

LBA-ECO CD-04 Soil Respiration, km 83 Tower Site, Tapajos National Forest, Brazil

Revision date: September 7, 2011

Summary:

This data set reports on the flux of carbon dioxide from logged forest soils near the eddy flux tower at the km 83 site, Para, Brazil. The automated soil respiration measurements were collected using 15 chambers, installed August 2001 in primary forest. Data were collected between December 19, 2001 and March 1, 2002. There is one comma-delimited data file with this data set.



Figure 1. Automated collection chamber

Data Citation:

Cite this data set as follows:

Goulden, M.L., H.R. da Rocha, S.D. Miller and H.C. de Freitas. 2011. LBA-ECO CD-04 Soil Respiration, km 83 Tower Site, Tapajos National Forest, Brazil. 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/1039>

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This data set was archived in September of 2011. Users who download the data between September 2011 and August 2016 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: Carbon Dynamics

Team ID: CD-04 (Goulden / Rocha)

The investigators were Goulden, Dr. Michael L.; Menton, Mary Catherine; Miller, Dr. Scott D.; Rocha, Prof. Humberto Ribeiro da; Freitas, Helber Custodio de; Figuera, Michela and Sousa, Cleilim Albert Dias de. You may contact Miller, Dr. Scott D. (smiller@albany.edu) and Goulden, Dr. Michael L. (mgoulden@uci.edu)

LBA Data Set Inventory ID: CD04_Soil_Respiration

Automated soil respiration measurements were collected using 15 chambers near the eddy flux tower at km 83, Tapajos National Forest, Para, Brazil. Chambers were installed August 2001 in primary forest. Selective logging occurred between September and December of 2001. After logging, 5 chambers were moved to a gap formed by the logging. Data were collected between December 19, 2001 and March 1, 2002.

Related Data Sets

- [LBA-ECO CD-04 Logging Damage, km 83 Tower Site, Tapajos National Forest, Brazil](#) (Survey of logging damage and biomass calculations made at the same km 83 site)
- [LBA-ECO CD-04 CO2 Profiles, km 83 Tower Site, Tapajos National Forest](#) (Atmospheric CO2 concentrations throughout the canopy at the same site with overlapping sampling periods)
- [LBA-ECO CD-04 CO2 and Heat Flux, km 83 Gap Tower Site, Tapajos National Forest](#) (CO2 measurements at the same site from June, 2002-January, 2004)
- [LBA-ECO TG-07 Soil CO2 Flux by Automated Chamber, Para, Brazil: 2001-2003](#) (Similar measurements made at the intact forest site 16 km north of the logged site)
- [LBA-ECO CD-04 Biomass Survey, km 83 Tower Site, Tapajos National Forest, Brazil](#) (Biometric tree survey performed at km 83 site in March 2000 before logging began)
- [LBA-ECO CD-04 Dendrometry, km 83 Tower Site, Tapajos National Forest, Brazil](#) (Dendrometry study conducted at the km 83 site after reduced impact logging from November 2000 to November 2004)

2. Data Characteristics:

Data are presented in one comma-delimited ASCII file:

CD04_TNF_KM83_Soil_Respiration.csv

Column	Heading	Units/format	Description
1	Day_of_study		Sampling point in decimal day. Noon on January 1 2001 equals 1.5
2	Vegetation		Location of the chamber: intact forest or gap, at day 410 chambers 11- 15 were moved from intact forest to a gap
3	Chamber		Chamber ID
4	CO2_Flux	micromol m-2 s-1	Flux of carbon dioxide in micromoles per meter squared per second (umol m-2 s-1), positive values represent net flux from the soil surface to the atmosphere while negative values represent net uptake of CO2 by the soil
5	T_chamber_air	degrees C	Temperature of the air inside the chamber in degrees Celsius
Missing data are represented by -999			

