

SNF SITE CHARACTERIZATION DATA: C.JARVIS

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SNF Site Characterization Data: C. Jarvis Data Set Guide Document

Summary:

This data set documentation is currently in work. In the interim, an abstract of the entire Superior National Forest (SNF) data collection activity from which the SNF Site Characterization Data: C.Jarvis data set is a product is being provided.

During the summers of 1983 and 1984, the National Aeronautics and Space Administration (NASA) conducted an intensive experiment in a portion of the Superior National Forest (SNF) near Ely, Minnesota, USA. The purpose of the experiment was to investigate the ability of remote sensing to provide estimates of biophysical properties of ecosystems, such as leaf area index (LAI), biomass and net primary productivity (NPP). The study area covered a 50 x 50 km area centered at approximately 48 degrees North latitude and 92 degrees West longitude in northeastern Minnesota at the southern edge of the North American boreal forest. The SNF is mostly covered by boreal forest. Boreal forests were chosen for this project because of their relative taxonomic simplicity, their great extent, and their potential sensitivity to climatic change. Satellite, aircraft, helicopter and ground observations were obtained for the study area.

These data comprise a unique dataset for the investigation of the relationships between the radiometric and biophysical properties of vegetated canopies. This is perhaps the most complete dataset of its type ever collected over a forested region. A key goal of the experiment was to use the aircraft measurements to scale up to satellite observations for the remote sensing of biophysical parameters.

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1. Data Set Overview:

Data Set Identification:

SNF Site Characterization Data: C.Jarvis.

Data Set Introduction:

These data comprise a unique dataset for the investigation of the relationships between the radiometric and biophysical properties of vegetated canopies. This is perhaps the most complete dataset of its type ever collected over a forested region.

Objective/Purpose:

The purpose of this study was to investigate the ability of remote sensing to provide estimates of biophysical properties of ecosystems, such as leaf area index (LAI), biomass and net primary productivity (NPP). A key goal of the experiment was to use the aircraft measurements to scale up to satellite observations for the remote sensing of biophysical parameters.

Summary of Parameters:

There are twenty-two (22) parameters for this dataset. Items 1 and 2 refer to the site and the specific plot studied within that site. 1. Site Identification 2. Plot Identification 3. Percent of total canopy closure 4. Percent of ground cover that is rock 5. Percent of ground cover that is soil 6. Percent of ground cover that is herbaceous matter 7. Percent of ground cover that is low shrubs 8. Percent of ground cover that is woody debris (boles, logs, etc.) 9. Percent of ground covered with spagnum and other mosses 10. Soil type information code 11. Soil color code 12. Soil moisture code 13. Percent of sand in the soil, based on texture 14. Percent of silt in the soil, based on texture 15. Percent of clay in the soil, based on texture 16. Depth of soil to bedrock or boulders (inches) 17. Presence of rock fragments in soil sample 18. Visual assessment of canopy density 19. Visual assessment of understory density 20. Visual assessment of ground cover density 21. Percent slope of the plot 22. The aspect of the plot

Discussion:

This data set documentation is currently in work. In the interim, an abstract of the entire Superior National Forest (SNF) data collection activity from which the SNF Site Characterization Data: C.Jarvis data set is a product is being provided.

During the summers of 1983 and 1984, the National Aeronautics and Space Administration (NASA) conducted an intensive experiment in a portion of the Superior National Forest (SNF) near Ely, Minnesota, USA. The purpose of the experiment was to investigate the ability of remote sensing to provide estimates of biophysical properties of ecosystems, such as leaf area index (LAI), biomass and net primary productivity (NPP). The study area covered a 50 x 50 km area centered at approximately 48 degrees North latitude and 92 degrees West longitude in northeastern Minnesota at the southern edge of the North American boreal forest. The SNF is mostly covered by boreal forest. Boreal forests were chosen for this project because of their relative taxonomic simplicity, their great extent, and their potential sensitivity to climatic change. Satellite, aircraft, helicopter and ground observations were obtained for the study area. These data comprise a unique dataset for the investigation of the relationships between the radiometric and biophysical properties of vegetated canopies. This is perhaps the most complete dataset of its type ever collected over a forested region.

