

Meteorology (OTTER)

Summary:

Meteorology data collected on an hourly basis from stations located near the OTTER sites in 1990 and summarized to monthly data.

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:

Data Set Identification:

Meteorology (OTTER)

Data Set Introduction:

The Oregon Transect Ecosystem Research (OTTER) Project was a cooperative effort between NASA and several universities to discern the ecology of western coniferous forests using remote sensing technology supported by ground observations. OTTER is an interdisciplinary project that tested a model that estimated the major fluxes of carbon, nitrogen, and water through a temperate coniferous forest ecosystem.

Six Oregon sites across an elevational and climatic gradient were intensively studied. The transect began at the Pacific coast at the site called Cascade Head, passed through the outskirts of Corvallis, through a dense Douglas fir forest at Scio, through a mountain hemlock/subalpine fir community at Santiam Pass, through a Ponderosa pine community near Metolius, and ended at a site east of Sisters called Juniper. In all, the transect stretched some 300 kilometers west to east.

Goals of the project were to simulate and predict ecosystem processes such as photosynthesis, transpiration, above-ground production, nitrogen transformation, respiration, decomposition, and hydrologic processes; combine field, lab, and remote sensing techniques to estimate key vegetation and environmental parameters; construct a "geo-referenced" database for extrapolation and testing of principles, techniques, and prediction; and verify the predictions through direct measurements of process rates or controls on processes.

Objective/Purpose:

OTTER meteorological data were summarized monthly and hourly.

Summary of Parameters:

Five parameters were investigated in this study: Atmospheric temperature, precipitation, relative humidity, shortwave radiation, and soil temperature.

Discussion:

Beginning in the summer of 1989, a meteorological station was established at five sites. The station used for site 5, Metolius, also served for site 6, named Juniper. The meteorological stations (Campbell Scientific Instruments, Inc., Logan, UT) were located no more than 15 kilometers from the forest stand.

Related DataSets:

[Canopy Chemistry](#) [Forest-BGC Model](#) [Leaf Area Index Data](#) [Leaf Reflectances: LICOR](#) [Leaf Reflectances: Perkin-Elmer](#) [Optical Thickness Data: Aircraft](#) [Optical Thickness Data: Ground](#) [Reflectance Reference Targets](#) [SE-590 Field-Measured Reflectances](#) [SE-590 Lab-Measured Reflectances](#) [SE-590 Landscape Reflectances](#) [SE-590 Low Altitude Reflectances](#) [Timber Measurements](#)

2. Investigator(s):

Investigator(s) Name and Title:

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Addresses: Oregon State University

Telephone Numbers: 1-(541)-737-2244

Electronic Mail Address: <http://www.fsl.orst.edu/fslhome.html>

Title of Investigation:

OTTER Meteorological Data

Contact (for Data Production Information):

Name: ORNL DAAC User Services Office

Address: Oak Ridge National Laboratory U.S.A.

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3. Theory of Measurements:

Information not available.

4. Equipment:

Sensor/Instrument Description:

- Barometer: An instrument used for determining atmospheric pressure. The two most common barometers are the mercury barometer and the aneroid barometer.
- Pyranometer: An instrument that measures shortwave radiation over the whole hemisphere.
- Rain Gauge: An instrument used for measuring the amount of precipitation (rainfall) received.
- Thermometer: An instrument used for measuring temperature.

Collection Environment:

Open-air forest.

Source/Platform:

Meteorological Station

Source/Platform Mission Objectives:

To record hourly and daily meteorological parameters such as relative humidity, air temperature, solar radiation, and precipitation.

Key Variables:

Information not available.

Principles of Operation:

Information not available.

Sensor/Instrument Measurement Geometry:

Information not available.

Manufacturer of Sensor/Instrument:

Information not available.

Calibration:

Calibration information is not available.

5. Data Acquisition Methods:

Air temperature, precipitation, relative humidity and total incident shortwave solar radiation (400-1100 nm) were collected every minute and then integrated or averaged hourly and recorded on an internal data logger. At approximately one month intervals, the data logger files were transferred to the memory on a portable computer. Through the course of the study, some instrument problems were detected.

6. Observations:**Data Notes:**

Beginning in approximately June 1990, the relative humidity data from four of the stations (excluding site 4) began to decline from expected values. Readings decreased randomly in discrete steps due to a decrease in the sensor sensitivity resulting from the moist climate of Oregon.

