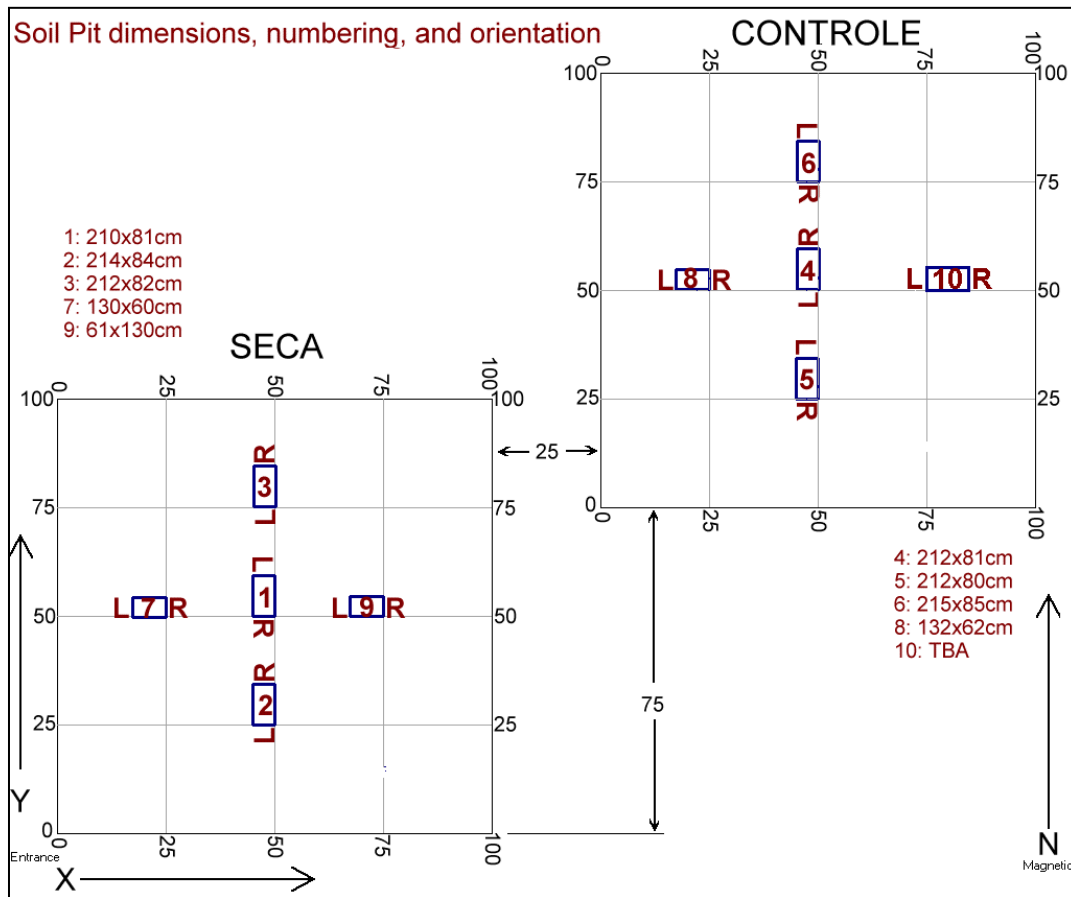


LBA-ECO ND-02 Soil Gas and Water Content, Rainfall Exclusion, Tapajos National Forest: 1999-2002

Summary:

This data set reports soil carbon dioxide (CO₂) and nitrous oxide (N₂O) concentrations and soil volumetric water content (VWC) from a rainfall exclusion experiment that was conducted at the km 67 Seca Floresta site, Tapajos National Forest, Brazil. Samples were collected every two to three months. The purpose was to observe the potential effects of severe water stress on a humid Amazonian forest (Nepstad 2002).

Data provided are from December 9, 1999, and April 2, 2000-June 14, 2002. There is one comma-delimited data file with this data set.



Data Citation:

Cite this data set as follows:

Davidson, E.A., C.J.R. de Carvalho, R.O. Figueiredo. 2012.LBA-ECO ND-02 Soil Gas and Water Content, Rainfall Exclusion, Tapajos National Forest: 1999-2002. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. <http://dx.doi.org/10.3334/ORNLDAAC/1117>

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This data set was archived in September of 2012. Users who download the data between September 2012 and August 2017 must comply with the LBA Data and Publication Policy.

Data users should use the Investigator contact information in this document to communicate with the data provider. Alternatively, the LBA Web Site [<http://lba.inpa.gov.br/lba/>] in Brazil will have current contact information.

Data users should use the Data Set Citation and other applicable references provided in this document to acknowledge use of the data.

