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

Forrest G. Hall and Sara K. Conrad, Editors

Volume 238

BOREAS TGB-8 Photosynthetic Rate Data
over the SSA-OBS and the SSA-OJP

Manuel Lerdau
State University of New York, Stony Brook

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

November 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 Sara K. Conrad, Editors

Volume 238

BOREAS TGB-8 Photosynthetic Rate Data
over the SSA-OBS and the SSA-OJP

Manuel Lerdau
State University of New York, Stony Brook

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

November 2000
BOREAS TGB-8 Photosynthetic Rate Data over the SSA-OBS and the SSA-OJP

Manuel Lerdau

Summary

The BOREAS TGB-8 team collected data to investigate the controls over NMHC fluxes from boreal forest tree species. This data set includes measurements of photosynthetic rates at mature jack pine and black spruce sites. The data were collected at the OJP and OBS tower flux locations in the BOREAS SSA. These areas contained mature stands of jack pine and black spruce and were the focal sites in the BOREAS program for studies of biosphere/atmosphere exchange from these two habitat types. The OBS site is situated in a black spruce/sphagnum bog with the largest trees 155 years old and 10-15 m tall. The OJP site is in a jack pine forest, 80 to 120 years old, which lies on a sandy bench of glacial outwash with the largest tree standing 15 m tall. Temporally, the data cover the period of 24-May-1994 to 19-Sep-1994. 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 TGB-08 Photosynthetic Rate Data over the SSA-OBS and the SSA-OJP

1.2 Data Set Introduction
The mechanistic controls over nonmethane hydrocarbon (NMHC) fluxes from boreal forest trees were investigated. These studies could be used to modify existing ecosystem models to include NMHC emissions and their response to seasonality and resource variability (primarily water and nitrogen).
1.3 Objective/Purpose
The objective was to measure the photosynthesis at 30 °C and 1000 mmol/m²/s from the BOREal Ecosystem-Atmosphere Study (BOREAS) Southern Study Area (SSA)-Old Black Spruce (OBS) and SSA-Old Jack Pine (OJP).

1.4 Summary of Parameters
Average daily photosynthesis and standard deviation of photosynthesis.

1.5 Discussion
The research was ordered around three general questions: (1) To what extent are leaf carbon balance and isoprene synthase activity (the enzyme responsible for isoprene emission) predictors of NMHC flux? (2) How do leaf carbon balance and isoprene synthase activity depend on nitrogen/water availability and carbon source/sink parameters? and (3) How do we modify the FORES-BGC ecosystem model, based on question 1 and 2, to predict canopy-level NMHC fluxes? Studies included seasonal monitoring of NMHC emissions and its relationship to plant phenology, photosynthesis, respiration, isoprene synthase activity, and leaf starch concentrations.

1.6 Related Data Sets
BOREAS TGB-08 Monoterpene Concentration Data over the SSA-OBS and the SSA-OJP
BOREAS TGB-08 Starch Concentration Data over the SSA-OBS and the SSA-OJP

2. Investigator(s)

2.1 Investigator(s) Name and Title
Manuel Lerdau

2.2 Title of Investigation

2.3 Contact Information

Contact 1:
Dr. Manuel Lerdau
Ecology and Evolution
SUNY
Stony Brook, NY
(516) 632-6633
(516) 632-7626 (fax)
mlerdau@life.bio.sunysb.edu

Contact 2:
Jeffrey A. Newcomer
Raytheon ITSS
Code 923
NASA GSFC
Greenbelt, MD 20771
(301) 286-7858
(301) 286-0239 (fax)
Jeffrey.Newcomer@gsfc.nasa.gov
3. Theory of Measurements

Sample Selection
For the photosynthesis/hydrocarbon measurements, 10 trees of each species were chosen that had sunlit leaves accessible within 3 m of the ground. All measurements were conducted on sunlit leaves that had developed the previous year. Tissue chemistry and gas exchange sampling on sunlit leaves from branches much higher in the canopy showed that there was no significant effect of branch height on photosynthetic rate or on tissue composition (ANOVA, p>0.05, data not shown). The black spruce trees used in the bog transect/tissue chemistry sampling were chosen on the basis of having sunlit leaves accessible within 2 m of the ground.