Separately, at site 4, named Santiam Pass, heavy snow pack conditions necessitated the removal of the meteorological station for a 5 month period (January 1 to May 8, 1990). Comparable data were obtained from a nearby meteorological station operated by the Oregon Department of Transportation which reports to the NOAA monthly climate data summaries.

Field Notes:

Information not available.

7. Data Description:**Spatial Characteristics:****Spatial Coverage:**

Site 1: Cascade Head Latitude 44 03' N, Longitude 123 57' 30" W Site 1A: Cascade Head Alder Stand Latitude 44 03' N, Longitude 123 57' 30" W Site 2: Warings Woods Latitude 44 36' N, Longitude 123 16' W Site 3: Scio Control Latitude 44 40' 30" N, Longitude 123 36' 40" W Site 3F: Scio Fertilized Latitude 44 40' 30" N, Longitude 123 36' 40" W Site 4: Santiam Pass Latitude

44 025' 20" N, Longitude 121 50' 20" W Site 5: Metolius Control Latitude 44 25' N, Longitude 121 40' W Site 5: Metolius Fertilized Latitude 44 25' N, Longitude 123 40' W Site 6: Juniper Latitude 44 17' 30" N, Longitude 121 20' W

Spatial Coverage Map:

Not applicable.

Spatial Resolution:

Not applicable.

Projection:

Not applicable.

Grid Description:

Not applicable.

Temporal Characteristics:

Temporal Coverage:

6 June 1989 through 4 January 1991

Temporal Coverage Map:

Not applicable.

Temporal Resolution:

Hourly and monthly.

Data Characteristics:

Parameter/Variable:

- Atmospheric Temperature
- Precipitation
- Relative Humidity
- Shortwave Radiation
- Soil Temperature

Variable Description/Definition:

- Atmospheric Temperature: The degree of hotness or coldness of the atmosphere. It is also a measure of the average speed or kinetic energy of the atoms and molecules within the atmosphere.
- Precipitation: A deposit on the earth of hail, mist, rain, sleet, or snow.
- Relative Humidity: The ratio of the amount of water vapor actually present in the air compared to the amount of water vapor the air can hold at that particular temperature and pressure. The ratio of the air's actual vapor pressure to its saturation vapor pressure.
- Shortwave Radiation: The radiant energy emitted from the sun, in the visible and near ultraviolet wavelengths.
- Soil Temperature: A measure of the thermal energy of a soil.

Unit of Measurement:

- Mean air temperature: Degrees Celsius
- Maximum air temperature: Degrees Celsius
- Minimum air temperature: Degrees Celsius
- Mean daytime air temperature: Degrees Celsius
- Mean nighttime air temperature: Degrees Celsius
- Mean relative humidity: Percentage (%)
- Mean daytime relative humidity: Percentage (%)
- Total precipitation: Millimeters/Day
- Mean 24 hour precipitation: Millimeters/Hour
- Mean 24 hour soil temperature: Degrees Celsius
- Total 24 hour short-wave radiation: Kilowatts/square meters/day
- Mean 24 hour short-wave radiation: Kilowatts/square meters/hour

Data Source:

Meteorological Station.

Data Range:

- Mean air temperature: Approximately 11 <--> 20
- Maximum air temperature: Approximately 13 <--> 32
- Minimum air temperature: Approximately 6 <--> 14
- Mean daytime air temperature: Approximately 11 <--> 23
- Mean nighttime air temperature: Approximately 8 <--> 16
- Mean relative humidity: Approximately 72 <--> 100
- Mean daytime relative humidity: Approximately 76 <--> 100
- Total precipitation: Approximately 0 <--> 30
- Mean 24 hour precipitation: Approximately 0 <--> 1.5
- Mean 24 hour soil temperature: Not available.
- Total 24 hour short-wave radiation: Approximately 5000 <--> 30000
- Mean 24 hour short-wave radiation: Approximately 150 <--> 2000

Sample Data Record:

- Mean air temperature: 14.2 14.1 12.8 12.4 11.8 12.4 14.1 13.4 12.3 11.9
- Maximum air temperature: 18.9 17.5 17.0 20.3 14.5 13.9 18.4 15.0 17.0 17.2
- Minimum air temperature: 10.3 11.8 8.2 6.0 8.1 10.8 10.6 11.0 8.6 6.1
- Mean daytime air temperature: 15.1 14.9 13.9 14.0 12.3 12.8 15.0 13.9 13.5 13.4
- Mean nighttime air temperature: 12.2 12.5 10.8 8.8 10.4 11.6 12.1 12.5 10.0 8.5
- Mean relative humidity: 82.0 80.8 81.7 87.6 97.3 69.4 93.5 98.8 87.6 85.7
- Mean daytime relative humidity: 77.9 77.4 78.0 82.9 96.4 95.6 90.1 98.3 82.7 81.0
- Total precipitation: 0.0 0.0 0.0 0.0 0.0 0.3 0.5 12.7 0.0 0.0
- Mean 24 hour precipitation: 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.5 0.0
- Mean 24 hour soil temperature: Not available.
- Total 24 hour short-wave radiation: 2582.4 26507.8 13859.0 28793.5 7781.8 5745.9
13939.3 5583.4 18954.5 27925.7
- Mean 24 hour short-wave radiation: 1680.0 1722.4 899.7 1867.8 504.4 372.2 902.4 361.3
1225.8 1805.3