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Detailed vegetation data were collected on the ground for about 100 sampled sites. These sites represent a range of stand density and age for spruce and aspen and also include jackpine and mixed stands. At each site, five circular subplots of 16 meters in diameter were sampled within a large plot of 60 meters in diameter. Within the subplots, all woody stems over 2 meters in height were tallied by species, diameter, and height. Within each subplot, coverage by vegetation was determined for the canopy, subcanopy and understory. Thirty each of black spruce and aspen trees from outside the plots were sacrificed and dimension analysis relations developed between diameter at breast height, biomass and leaf area index. Also, above-ground NPP was estimated for each test site. For the aspen sites, bark area and understory leaf area indexes were found. During the spring, measurements of understory leaf extension and canopy coverage were made on several days to describe the phenology of an aspen stand.

Measurements of the optical properties of canopy components were made for wavelengths between 0.35 and 2.1 micrometers. Reflectance and transmittance properties of leaves and needles of eight major overstory tree species and three understory shrubs were measured. Multiple measurements of aspen and spruce allow an investigation of the variability of optical properties within a species, spagnum moss and leaf litter. Above-canopy reflectance was observed by a helicopter-mounted Barnes Modular Multiband Radiometer (MMR). The helicopter MMR data have a spatial resolution of approximately 32 meters. In 1983, 10 days of data were collected between May and October, with a total of 105 sites observed. In 1984, 8 days of data were collected between May and September, with a total of 29 sites observed. Several sites have multiple observations, to allow studies of seasonal variation. Thematic Mapper Simulator (TMS) data were collected from the NASA C-130 flying over the SNF. The flights were in a 'criss-cross' pattern to allow observation of the same location with multiple sun and view angles. The TMS scans out to 50 degrees off nadir; in flights at 5000 feet above ground level, a nadir pixel covers 3.81 meters along the scan. Three days of TMS data are presented; these data have been atmospherically corrected and calibrated to determine surface reflectance. A key goal of the experiment was to use the aircraft measurements to scale up to satellite observations for the remote sensing of biophysical parameters.

Related Data Sets:

Not available.

2. Investigator(s):

Investigator(s) Name and Title:

Dr. Celeste Jarvis
NASA Headquarters

Title of Investigation:

Biophysical, Morphological, Canopy Optical Property, and Productivity Data on the Superior National Forest.

Contact Information:

Dr. Celeste Jarvis
NASA Headquarters
Telephone: 1 (202) 488-5126
Email: cjarvis@mail.hq.nasa.gov

3. Theory of Measurements:

Not available.

4. Equipment:

Sensor/Instrument Description:

Collection Environment:

Ground-based.

Source/Platform:

Field Investigation.

Source/Platform Mission Objectives:

Not available.

Key Variables:

- Canopy characteristics
- Forest composition/structure
- Litter characteristics
- Soil color
- Soil consistence
- Soil depth
- Soil moisture
- Soil texture
- Vegetation cover

Principles of Operation:

Not available.

Sensor/Instrument Measurement Geometry:

Not available.

Manufacturer of Sensor/Instrument:

Not available.

Calibration:

Not available.

5. Data Acquisition Methods:

Not available.

6. Observations:

Data/Field Notes:

Not available.

7. Data Description:

Spatial Characteristics:

The study area covered a 50 x 50 km area centered at approximately 48 degrees North latitude and 92 degrees West longitude in northeastern Minnesota at the southern edge of the North American boreal forest.

Temporal Characteristics:

During the summers of 1983 and 1984, the National Aeronautics and Space Administration (NASA) conducted an intensive experiment in a portion of the Superior National Forest (SNF) near Ely, Minnesota, USA.

Data Characteristics:

There are twenty-two (22) parameters for these datasets. Items 1-2 refer to the site and the plot, respectively.