Sample Procedure
Hydrocarbon emissions: Samples were collected by enclosing branches in a temperature- and light-controlled cuvette connected to a plant gas exchange system (Campbell MPH 1000, Campbell Scientific, Logan, UT) and flowing hydrocarbon-free air over the needles. Temperature was controlled by use of thermoelectric coolers provided by Campbell Scientific, and light intensity was controlled by mounting a projector bulb at a right angle to the top of the glass-topped cuvette. The light was then reflected off of a cold mirror (45° cold mirror, 15-33233, OCLI, Santa Rosa, CA) mounted at a 45° angle to the cuvette. The mirror transmitted light at wavelengths >720 nm and reflected light of shorter wavelengths. Hydrocarbon-free air was produced by pumping ambient air through a clean-air generator (Aadco 5L, AADCO Instruments, Silver Springs, FL) and adding CO₂ back to the entering air stream. All flows and environmental conditions were monitored by the sensors and mass flow controllers of the Campbell MPH 1000.

4. Equipment

4.1 Sensor/Instrument Description
None given.

4.1.1 Collection Environment
Samples were collected under all environmental conditions.

4.1.2 Source/Platform
Trees.

4.1.3 Source/Platform Mission Objectives
The purpose of the trees and branches for this experiment was to support the measurement equipment.

4.1.4 Key Variables
Photosynthetic rate.

4.1.5 Principles of Operation
None given.

4.1.6 Sensor/Instrument Measurement Geometry
None given.
4.1.7 Manufacturer of Sensor/Instrument
Campbell Scientific
AADCO Instruments
Silver Springs, FL
Supelco
Bellafonte, PA
Tekmar
Cincinnati, OH
SKC, Inc.
Eighty Four, PA
Finnigan
San Jose, CA
J&W Scientific
Folsom, CA
Hewlett Packard
LACHAT Inst.
Mequon, WI

4.2 Calibration
None given.

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
Samples were collected by enclosing branches in a temperature- and light-controlled cuvette connected to a plant gas exchange system (Campbell MPH 1000, Campbell Scientific, Logan, UT) and flowing hydrocarbon-free air over the needles. Temperature was controlled by use of thermoelectric coolers provided by Campbell Scientific, and light intensity was controlled by mounting a projector bulb at a right angle to the top of the glass-topped cuvette. The light was then reflected off of a cold mirror (45° cold mirror, 15-33233, OCLI, Santa Rosa, CA) mounted at a 45° angle to the cuvette. The mirror transmitted light at wavelengths >720 nm and reflected light of shorter wavelengths. Hydrocarbon-free air was produced by pumping ambient air through a clean-air generator (Aadco 5L, AADCO Instruments, Silver Springs, FL) and adding CO₂ back to the entering air stream. All flows and environmental conditions were monitored by the sensors and mass flow controllers of the Campbell MPH 1000.
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 for the measurement sites are:

SSA-OBS 53.99° N, 105.12° W
SSA-OJP 53.92° N, 104.69° W

7.1.2 Spatial Coverage Map
None given.

7.1.3 Spatial Resolution
These data are point source measurements taken near the given coordinates.

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 24-May-1994 to 19-Sep-1994.

