

LBA-ECO ND-07 Carbon and Nitrogen in Cerrado Plants and Soils, Brasilia: 1999-2000

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Revision date: September 13, 2012

## Summary:

This data set provides (1) delta 15N ratios and nitrogen concentrations for foliar samples and (2) delta\_13C and delta 15N ratios and carbon and nitrogen concentrations for soil samples collected from cerrado sites within the Ecological Reserve of the Brazilian Institute of Geography and Statistics (IBGE), Brasilia, Brazil. Foliar samples, collected from 320 individuals representing 45 woody tree and shrub species, and soil samples were collected from 5 cerrado locations (2 in campo sujo, 2 in cerrado denso and 1 in cerrado). Soil samples were collected to 450 cm depth in the campo sujo and 800 cm depth elsewhere. Samples were collected during the rainy season (December 1999 to March 2000) the dry season (July to September 2000).

Eiten (1972) described campo sujo as an open savanna with scattered trees and shrubs, cerrado sensu stricto as a savanna woodland with abundant evergreen and deciduous trees and shrubs and an herbaceous understory and cerrado denso as medium to tall woodlands with closed or semiclosed canopies (Bustamante et al., 2004).

There are two comma-delimited data files with this data set.

## Data Citation:

**Cite this data set as follows:**

Bustamante, M.C.C. and L.A. Martinelli. 2012. LBA-ECO ND-07 Carbon and Nitrogen in Cerrado Plants and Soils, Brasilia: 1999-2000 . 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](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 Users who download LBA data in the five years after data have been archived must contact the investigators who collected the data, per provisions 6 and 7 in the Policy.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 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 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.

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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-07 (Zepp / Bustamante)

The investigators were Zepp, Richard G.; Bustamante, Mercedes ; Bresolin, Joana Dias; Burke, Roger A.; Carvalho, Arminda Moreira; Cruz, Meyr Pereira; da Rocha, Cristiane Oliveira; Fernandes, Erika Barretto; Ferreira, Joice; Garcia-Montiel, Diana Cecilia; Kisselle, Keith ; Kozovits, Alessandra Rodrigues; Markewitz, Daniel ; Molina, Marirosa ; Parron, Lucilia ; Perez, Katia Sueli Sivek; Pinto, Alexandre de Siqueira; Prado, Cesar Coelho; Rosado, Alexandre Soares; Silva, Dulce Alves da; Silva, Jose Salomao Silva, Maria Regina Sartori da; Sousa, Danielle Matias and Viana, Laura Tillman. You may contact Bustamante, Mercedes (mercedesmcb@gmail.com).

**LBA Data Set Inventory ID:**ND07\_15N\_Leaves\_Soil

This data set provides (1) delta 15N ratios and nitrogen concentrations for foliar samples and (2) delta\_13C and delta 15N ratios and carbon and nitrogen concentrations for soil samples collected from cerrado sites within the Ecological Reserve of the Brazilian Institute of Geography and Statistic (IBGE), Brasilia, Brazil. Foliar samples, collected from 320 individuals representing 45 woody tree and shrub species, and soil samples were collected from 5 cerrado locations (2 in campo sujo, 2 in cerrado denso and 1 in cerrado). Soil samples were collected to 450 cm depth in the campo sujo and 800 cm depth elsewhere. Samples were collected during the rainy season (December 1999 to March 2000) the dry season (July to September 2000).

Eiten (1972) described campo sujo as an open savanna with scattered trees and shrubs, cerrado sensu stricto as a savanna woodland with abundant evergreen and deciduous trees and shrubs and an herbaceous understory and cerrado denso as medium to tall woodlands with closed or semiclosed canopies (Bustamante et al., 2004).

## Related data sets:

- [LBA-ECO ND-07 Microbial Biomass in Cerrado Soils, Brasilia, Brazil](#) (Research conducted in the same area)
- [LBA-ECO ND-07 Trace Gas Fluxes Under Multiple Land Uses, Brazil: 1999-2004](#) (Research conducted in the same area)

# 2. Data Characteristics:

The data are available in two comma-delimited ASCII files:

**File #1:** Foliar\_15N\_IGBE\_cerrado.csv.

**File #2:** Soil\_isotope\_ratios\_IGBE\_cerrado.csv

**File 1: Foliar\_15N\_IGBE\_cerrado.csv.**

Column	Heading	Units/format	Description
1	Species		Scientific name in the format Genus species
2	Family		Scientific family
3	Spp_code		Unique numeric code for each species
4	Physiognomy		Vegetation type within the general classification of cerrado: Cerrado sensu strictu (cerrado); cerrado

			denso and campo sujo
5	Life_form		Plant life form: tree, shrub or grass
6	delta_15N	per mil	Ratio of 15N to 14N in the foliar sample expressed relative to standard air
7	N	percent	Foliar nitrogen concentration reported in percent of total leaf weight

**Example data records:**

Species,Family,Spp\_code,Physiognomy,Life\_form,delta\_15N,N  
 Acosmium dasycarpum,Leguminosae,30,cerrado,tree,0.8,3.6  
 Acosmium dasycarpum,Leguminosae,30,cerrado,tree,0.1,4.6  
 Acosmium dasycarpum,Leguminosae,30,cerrado,tree,-0.1,2.2  
 ...  
 Erythroxylum tortuosum,Erythroxylaceae,12,cerrado,tree,0.6,1.7  
 Guapira graciliflora,Nyctaginaceae,2,cerrado,tree,3.4,3.1  
 Guapira graciliflora,Nyctaginaceae,2,cerrado,tree,2.7,4.9  
 ...  
 Vochysia elliptica,Vochysiaceae,38,cerrado denso,tree,-1,0.8  
 Vochysia elliptica,Vochysiaceae,38,cerrado,tree,-0.4,1  
 Vochysia elliptica,Vochysiaceae,38,cerrado,tree,-2.8,0.9