1.
variable=site_id
definition=site where data were gathered
minimum=300
maximum=335
2.
variable=plot_id
definition=Plot ID within the site
minimum=1
maximum=5
3.
variable=canclosr
definition=Percent of total canopy closure
units=%
minimum=0
maximum=90
4.
variable=pct_rock

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definition=Percent of ground cover that is rock
units=%
minimum=0
maximum=100

5.
variable=pct_soil
definition=Percent of ground cover that is soil
units=%
minimum=0
maximum=100

6.
variable=pct_herb
definition=Percent of ground cover that is herbaceous matter
units=%
minimum=0
maximum=100

7.
variable=pct_shrub
definition=Percent of ground cover that is low shrubs
units=%
minimum=0
maximum=100

8.
variable=pct_dbrs
definition=Percent of ground cover that is woody debris (boles, logs, etc.)
units=%
minimum=0
maximum=90

9.
variable=pct_moss
definition=Percent of ground covered with spagnum and other mosses
units=%
minimum=0
maximum=90

10.
variable=soiltype
definition=Soil type information code
code=TIL: glacial till
code=LAC: lacustrine
code=ORG: organic
code=RCK: exposed bedrock

11.
variable=soilcolr
definition=Soil color code

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code=BL: black
code=BR: brown
code=GR: gray
code=WT: white
code=MNA: not applicable (no soil)

12.

variable=soilmstr
definition=Soil moisture code
code=WET: wet
code=MST: moist
code=MED: moderatly dry
code=DRY: dry
code=NAA: not applicable (no soil)

13.

variable=spetsand
definition=Percent of sand in the soil, based on texture
units=%
minimum=0
maximum=100

14.

variable=spetsilt
definition=Percent of silt in the soil, based on texture
units=%
minimum=0
maximum=90

15.

variable=sptclay
definition=Percent of clay in the soil, based on texture
units=%
minimum=0
maximum=90

16.

variable=soil_dep
definition=Depth of soil to bedrock or boulders (inches) (-999 means no depth was >36 inches)
units=inches
minimum=0
maximum=24

17.

variable=rockfrag
definition=Presence of rock fragments in soil sample
code=PL: pebbles
code=ST: stones
code=RK: rocks
code=BL: boulders

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18.

variable=can_dens
 definition=Visual assessment of canopy density
 code=DEN: dense
 code=MDN: moderatly dense
 code=MOD: moderate
 code=MSP: moderatly sparse
 code=SPR: sparse

19.

variable=undstden
 definition=Visual assessment of understory density
 code=DEN: dense
 code=MDN: moderatly dense
 code=MOD: moderate
 code=MSP: moderatly sparse
 code=SPR: sparse

20.

variable=grcovden
 definition=Visual assessment of ground cover density
 code=DEN: dense
 code=MDN: moderatly dense
 code=MOD: moderate
 code=MSP: moderatly sparse
 code=SPR: sparse

21.

variable=slope
 definition=Percent slope of the plot
 units=%
 minimum=0
 maximum=40

22.

variable=aspect
 definition=The aspect of the plot
 units=degrees clockwise from north
 minimum=0
 maximum=340

Sample Data Record:

site_id	plot_id	canclotr	pct_rock	pct_soil	pct_herb
300	1	60	5	5	35
pct_shrb	pct_dbrs	pct_moss	soiltype	soilcolr	soilmstr
50	5	0	"TIL"	"-999"	"MST"
spctsand	spctsilt	spctclay	soil_dep	rockfrag	can_dens
30	50	20	-999	"BL"	"MDN"

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undstden	grcovden	slope	aspect
"DEN"	"DEN"	5	-999

8. Data Organization:

Data Granularity:

The data file associated with the C. Jarvis SNF Site Characterization is listed below.

1. Data File cj_sites.dat 53.7 KBytes

Period: 10 May 1984 through 12 Jun 1984

Latitude: 48.17N To 47.66N, Longitude: 91.77W To 92.51W

A general description of data granularity as it applies to the IMS appears in the [EOSDIS Glossary](#).

Data Format:

The data files associated with this data set consist of numeric and character fields of varying lengths aligned in columns. The first row of each data file contains the 8 character SAS variable name that links to the data format definition file. Character fields are enclosed in double quotes and numeric fields are listed without quotes.