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1. Data Set Overview:

Project: LBA (Large-Scale Biosphere-Atmosphere Experiment in the Amazon)

Activity: LBA-ECO

LBA Science Component: Nutrient Dynamics

Team ID: ND-02 (Davidson / Stone / Markewitz / Carvalho / Sa / Vieira / Moutinho / Figueiredo)

The investigators were Carvalho, Claudio Jose Reis de; Davidson, Eric A.; Figueiredo, Ricardo ; Markewitz, Daniel; Moutinho, Paulo; Sa, Tatiana Deane De Abreu; Stone, Thomas A.; Vieira, Ima; Almeida, Arlete; Araujo, Thereza Cristina; Bastos, Therezinha Xavier; Coelho, Roberta de Fatima R.; Correa, Jean Michel; Costa, Brenda Magda do Nascimento; Costa, Fabiola Fernandes; Cunha, Ewerton da Silva; de Figueiredo, Tenilson Monteiro; Dutra, Fabio Carneiro; Freire, Georgia Silva; Guerrero, Jose Benito; Guild, Liane S.; Hayashi, Sanae Nogueira; Ishida, Francoise; Junior, Alvaro Castro Pacheco; Kingerlee, Wendy; Leal, Eliane Constantinov; Leao, Luciene Mota de; Leite, Tania de Sousa; Lobato Junior, Ivan da Costa; Lopes, Leticia Campos; Martins, Jorge Ricardo de Souza; Maues, Bernardo Antonio Rodrigue Antonio; Pacheco, Nilza Araujo; Pantoja, Maria de Jesus Ribeiro; Pedreira, Alessandra Cavalcante; Portela, Gilvane Azevedo; Reis, Marilea Barros; Rodrigues Pantoja, Karina de Fatima; Rosa, Maria Beatriz Silva da; Saba, Renata Tuma; Salimon, Cleber; Santos, Elisana Batista; Santos, Maria Tereza Primo dos; Santos Junior, Mario Rosa; Schuler, Marysol A. E.; Serrao, Bruno de Oliveira; Siddique, Ilyas ; Silva, Marilia ; Silva, Patricio de Souza; Silva, Sabrina; Silva, Wanderley; Souza, Alex Henrique Moreira de; Souza, Cleo Marcelo Araujo; Souza, Karina Christina Neves de and Tancredi, Nicola Saverio Holanda. You may contact Davidson, Eric A (edavidson@whrc.org).

LBA Data Set Inventory ID: ND02_Soil_Gases_REE

This data set reports soil carbon dioxide (CO₂) and nitrous oxide (N₂O) concentrations and soil volumetric water content (VWC) from a rainfall exclusion experiment that was conducted at the km 67 Seca Floresta site, Tapajos National Forest, Brazil. Samples were collected every two to three months. The purpose was to observe the potential effects of severe water stress on a humid Amazonian forest (Nepstad 2002). Data provided are from December 9, 1999, and April 2, 2000-June 14, 2002.

Related Data Sets

- [LBA-ECO TG-09 SOIL ISOTOPIC C, N, H₂O, AND N₂O DATA, TAPAJOS NATIONAL FOREST, BRAZIL](#) (Studies performed during same time frame, same location)
- [LBA-ECO ND-02 SOIL GAS FLUX, RAINFALL EXCLUSION, KM 67, TAPAJOS NATIONAL FOREST](#) (Studies performed during same time frame, same location)
- [LBA-ECO ND-02 SOIL VOLUMETRIC WATER CONTENT, TAPAJOS NATIONAL FOREST, BRAZIL](#) (Volumetric soil measurements from the same site for an overlapping time period)

2. Data Characteristics:

Data are available in one ASCII comma separated file:

REE_soil_gases_1999_2002.csv

Column	Heading	Units/format	Description
1	Date	YYMMDD	Sampling date (YYYYMMDD)
2	Pit number		Pit identification
3	Treatment		Plot treatment either rainfall exclusion or control
4	Depth	cm	Sampling depth from soil surface
5	VWC	cm ³ /cm ³	H ₂ O per cm ³ soil; soil volumetric water content reported in cubic centimeters of water per cubic centimeter of soil
6	conc_CO2	%	Concentration of carbon dioxide reported in percent
7	conc_N2O	ppm	Concentration of nitrous oxide reported in parts per million
missing data represented by -9999			

Example data records

```
Date,Pit number,Treatment,Depth,VWC,conc_CO2,conc_N2O
19991209,1,exclusion,10,-9999,0.74,0.7
19991209,1,exclusion,25,-9999,1.49,1.29
19991209,1,exclusion,30,0.337,-9999,-9999
...
20020614,6,control,900,0.388,-9999,-9999
20020614,6,control,1000,0.412,-9999,-9999
20020614,6,control,1100,0.409,5.67,0.6
```

Site boundaries: (All latitude and longitude given in decimal degrees)

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Para Western (Santarem) - km 67 Seca-Floresta Site (Para Western (Santarem))	-55.0000	-55.0000	-2.75000	-2.75000	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 1999/12/09 to 2002/06/14
- Temporal Resolution: samples were collected every two to three months

Platform/Sensor/Parameters measured include:

- FIELD SURVEY / TIME DOMAIN REFLECTOMETRY / SOIL MOISTURE/ WATER CONTENT
- FIELD SURVEY / GAS CHROMATOGRAPH / NITROUS OXIDE
- FIELD SURVEY / GAS CHROMATOGRAPH / CARBON DIOXIDE

3. Data Application and Derivation:

Stratified measurements of soil gas concentrations can be used to understand the effect of drought and seasonality on carbon and nitrogen budgets as well as greenhouse gas emissions from mature tropical forests.

