

LBA-ECO TG-07 Seasonal Trace Gas Profiles, Amazonas and Mato Grosso: 2004-2005

[Get Data](#)

Revision date: July 9, 2012

Summary:

This data set provides trace gas concentrations of methane (CH₄), nitrous oxide (N₂O), and carbon dioxide (CO₂) from air samples collected at three tower locations (canopy layer) in the Brazilian Amazon during the wet and dry seasons of 2004 and 2005: the Caxiupana National Forest, in the state of Amazonas; the Manaus site in the Cuieiras Reserve; and the Sinop site, located north of that city in the state of Mato Grosso. There is one comma-delimited ASCII file with this data set.

Data Citation:

Cite this data set as follows:

do Carmo, J.B., M. Keller, J.D. Dias, P.B. de Camargo and P. Crill. 2012. LBA-ECO TG-07 Seasonal Trace Gas Profiles, Amazonas and Mato Grosso: 2004-2005. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Implementation of the LBA Data and Publication Policy by Data Users:

The LBA Data and Publication Policy [http://daac.ornl.gov/LBA/lba_data_policy.html] is in effect for a period of five (5) years from the date of archiving and should be followed by data users who have obtained LBA data sets from the ORNL DAAC. Users who download LBA data in the five years after data have been archived must contact the investigators who collected the data, per provisions 6 and 7 in the Policy.

This data set was archived in July of 2012. Users who download the data between July 2012 and June 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 website [<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.

Table of Contents:

- [1 Data Set Overview](#)
- [2 Data Characteristics](#)
- [3 Applications and Derivation](#)
- [4 Quality Assessment](#)
- [5 Acquisition Materials and Methods](#)
- [6 Data Access](#)
- [7 References](#)

1. Data Set Overview:

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

Activity: LBA-ECO

LBA Science Component: Trace Gas and Aerosol Fluxes

Team ID: TG-07 (Keller / Oliveira)

The investigators were Keller, Michael M.; Albuquerque, Sergio Silva; Alexander, Jess Everett; Araujo, Flavia ; Bowley, Evilene; Braswell, Bobby H.; Camargo, Plinio Barbosa de; Carmo, Janaina Braga do; Crill, Patrick Michael; Dias, Jadson Dezincourt ; Dias, Joelma ; Filho, Deusdedith Cruz; Hagen, Stephen Charles; Hunter, Maria O'Healy; Li, Changsheng ; Lima, Risonaldo Leal; Mello, William Zamboni de; Mosedale, Andrew H; Palace, Michael William; Pepler, Paul Thomas; Pereira,

Cleuton Alessandro; Pereira, Rodrigo Antonio; Rivera Costa, Maria Milagros; Sampaio, Irene Cibelle Goncalves; Scaranello, Marcos Augusto; Silva, Hudson Cleber Pereira; Silva, Kadson Oliveira; Silva, Kemeson Oliveira da; Sousa Neto, Eraclito; Varner, Ruth; Xiao, Xiangming and Zweede, Johan Cornelis. You may contact Carmo, Janaina Braga do (jbcarmo2008@gmail.com).

LBA Data Set Inventory ID: TG07_Trace_Gas_Profiles

This data set provides trace gas concentrations of methane (CH₄), nitrous oxide (N₂O), and carbon dioxide (CO₂) from air samples collected at three tower locations (canopy layer) in the Brazilian Amazon during the wet and dry seasons of 2004 and 2005: the Caxiuana National Forest, in the state of Amazonas; the Manaus site in the Cuieiras Reserve; and the Sinop site, located north of that city in the state of Mato Grosso.

2. Data Characteristics: Data are included for N₂O but it is not included in the publications..see the pdf's with the guide section in the folder...no discussion for nitrous oxide included in sect 5...?