8. Data Organization:

Data Granularity:

The ms101.dat file contains 11 fields of hourly meteorological data, while the ms102.dat file contains 18 fields of daily meteorological data. The accompanied .doc files explain the various fields found in the analogous .dat file.

Data Format:

There are two ASCII data sets: ms101.dat and ms102.dat and are accompanied by analogous ASCII companion files: ms101.doc and ms102.doc. In addition, a data set companion file is also available: metchem.doc and is included in the complete data set.

9. Data Manipulations:

Formulae:

Derivation Techniques and Algorithms:

Information not available.

Data Processing Sequence:

Data processing information is not available.

Calculations:

Special Corrections/Adjustments:

The data were corrected using the logic developed by Running and others (1987) in which minimum temperature serves as an approximation of dew point temperature, with relative humidity then varying by a known function with daytime temperature. When this was tested against earlier calibrated data, the procedure provided a good agreement with the observed relative humidities at sites 2 and 3 ($R^2 = 0.84$ and 0.79 , respectively). Humidity correction dates (1990) for each station is as follows: Site 1, June 1; Site 2, April 1; Site 3, April 1; Site 4, no correction; Site 5, April 1.

Calculated Variables:

Information not available.

Graphs and Plots:

Maps are submitted separately. Sites 2,4 and 6 contain one plot each, chosen to represent a uniform and representative sample of the area. Site 1 contains 2 plots, one containing primarily western hemlock and one containing primarily red alder. Sites 3 and 5 contain one fertilized and one unfertilized plot at each location.

10. Errors:

No information is available on the possible errors that were encountered during the hourly meteorological measurements.

11. Notes:

Notes about the data are not available.

12. Application of the Data Set:

The meteorological data are a key portion in the OTTER project goals. They give hard, physical data about the sites in the study. The combination of this field work with laboratory study and remote sensing techniques will help to simulate and predict ecosystem processes.

13. Future Modifications and Plans:

No future plans, the OTTER campaign is complete.

14. Software:

Software Description:

The public domain software package, Imdisp, is provided for image display on IBM compatibles. The popular shareware program, Stuffit, is necessary to extract the execution file for the Macintosh image display program, Image4pds.

Software Access:

Software to display most of the OTTER image data (except Aviris and Asas data) on Macintosh and IBM personal computers (and compatibles) is provided on the CD-Rom disc containing the data sets.

15. Data Access:

Contacts for Archive/Data Access Information:

Name: ORNL DAAC User Services Office

Address: ORNL DAAC User Services Office Oak Ridge National Laboratory U.S.A.

Telephone Number: 1-(865)-241-3952

Electronic Mail Address: ornl~~l~~daac@ornl.gov

Data Center Identification:

ORNL DAAC

Procedures for Obtaining Data:

Contact the ORNL DAAC User Services Office Oak Ridge National Laboratory U.S.A.

Telephone: 1-(865)-241-3952 FAX: 1-(865)-574-4665 Internet: ornl~~l~~daac@ornl.gov

Data Center Status/Plans:

To be determined.

16. Output Products and Availability:

Available via FTP or on CD-ROM.

Also available on-line via the World Wide Web at <http://daac.ornl.gov>.

17. References:

Information is not available.

18. Glossary of Terms:

Glossary terms can be found in the [Glossary](#) list.

19. List of Acronyms:

Additional acronyms can be found in the [Acronyms](#) list. ESD Environmental Sciences Division (Oak Ridge National Laboratory) FTP File Transfer Protocol NASA National Aeronautics and Space Administration km kilometers ORNL Oak Ridge National Laboratories Oak Ridge, Tennessee, U.S.A. OTTER Oregon Transect Ecosystem Research

20. Document Information:

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Document

http://daac.ornl.gov/OTTER/guides/Hourly_Meteorology_Data.html