

Forest-BGC Model (OTTER)

Summary:

Six parameters were investigated and predicted in Running's BGC-forest model: the decomposition ratio of detritic material; the amount of water that was evaporated, respired, and transpired; the net photosynthesis that occurred, and the soil moisture content.

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1. Data Set Overview:

Data Set Identification:

Forest-BGC Model (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:

To simulate a forest ecosystem through the use of a computer model and through the use of the model be able to predict a variety of parameters.

Summary of Parameters:

Six parameters were investigated and predicted in the BGC-forest model: the decomposition ratio of detritic material; the amount of water that was evaporated, respired, and transpired; the net photosynthesis that occurred; and the soil moisture content.

Discussion:

Information not available.

Related Data Sets:

[Canopy Chemistry Leaf Area Index Data Leaf Reflectances: LICOR Leaf Reflectances: Perkin-Elmer Meteorology 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:

Name: Steven Running Professor of Ecology Director of the Numerical Terradynamics Simulation Group

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Title of Investigation:

OTTER Forest-BGC Simulation

Contact (for Data Production Information):

Name: ORNL DAAC User Services Office

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

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

Electronic Mail Address: ornldaac@ornl.gov

3. Theory of Measurements:

Information not available.

4. Equipment:

Sensor/Instrument Description:

Analysis: The process of an individual examining the information collected during a scientific investigation. Often this takes the form of reviewing and working with output from modeling activities (by computer) to give meaning to the information.

Collection Environment:

Not applicable.

Source/Platform:

Computer model.

Source/Platform Mission Objectives:

To be able to predict key parameter in a forest ecosystem through the use of computer modeling.

Key Variables:

Not applicable.

Principles of Operation:

Not applicable.

Sensor/Instrument Measurement Geometry:

Not applicable.

Manufacturer of Sensor/Instrument:

Information not available.

Calibration:

Calibration information is not available.

5. Data Acquisition Methods:

Computer-generated data.

6. Observations:

Observation information is not available.

7. Data Description:

Spatial Characteristics:

Spatial Coverage:

Site 1: Cascade Head Latitude 44 03' N, Longitude 123 57' 30" W Site 2: Warings Woods
Latitude 44 36' N, Longitude 123 16' W Site 3: Scio Latitude 44 40' 30" N, Longitude 123 36'
40" W Site 5: Metolius Latitude 44 25' N, Longitude 121 40' W

Spatial Coverage Map:

Information not available.

Spatial Resolution:

Not applicable.

Projection:

Not applicable.

Grid Description:

Not applicable.

Temporal Characteristics:

Temporal Coverage:

First simulation run 06 June 1988. Revised 04 February 1991

Temporal Coverage Map:

Not applicable.

Temporal Resolution:

Not applicable

Data Characteristics:

Parameter/Variable:

- Decomposition Ratio
- Evaporation
- Net Photosynthesis
- Respiration
- Soil Moisture Content
- Transpiration

Variable Description/Definition:

- Decomposition Ratio: Proportion of decomposed material to non-decomposed material.
- Evaporation: Process by which a liquid (water) changes into a gas.
- Net Photosynthesis: Rate at which green plants convert CO₂ and water into organic compounds using energy and light and releasing O₂.
- Respiration: Energy-yielding oxidative reaction in living matter.
- Soil Moisture Content
- Transpiration: Process by which water in plants is transferred as water vapor to the atmosphere.

Unit of Measurement:

- Decomposition Ratio: Percentage (%)
- Evaporation: cubic meters (m³)
- Net Photosynthesis: kilograms (kg)
- Respiration: kilograms (kg)
- Soil Moisture Content: cubic meters (m³)
- Transpiration: cubic meters (m³)

Data Source:

Computer Model

Data Range:

- Decomposition Ratio: 3.0E+3, no variance
- Evaporation: 0.0, no variance
- Net Photosynthesis: 0.0, no variance

- Respiration: 0.0, no variance
- Soil Moisture Content: 452.0 <--> 2350.0
- Transpiration: 0.0, no variance

Sample Data Record:

- Decomposition Ratio: 3.0E+3
- Evaporation: 0.0
- Net Photosynthesis: 0.0
- Respiration: 0.0
- Soil Moisture Content: 2350.0
- Transpiration: 0.0

8. Data Organization:

Data Granularity:

Each file in the data set consists of fields that give the results of the computer simulation. All six parameters that were the primary objective of the simulation can be found within.

Data Format:

There are four ASCII data files available for downloading: CH31jan91.ini, ME31jan91.ini, SC31jan91.ini, and WW31jan91.ini. Two ASCII companion files complete the data set: dayfile.doc and running.doc.

9. Data Manipulations:

No data manipulation information is available.

10. Errors:

No information is available on the possible errors that were encountered during running of the simulation.

11. Notes:

Limitations of the Data:

The Santiam site did not have a complete climate file so it is not included in the data set.

Known Problems with the Data:

The model over predicts canopy precipitation interception and possible leaf conductance for high LAI stands. The fix for this problem should not be done casually because it will help define an important research question. There was insufficient time to define site specific leaf areas, soil water capacities, stem, and other stand carbon variables. The simulations, therefore, were not built as carefully as would have been liked.

Usage Guidance:

The results should be treated as a first warmup to look at relative seasonal timing of ecosystem activity and relative differences between sites and as a practice for producing, retrieving, and analyzing the simulations.

Any Other Relevant Information about the Study:

To translate the output numbers to recognizable units, all water variables, when divided by 100 become 1-dimensional water, cm, as expressed in hydrology. For example, a soil of 534 is actually 5.34 cm. All carbon variables, when divided by 1000, become Mg/ha/yr of CARBON, not biomass. So 12000 PSN is 12 Mg/ha/yr photosynthetic production. The B# variable is pre-dawn leaf water potential in MPA.

12. Application of the Data Set:

Steve Running's forest-BGC model is a key portion of the OTTER project. The study allows for possible future predictions to be made when it is not possible for field investigations to occur or satellite data to be gathered.

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 disk 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 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 daac@ornl.gov

Data Center Status/Plans:

To be determined.

16. Output Products and Availability:

Available via FTP file or on CD-ROM.

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

17. References:

Information 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 NTSG Numerical Terradynamics Simulation Group ORNL Oak Ridge National Laboratories Oak Ridge, Tennessee, U.S.A OTTER Oregon Transect Ecosystem Research PSN Photosynthesis

20. Document Information:

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