Data are reported in one comma-delimited ASCII file:

TG07_Gas_fluxes_wet_dry_2004_05.csv

Column	Heading	Units/format	Description
1	Site		Sampling location: Caxiuana, Manaus, Sinop
2	Sample_date	yyyymmdd	Sample date (yyyymmdd)
3	Sample_time	hh:mm	Time at which each sample was collected in local time which is GMT -5 (hh:mm, 24 hour clock)
4	Season		Season in which samples were collected: wet or dry
5	Collection_period		Samples were either collected during the daylight hours (diurnal) or late at night (nocturnal)
6	Jar_ID		Sample identification for laboratory use
7	Height	m	Sample height in meters above the ground
8	Conc_CO2	ppm	Concentration of carbon dioxide in parts per million,
9	Conc_N2O	ppm	Concentration of nitrous oxide in parts per million,
10	Conc_CH4	ppm	Concentration of methane in parts per million
11	Mix_ratio_CO2	ppm	Height weighted average mixing ratio for carbon dioxide in parts per million
12	Mix_ratio_N2O	ppm	Height weighted average mixing ratio for nitrous oxide in parts per million
13	Mix_ratio_CH4	ppm	Height weighted average mixing ratio for methane in parts per million

Missing data are represented by -9999

Example data records:

Site,Sample_date,Sample_time,Season,Collection_period,Jar_ID,Height,Conc_CO2,Conc_N2O,Conc_CH4,Mix_ratio_CO2,Mix_ratio_N2O,Mix_ratio_CH4

Sinop,20040418,12:20,wet,diurnal,18,32,380.72,320.45,1.78,265.18,248.71,1.23
Sinop,20040418,12:23,wet,diurnal,39,10,390.72,403.07,1.8,62.65,60.24,0.28
Sinop,20040418,12:27,wet,diurnal,11,5,411.23,368.05,1.76,50.67,43.45,0.22

...

Manaus,20040112,23:45,wet,nocturnal,12,5,425.39,511.54,1.79,37.96,39.63,0.16
SManaus,20040112,23:48,wet,nocturnal,19,1,428.81,380.14,1.78,7.7,6.33,0.03
Manaus,20040112,23:51,wet,nocturnal,48,0.2,437.81,332.39,1.77,1.95,1.48,0.01

...
 Caxiuana,20041108,14:34,dry,diurnal,13,5,
 406.34,321.78,1.77,41.93,39.84,0.18
 Caxiuana,20041108,14:45,dry,diurnal,53,1,
 432.25,315.69,1.75,9.14,8.09,0.04
 Caxiuana,20041108,14:56,dry,diurnal,44,0.2,
 482.05,331.55,1.77,2.41,2.07,0.01

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Para Eastern (Belem) - FLONA Caxiuana (Para Eastern (Belem))	-51.45360	-51.45360	-1.74830	-1.74830	World Geodetic System, 1984 (WGS-84)
Amazonas (Manaus) - Cuieras (Amazonas (Manaus))	-60.021		-2.609		World Geodetic System, 1984 (WGS-84)
Mato Grosso - Sinop (Mato Grosso)	-55.32470	-55.32470	-11.41230	-11.41230	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 2004/02/12 to 2005/05/12
- Temporal Resolution: Sampling was done in campaigns lasting 3-4 days at a time with two campaigns per site

Platform/Sensor/Parameters measured include:

- FIELD INVESTIGATION / IRGA / TRACE GAS FLUX
- LABORATORY / GAS CHROMATOGRAPH / METHANE

3. Data Application and Derivation:

Trace gas fluxes from undisturbed tropical forests are important components of the global carbon and nitrogen budgets. These time series of soil-atmosphere gas exchange of N₂O, CH₄, and CO₂ reveal important seasonal and diurnal variations in flux and provide insight to the environmental and biological controls in this ecosystem.

4. Quality Assessment:

The IRGA was calibrated with secondary standards traceable to NOAA CMDL standards before and after each campaign. Span and zero drifts were less than 1 ppm. The analytical accuracy was traceable to NOAA CMDL standards. The precision expressed as the standard error of the mean for multiple measurements from standards was better than 1 ppm CO₂.

Analytical accuracy was better than 0.02 ppm CH₄ and precision was better than 0.005 ppm expressed as the standard error of the mean for multiple measurements of standards.

5. Data Acquisition Materials and Methods:

Sampling sites

Dry and wet season measurements were made at three towers used for micrometeorological studies in upland old growth forest in the Brazilian Amazon. The Caxiuana National Forest site, located near Melgaco, in the state of Amazonas has a mean annual precipitation of 2,060 mm and a dry period from September through November. The Manaus site in the Cuieiras Reserve has a mean annual precipitation of 2,250 mm with a dry season from July to September. The Sinop site, located north of that city in the state of Mato Grosso on a 20 km² patch of undisturbed forest, is surrounded by selectively logged forest. Mean annual rainfall is 2,037 mm with four dry months from June through September. Annual mean temperatures across sites range from 24.1 to 26.7 degrees C.