Below are the first three lines in the data file.

site_id	plot_id	canclosr	pct_rock	pct_soil	pct_herb	pct_shrb
300	1	60	5	5	35	50
300	2	40	10	5	60	25

Missing data values can be of two varieties:

1. Values that were identified as missing in the original data files. Missing numeric values of this type are identified in these data as -999.
2. Those holes that were created as a result of combining files that contained a slightly different variable set. Missing values of this type are identified in these data files as empty double quotes for character fields and a single period, '.' for numeric fields.

9. Data Manipulations:

Not available.

10. Errors:

Sources of Error:

Not available.

Quality Assessment:

Data Validation by Source:

Not available.

Confidence Level/Accuracy Judgment:

Not available.

Measurement Error for Parameters:

Not available.

Additional Quality Assessments:

Not available.

Data Verification by Data Center:

The Superior National Forest data was received from the Goddard Space Flight Center in three media:

- As data dumps from the original Oracle SNF database maintained by GSFC, transferred electronically from the GSFC system to the ORNL system;
- As ASCII files that mirrored the tables published in the Tech Memo; and
- As hard copy (Tech Memo).

Data from both electronic sources were input into SAS by ORNL DAAC data management staff and compared using computer code developed to process the SNF data. In many cases, the data values from both sources were found to be identical. In some cases, however, differences were identified and the providers of the data were consulted to resolve inconsistencies.

Additionally, some variable columns were available in one source, but not the other for various reasons. For example, some calculated variables/columns were provided in the ASCII files (reflecting the Tech Memo tables) that were not stored in the Oracle database for purposes of space conservation.

For similar reasons, coded values were used for many of the site and species identifier variables. A separate reference table was provided to link the coded variable with its definition, e.g., the SPECIES_REF file and the SITE_REF file.

The database produced by the ORNL DAAC is a hybrid product that is a composite of data and information extracted from all three source media. In data sets where coded variables were included, the code definition variables have been added to improve usability of the data set as a stand-alone product.

Therefore the ASCII files that are available through the ORNL DAAC on-line search and order systems are output from a data set that is a product of the essential core of numeric data provided by the data source (GSFC), augmented with additional descriptive information provided by GSFC and reorganized by the ORNL DAAC into a data structure consistent with other similar data sets maintained by the ORNL DAAC.

11. Notes:

Limitations of the Data:

Not available.

Known Problems with the Data:

None known at this revision.

Usage Guidance:

Not available.

Any Other Relevant Information about the Study:

None.

12. Application of the Data Set:

The aircraft measurements in this data set can be used to scale up to satellite observations for the remote sensing of biophysical parameters.

13. Future Modifications and Plans:

None known at this revision.

14. Software:

Not available.

15. Data Access:

Contact Information:

ORNL DAAC User Services
Oak Ridge National Laboratory
Telephone: (865) 241-3952
FAX: (865) 574-4665
Email: ornldaac@ornl.gov

Data Center Identification:

ORNL Distributed Active Archive Center
Oak Ridge National Laboratory
Telephone: (865) 241-3952

FAX: (865) 574-4665

Email: ornl_daac@ornl.gov

Procedures for Obtaining Data:

Users may place requests by telephone, electronic mail, or FAX. Data is also available via the World Wide Web at <http://daac.ornl.gov>.

Data Center Status/Plans:

The Superior National Forest Data is available from the ORNL DAAC. Please contact the ORNL DAAC User Services Office for the most current information about these data.

16. Output Products and Availability:

Available via FTP or on CD-ROM.

17. References:

Not available.

Archive/DBMS Usage Documentation.

Contact the EOS Distributed Active Archive Center (DAAC) at Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee (see the [Data Center Identification Section](#)). Documentation about using the archive and/or online access to the data at the ORNL DAAC is not available at this revision.

18. Glossary of Terms:

A general glossary for the DAAC is located at [EOSDIS Glossary](#).

19. List of Acronyms:

URL Uniform Resource Locator

A general list of acronyms for the DAAC is available at <http://cdiac.esd.ornl.gov/cdiac/pns/acronyms.html>.

20. Document Information:

Not available.

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