Example data records:

```
Day_of_study,Vegetation,Chamber,CO2_Flux,T_chamber_air
353.0049,forest,1,1.6,23.9
353.0132,forest,2,1.8,24.0
353.0215,forest,3,1.8,23.7
353.0299,forest,4,1.1,24.2
353.0382,forest,5,2.0,23.5
353.0465,forest,6,1.9,23.0
353.0549,forest,7,2.2,22.6
353.0632,forest,8,2.7,22.3
...
```

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 83 Logged Forest Tower (Para Western (Santarem))	-54.9707	- 54.9707	- 3.017	- 3.017	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 2001/12/19 to 2002/03/01.
- Temporal Resolution: 30-minute

Platform/Sensor/Parameters measured include:

- FIELD INVESTIGATION / GAS EXCHANGE SYSTEM / RESPIRATION

3. Data Application and Derivation:

Soil CO₂ efflux is the sum of litter decomposition, soil organic matter decomposition, and root respiration. It can account for up to 30 percent of ecosystem respiration in tropical forests. This data set is a valuable tool to determine the diurnal, seasonal, and interannual controls on CO₂ efflux from the soil surface in the Tapajos National Forest.

4. Quality Assessment:

Fluxes were not calculated for periods with obvious sampling problems (e.g. abnormally high or low initial CO₂ mixing ratios, extremely non-linear fluxes, etc.) Fluxes deemed good visually were fitted with a linear least squares regression to the linear part of the curve for each individual chamber closure. Efflux of CO₂ from the soil was calculated as the slope of the linear fit (ppmv/min) converted to molar volume divided by the collar area and multiplied by the system volume (chamber volume and tubing volume). The short closure times for the fluxes allow for the least amount of buildup of CO₂ in the chamber headspace while still allowing for a flux calculation based on 10 to 20 concentration measurements.

5. Data Acquisition Materials and Methods:

Automated soil respiration measurements were collected near the eddy flux tower at km 83, Tapajos National Forest, Para, Brazil. Selective logging occurred between September and December of 2001. After logging, 5 chambers were moved to a gap formed by the logging.

Aluminum chambers were used to measure the efflux of CO₂ from the soil to the atmosphere following the procedures of Goulden and Crill (1997). Fifteen chambers were set up to measure trace gas exchange between the soil and atmosphere about 8 times a day. Each chamber was sampled for 12 min although the CO₂ flux was measured within the first 4 minutes. Chambers were pushed closed over an area of 1,866 cm² by a pneumatic cylinder onto an anchor/frame that was set about 2 cm into the soil and extended an average of 4 cm above the soil surface. Closed chambers were sealed to the frame by fitting into a water-filled trough that was replenished as needed. They enclosed an average volume of 38,100 cm³. Headspace air was pulled through an infrared gas analyzer (LI-6262, LiCor Inc., Lincoln, Nebraska, USA) in absolute mode at a flow rate of 300 ml m⁻¹ (MKS Instruments, Andover, MA). Air was circulated through the chambers at 1,000 ml min⁻¹. Chambers were intentionally leaky to ensure no pressure gradient when the chambers were closed. All tubing and connectors were selected to minimize water vapor, and CO₂ absorption and permeability.

The data were recorded and the system managed with a CR10X datalogger (Campbell Scientific, Logan UT). The chamber temperature, IRGA sample cell pressure, and raw CO₂ were sampled every 3 seconds and averaged every 12 seconds. The solenoids used for chamber selection, chamber closure and calibration were controlled with four 16-channel control modules. The set point for the mass flow controller was provided by a 4 channel analog output module. The signals from the thermocouples in each chamber were multiplexed.

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:

Goulden M.L. and P.M. Crill. 1997. Automated measurements of CO₂ exchange at the moss surface of a black spruce forest. *Tree Physiology* 17:537-542.

Related Publications

- Goulden, M.L., S.D. Miller, H.R. da Rocha, M.C. Menton, H.C. de Freitas, A.M.E.S. Figueira, and C.A.D. de Sousa. 2004. Diel and seasonal patterns of tropical forest CO₂ exchange. *Ecological Applications Supplement*, 14(4):S42-S54.