Field sampling

Six canopy height levels were sampled at Caxiuana and Sinop. The sampling heights in meters, which were the maximum heights of the trees in the vicinity of the towers, were 0.2,1,5,10,20, and 37 m for Caxiuana (during the dry season, the top heights for Caxiuana were 15, 25, and 40 m), and 0.2,1,5,10,20, and 32 m at Sinop. Only five levels were sampled at Manaus and those were at 0.2,1,5,25, and 45 m. We used a portable profile system for gas measurement and sampling. Four (approximately 6 mm) o.d. nylon tubes were mounted on each tower at heights of 5 to 45 m, and two tubes were placed at 0.2 and 1 m height about 10 m distant from the tower base. Teflon filters (0.45 mm pore size, Cole Parmer, Vernon Hills, IL, USA) protected each tube inlet.

A valve manifold received six tubes that were flushed continuously at 1 liter per minute using separate pumps (UNMP08L, KNF, Trenton, NJ, USA). Sequential selection of each tube outflow to an infra-red gas analyzer (IRGA) (Li-6262, LiCor, Lincoln, NE, USA) allowed us to monitor CO₂ mixing ratios corrected for the effects of water vapor in real time. The IRGA was calibrated with secondary standards traceable to NOAA CMDL standards before and after each campaign. Span and zero drifts were less than 1 ppm. The analytical accuracy was traceable to NOAA CMDL standards. The precision expressed as the standard error of the mean for multiple measurements from standards was better than 1 ppm CO₂. Air samples were collected from each level 3 to 5 times on several nights and at least once during well-mixed daytime conditions during each campaign for a total of 75 profiles on 19 dates. Air samples were pressurized to 2 atm using a secondary pump (MOA-P101-HJ, GAST Manufacturing, Benton Harbor, MI, USA) into 500 ml electropolished stainless steel canisters closed with stainless steel valves (SS-14DPM-A, Swagelok, Solon, OH, USA) and stored for up to 10 days prior to analysis. Tests of air samples and standards lasting up to 60 days showed no appreciable drift.

Methane analysis

Samples were analyzed for CH₄ using flame ionization gas chromatography off site (Varner et al., 2003). An automated analysis routine was used to inject canister samples and CH₄ standards traceable to NOAA CMDL standards. Samples and standards passed through Drierite¹ to remove water vapor prior to analysis. Each canister sample was analyzed at least twice. Analytical accuracy was better than 0.02 ppm CH₄ and precision was better than 0.005 ppm expressed as the standard error of the mean for multiple measurements of standards.

Mixing ratio calculations

We calculated a height weighted average mixing ratio of each gas for the canopy layer (defined as ground level to maximum sampling height) by linear interpolation between levels. We estimated CH₄ emission using a canopy layer budget (Trumbore et al., 1990) calculated as

$$dC/dt \text{ equals } P - k(C-C_t)$$

where C is the mixing ratio of the gas in the canopy layer, P is the net production in that layer including the soil atmosphere flux, k is an exchange coefficient between the canopy layer and the overlying atmosphere and C_t is the mixing ratio of the gas in the overlying atmosphere.

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:

do Carmo, J.B., M. Keller, J.D. Dias, P.B. de Camargo and P. Crill. 2006. A source of methane from upland forests in the Brazilian Amazon. *Geophysical Research Letters* 33:doi:10.1029/2005GL025436.

Trumbore, S. E., M. Keller, S. C. Wofsy, and J. M. Costa (1990), Measurements of soil and canopy exchange rates in the Amazon rain forest using ^{222}Rn , *J. Geophys. Res.*, 95, 16865-16873.

Varner, R. K., M. Keller, J. R. Robertson, J. D. Dias, H. Silva, P. M. Crill, M. McGroddy, and W. L. Silver (2003), Experimentally induced root mortality increased nitrous oxide emissions from tropical forest soil, *Geophys. Res. Lett.*, 30(3), 1144, doi:10.1029/2002GL016164.