7.2.2 Temporal Coverage Map
None given.

7.2.3 Temporal Resolution
Monthly averages of the data were submitted.

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>SAMPLE_MONTH</td>
</tr>
<tr>
<td>SPECIES</td>
</tr>
<tr>
<td>SAMPLE_AMOUNT</td>
</tr>
<tr>
<td>MEAN_PHOTOSYNTHETIC_RATE</td>
</tr>
<tr>
<td>STD_ERR_PHOTOSYNTHETIC_RATE</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>SAMPLE_MONTH</td>
<td>The month during which the data were measured.</td>
</tr>
<tr>
<td>SPECIES</td>
<td>Botanical (Latin) name of the species (Genus species).</td>
</tr>
<tr>
<td>SAMPLE_AMOUNT</td>
<td>The number of trees sampled.</td>
</tr>
<tr>
<td>MEAN_PHOTOSYNTHETIC_RATE</td>
<td>Average measured photosynthesis at 30C.</td>
</tr>
<tr>
<td>STD_ERR_PHOTOSYNTHETIC_RATE</td>
<td>Standard error for the concentration measurements.</td>
</tr>
<tr>
<td>CRTFCN_CODE</td>
<td>The BOREAS certification level of the data. Examples are CPI (_checked by PI), CGR (Certified by Group), PRE (Preliminary), and CPI-?? (CPI but questionable).</td>
</tr>
<tr>
<td>REVISION_DATE</td>
<td>The most recent date when the information in the referenced data base table record was revised.</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>SAMPLE_MONTH</td>
<td>[none]</td>
</tr>
<tr>
<td>SPECIES</td>
<td>[none]</td>
</tr>
<tr>
<td>SAMPLE_AMOUNT</td>
<td>[counts]</td>
</tr>
<tr>
<td>MEAN_PHOTOSYNTHETIC_RATE</td>
<td>[micromoles][meter^-2][second^-1]</td>
</tr>
<tr>
<td>STD_ERR_PHOTOSYNTHETIC_RATE</td>
<td>[micromoles][meter^-2][second^-1]</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>[Assigned by BORIS Staff]</td>
</tr>
<tr>
<td>SUB_SITE</td>
<td>[Assigned by BORIS Staff]</td>
</tr>
<tr>
<td>SAMPLE_MONTH</td>
<td>Investigator</td>
</tr>
<tr>
<td>SPECIES</td>
<td>Investigator</td>
</tr>
<tr>
<td>SAMPLE_AMOUNT</td>
<td>Investigator</td>
</tr>
<tr>
<td>MEAN_PHOTOSYNTHETIC_RATE</td>
<td>Campbell MPH 1000</td>
</tr>
<tr>
<td>STD_ERR_PHOTOSYNTHETIC_RATE</td>
<td>Investigator</td>
</tr>
<tr>
<td>CRTFCN_CODE</td>
<td>[Assigned by BORIS Staff]</td>
</tr>
<tr>
<td>REVISION_DATE</td>
<td>[Assigned by BORIS Staff]</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 Limit</th>
<th>Detect Not Collectd</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE_NAME</td>
<td>SSA-OBS-FLXTR</td>
<td>SSA-OJP-FLXTR</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SUB_SITE</td>
<td>TGB08-CON01</td>
<td>TGB08-CON01</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SAMPLE_MONTH</td>
<td>N/A</td>
<td>N/A</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SPECIES</td>
<td>N/A</td>
<td>N/A</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SAMPLE_AMOUNT</td>
<td>10</td>
<td>10</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>MEAN_PHOTOSYNTHETIC_RATE</td>
<td>2.5</td>
<td>10.5</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>STD_ERR_PHOTOSYNTHETIC_RATE</td>
<td>2</td>
<td>6</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>25-MAR-97</td>
<td>25-MAR-97</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 Collected** -- 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 records from a sample data file on the CD-ROM.

```
<table>
<thead>
<tr>
<th>SITE NAME</th>
<th>SUB_SITE</th>
<th>SAMPLE MONTH</th>
<th>SPECIES</th>
<th>SAMPLE AMOUNT</th>
<th>MEAN PHOTOSYNTHETIC RATE</th>
<th>STD_ERR PHOTOSYNTHETIC_RATE</th>
<th>CRTFCN_CODE</th>
<th>REVISION DATE</th>
</tr>
</thead>
</table>
| 'SSA-OBS-FLXTR', 'TGB08-CON01', 'April', 'Picea mariana', 10, 4.7, 3.0, 'CPI', 25-MAR-97
| 'SSA-OBS-FLXTR', 'TGB08-CON01', 'August/September', 'Picea mariana', 10, 10.5, 5.0, 'CPI', 25-MAR-97
| 'SSA-OBS-FLXTR', 'TGB08-CON01', 'July', 'Picea mariana', 10, 9.8, 5.0, 'CPI', 25-MAR-97
```

### 8. Data Organization

#### 8.1 Data Granularity

The smallest unit of data tracked by the BOREAS Information System (BORIS) was the average photosynthetic rate for a given site in a given month.

#### 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 given.

9.1.1 Derivation Techniques and Algorithms
   None given.

9.2 Data Processing Sequence
   None given.

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.

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
    The 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.

11.4 Other Relevant Information
None.

12. Application of the Data Set
These data could be useful in refining plant growth and respiration models by comparing the model results with actual measurements.

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 photosynthetic rate 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: ornl_daac@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  

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 given.