4. Quality Assessment:

Duplicate syringe samples were analyzed for gas concentrations from each gas sampling tube at each depth in each soil pit. All chromatographs were visually inspected to ascertain good peak separation. Standard curves were repeated approximately every two hours to adjust for potential instrument drift.

5. Data Acquisition Materials and Methods:

Site description

The Tapajos National Forest, located in east-central Amazonia, receives 600 to 3000 mm of rain each year, with a mean of 2000 mm, most of which falls during the wet season from January to June. The forest is situated on a terrace of tertiary sediments capped by the Belterra Clay Formation (Clapperton, 1993). The Oxisol soil (Haplustox) is acidic (pH 4 to 5), is dominated by kaolinite clay minerals (60 to 80% clay), and is free of hardpan or iron oxide concretions in the upper 12 m; the water table is more than 100 m deep. The forest has emergent trees up to 55 m in height, with a continuous canopy at approximately 30 m (Nepstad et al., 2002).

Experiment Description

Two 1 ha plots were identified from an initial survey of 20 ha of forest. A 1.5 m deep trench was excavated around the perimeter of the treatment plot to reduce the potential for lateral movement of soil water from the surrounding forest into the plot. A similar trench was excavated around the control plot to avoid the confounding of treatment and trenching effects.

Plastic PAR-transmitting greenhouse panels were installed in the understory of the exclusion plot only for the duration of the rainy season. The panels were installed such that small gaps were left around tree stems to allow in nutrient-rich stemflow. In all, about half of the annual rainfall was diverted from the exclusion plot. While they were in place, panels were flipped on their sides every two days to return any accumulated litter to the forest floor beneath.

Volumetric soil water content was measured to 11 m depth in each of the soil shafts using time domain reflectometry (TDR). The rods of each sensor were embedded at one end in an epoxy resin head. Each sensor was installed at the end of a 1.5 m auger hole drilled horizontally into the wall of the shaft (the rods pushed into the intact soil) to avoid shaft effects on soil moisture; the holes were then backfilled with soil. Each of the six shafts (three per plot) have duplicate vertical sensors at the soil surface and duplicate horizontal sensors in opposite walls at 50, 100, 200, 300 cm, and at 100 cm intervals to 1,100 cm depth. The dielectric constant of the TDR probes was measured with a cable tester, and VWC was estimated from the calibration equation developed in a similar Belterra clay formation, in eastern Amazonia (Jipp et al., 1998). The mean VWC was calculated from the duplicate TDR probes at each depth in each shaft.

Soil gas sampling

Stainless steel gas sampling tubes (3 mm diameter) were installed into the walls of each of the six soil shafts at depths of 10, 25, 50, 100, 200, 300, 700, and 1100 cm, following the methodology of Davidson and Trumbore, (1995). The tubes were placed into 1.5 m long horizontal auger holes that were then backfilled. Duplicate gas samples of 20 mL were withdrawn from each tube through a septum and fitting on the exposed end in the soil pit using a nylon syringe. The N₂O and CH₄ concentrations were analyzed by ECD and FID gas chromatography, as described above for syringe samples. The CO₂ concentrations in the soil profiles were sufficiently high that quantification could be achieved with the ECD.

6. Data Access:

This data is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Data Archive Center:

Contact for Data Center Access Information:

E-mail: uso@daac.ornl.gov

Telephone: +1 (865) 241-3952

7. References:

Clapperton, C. (1993). Quaternary Geology of South America. Elsevier Science, New York.

Davidson EA, Trumbore SE (1995). Gas diffusivity and production of CO₂ in deep soils of the eastern Amazon. *Tellus*, 47B, 550-565.

Jipp P., Nepstad D.C, Cassel, K. et al. (1998). Deep soil moisture storage and transpiration in forests and pastures of seasonally-dry Amazonia. *Climatic Change*, 39, 395-412.

Nepstad, D.C., Moutinho, P.R.dS, Dias-Filho, M.B. et al. (2002). The effects of rainfall exclusion on canopy processes and biogeochemistry of an Amazon forest. *Journal of Geophysical Research*, 107, 8085, doi:10.1029/2001JD000360.

Related Publications

- Davidson, E.A., F.Y. Ishida, D.C. Nepstad. 2004. Effects of an experimental drought on soil emissions of carbon dioxide, methane, nitrous oxide, and nitric oxide in a moist tropical forest. *Global Change Biology* 10:718-730. doi:10.1111/j.1365-2486.2004.00762.x