables
   None.

9.4 Graphs and Plots
   None.

10. Errors

10.1 Sources of Error
   There were no power failures, and all wires were installed in PVC tubing so nothing could chew on them. There were no known errors.

10.2 Quality Assessment

10.2.1 Data Validation by Source
   Temperature data have been collected with great care. The above-ground thermocouple wire is covered with a thin aluminum shield to prevent interference by direct radiation.

10.2.2 Confidence Level/Accuracy Judgment
   The temperature data and accurate to 0.5 °C.

10.2.3 Measurement Error for Parameters
   Calibration was accomplished to 0.2 °C, but TE-06 suggests a measurement accurate of +/-0.5 °C on the data.

10.2.4 Addition Quality Assessments
   None.

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
   No known problems.

11.3 Usage of Guidance
   None given.

11.4 Other Relevant Information
   None given.

12. Application of the Data Set

These data can be used to study temperature variations over time and soil depth.
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 NSA soil and air temperature 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/ [Internet Link].

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

AFM - Airborne Fluxes and Meteorology
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
GMT - Greenwich Mean Time
GSFC - Goddard Space Flight Center
HTML - HyperText Markup Language
IFC - Intensive Field Campaign
NASA - National Aeronautics and Space Administration
NSA - Northern Study Area
OA - Old Aspen
ORNL - Oak Ridge National Laboratory
PANP - Prince Albert National Park
SSA - Southern Study Area
TE - Terrestrial Ecology
URL - Uniform Resource Locator

20. Document Information

20.1 Document Revision Date
Written: 04-Apr-1997
Revised: 26-Jul-1999

20.2 Document Review Date(s)
BORIS Review: 28-Apr-1997
Science Review:

20.3 Document ID
20.4 Citation
When using these data, please contact the investigators listed in Section 2.3 and cite any 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-6 1994 Soil and Air Temperatures in the NSA**

**AUTHOR(S):** John Norman and Tim Wilson
Forrest G. Hall and Shelaine Curd, Editors

**PERFORMING ORGANIZATION NAME(S) AND ADDRESS (ES):**
Goddard Space Flight Center
Greenbelt, Maryland 20771

**SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS (ES):**
National Aeronautics and Space Administration
Washington, DC 20546-0001

**ABSTRACT (Maximum 200 words):**
The BOREAS TE-6 team collected several data sets to examine the influence of vegetation, climate, and their interactions on the major carbon fluxes for boreal forest species. This data set contains measurements of the air temperature at a single height and soil temperature at several depths in the NSA from 25-May to 08-Oct-1994. Chromel-Constantan thermocouple wires run by a miniprogrammable data logger (Model 21X, Campbell Scientific, Inc., Logan, UT) provided direct measurements of temperature. The data are stored in tabular ASCII files.