18. Glossary of Terms

None given.

19. List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
</tr>
<tr>
<td>BOREAS</td>
<td>BOREal Ecosystem-Atmosphere Study</td>
</tr>
<tr>
<td>BORIS</td>
<td>BOREAS Information System</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Compact Disk-Read-Only Memory</td>
</tr>
<tr>
<td>DAAC</td>
<td>Distributed Active Archive Center</td>
</tr>
<tr>
<td>EI</td>
<td>Electron Ionization</td>
</tr>
<tr>
<td>EOS</td>
<td>Earth Observing System</td>
</tr>
<tr>
<td>EOSDIS</td>
<td>EOS Data and Information System</td>
</tr>
<tr>
<td>FID</td>
<td>Flame Ionization Detector</td>
</tr>
<tr>
<td>GC/MS</td>
<td>Gas Chromatograph/Mass Spectrometer</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GSFC</td>
<td>Goddard Space Flight Center</td>
</tr>
<tr>
<td>HTML</td>
<td>Hyper-Text Markup Language</td>
</tr>
<tr>
<td>NAD83</td>
<td>North American Datum of 1983</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NMHC</td>
<td>Nonmethane Hydrocarbon</td>
</tr>
<tr>
<td>NSA</td>
<td>Northern Study Area</td>
</tr>
<tr>
<td>OA</td>
<td>Old Aspen</td>
</tr>
<tr>
<td>OBS</td>
<td>Old Black Spruce</td>
</tr>
<tr>
<td>OJP</td>
<td>Old Jack Pine</td>
</tr>
<tr>
<td>ORNL</td>
<td>Oak Ridge National Laboratory</td>
</tr>
<tr>
<td>PANP</td>
<td>Prince Albert National Park</td>
</tr>
<tr>
<td>SSA</td>
<td>Southern Study Area</td>
</tr>
<tr>
<td>TF</td>
<td>Tower Flux</td>
</tr>
<tr>
<td>TGB</td>
<td>Trace Gas Biogeochemistry</td>
</tr>
<tr>
<td>TKN</td>
<td>Total Kjeldahl Nitrogen</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
</tr>
</tbody>
</table>
20. Document Information

20.1 Document Revision Date
Written: 27-Jul-1997
Last updated: 06-Aug-1999

20.2 Document Review Date(s)
Science Review:

20.3 Document ID

20.4 Citation
When using these data, please include the following acknowledgment as well as citations of relevant papers in Section 17.2:
Manuel Lerdau: Department of Ecology and Evolution, State University of New York, Stony Brook, NY 11794-5245 Marcy Litvak and Russell Monson: Department of Environmental, population and Organismic Biology, University of Colorado, Boulder, CO 80309

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 TGB-8 Photosynthetic Rate Data over the SSA-OBS and the SSA-OJP

Manuel Lerdau
Forrest G. Hall and Sara K. Conrad, Editors

Goddard Space Flight Center
Greenbelt, Maryland 20771

National Aeronautics and Space Administration
Washington, DC 20546-0001

M. Lerdau: State University of New York, Stony Brook; S.K. Conrad: Raytheon ITSS

The BOREAS TGB-8 team collected data to investigate the controls over NMHC fluxes from boreal forest tree species. This data set includes measurements of photosynthetic rates at mature jack pine and black spruce sites. The data were collected at the OJP and OBS tower flux locations in the BOREAS SSA. These areas contained mature stands of jack pine and black spruce and were the focal sites in the BOREAS program for studies of biosphere/atmosphere exchange from these two habitat types. The OBS site is situated in a black spruce/sphagnum bog with the largest trees 155 years old and 10-15 m tall. The OJP site is in a jack pine forest, 80 to 120 years old, which lies on a sandy bench of glacial outwash with the largest tree standing 15 m tall. Temporally, the data cover the period of 24-May-1994 to 19-Sep-1994. The data are stored in tabular ASCII files.

14. SUBJECT TERMS
- BOREAS, trace gas biogeochemistry.

17. SECURITY CLASSIFICATION OF REPORT
- Unclassified

18. SECURITY CLASSIFICATION OF THIS PAGE
- Unclassified

19. SECURITY CLASSIFICATION OF ABSTRACT
- Unclassified

20. LIMITATION OF ABSTRACT
- UL