**File #2: Soil\_isotope\_ratios\_IGBE\_cerrado.csv**

Column	Heading	Units/format	Description
1	Sample_no		Sample number: each field sample has a unique number; analytical replicates have the same sample number
2	Sample_type		Sample material: in addition to the soil samples, 3 litter samples were collected from the soil surface near each pit
3	Sample_code		Unique sample identifier for each field sample
4	Physiognomy		Vegetation type within the general classification of cerrado: Cerrado sensu strictu (cerrado); cerrado denso and campo sujo
5	Soil_pit_ID		Samples were collected from one soil pit in the cerrado and two pits in each of the other two vegetation types
6	Pit_wall		Samples were collected from two walls in each pit, wall A or wall B. At each depth walls were 150 cm; not applicable if sample was a litter sample collected from the surface.
7	Analytical_rep		Randomly samples were replicated for lab analysis and are indicated with an A or B
8	Sampling_depth	cm	Depth below the soil surface from which the sample was collected in cm; not applicable if sample was a litter sample collected from the surface
9	Wt_sample	mg	Weight in milligrams of the sub sample used in the analysis
10	delta_13C	per mil	Ratio of 13 C to 12 C in the sample relative to an international standard expressed in per mil
11	C	percent	Concentration of carbon in the sample expressed as

			percent by weight
12	delta_15N	per mil	Ratio of 15 C to 14 N in the sample relative to an international standard expressed as per mil
13	N	percent	Concentration of nitrogen in the sample expressed as percent by weight
14	C_to_N		Ratio of carbon to nitrogen in the sample on a weight basis

Missing values are represented as -9999

### Example data records:

Sample\_no,Sample\_type,Sample\_code,Physiognomy,Soil\_pit\_ID,Pit\_wall,Analytical\_rep,  
Sampling\_depth,Wt\_sample,delta\_13C,C,delta\_15N,N,C\_to\_N  
1,Litter,CS1-1,campo sujo,1,not applicable,A,  
not applicable,1.575,-26.7,44.37,-0.16,0.73,60.68  
1,Litter,CS1-1,campo sujo,1,not applicable,B,  
not applicable,1.517,-26.76,44.77,0.18,0.76,58.75  
2,Litter,CS1-2,campo sujo,1,not applicable,-9999,  
not applicable,1.515,-26.83,49.1,1.2,0.64,76.95  
...  
16,Soil,CS1A-1,campo sujo,1,A,A,  
0-5cm,15.524,-19.37,4.59,4.02,0.23,19.96  
16,Soil,CS1A-1,campo sujo,1,A,B,  
0-5cm,15.055,-19.61,4.2,4.02,0.23,18.02  
17,Soil,CS1A-2,campo sujo,1,A,-9999,  
5-10cm,15.403,-18.49,3.49,5.34,0.19,18.28

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Brasilia - Reserva Ecologica do Roncador IBGE (Brasilia)	-47.85060	-47.85060	-15.93280	-15.93280	World Geodetic System, 1984 (WGS-84)

### Time period:

- The data set covers the period 1999/12/01 to 2000/09/30
- Temporal Resolution: collections were made in December 1999-March 2000 (wet season), and July-September 2000 (dry season)

### Platform/Sensor/Parameters measured include:

- LABORATORY / MASS SPECTROMETER / ISOTOPES
- LABORATORY / CARBON ANALYZER / CARBON
- LABORATORY / CHN ANALYZER / NITROGEN
- LABORATORY / CHN ANALYZER / NITROGEN
- LABORATORY / CARBON ANALYZER / CARBON

## 3. Data Application and Derivation:

$^{15}\text{N}$  isotope ratios and the variability in delta values within and across sites may be used as a proxy for interpreting aspects of the N cycles.

## 4. Quality Assessment:

Stable isotope ratios of nitrogen were measured relative to international recognized standards. Internal working standards (Atropine and soil standard no. 502-308 from LECO Corporation) were included in every run, as regular laboratory procedure. The precision of measurements was plus or minus 0.1 percent and 0.35 per mil for N and delta  $^{15}\text{N}$ , respectively

## 5. Data Acquisition Materials and Methods:

### Site description:

Plant and soil samples were collected in the Ecological Reserve of the Brazilian Institute of Geography and Statistic (IBGE). This reserve has an area of 1,350 ha and is located in the Planalto Central Brasileiro, approximately 35 km south of the city of Brasilia. The IBGE Reserve encompasses the most common vegetation types of cerrado: campo sujo, cerrado sensu stricto (cerrado), and cerrado denso. Eiten (1972) described campo sujo as an open savanna with scattered trees and shrubs, cerrado sensu stricto as a savanna woodland with abundant evergreen and deciduous trees and shrubs and an herbaceous understory and cerrado denso as medium to tall woodlands with closed or semiclosed canopies (Bustamante et al., 2004).

Soils in the cerrado and cerrado denso are classified as Latossolo Vermelho-Escuro in the Brazilian soil classification, which is equivalent to Plinthic Haplustox in the American soil classification. In the campo sujo, the soil type is Latossolo Vermelho-Amarelo (Typic Haplustox). Typically, the soils are deep and acidic, with low organic matter and nutrient contents (Bustamante et al., 2004).

The average annual rainfall is 1500 mm, most of it (>90%) falling in the rainy season, which results in severe water stress during the dry season (May to September).

### Leaf samples:

Five fully expanded leaf samples were collected from each of 320 individual plants belonging to 45 species of woody plants including trees and shrubs.

- In the cerrado, the most intensive sampling site, 188 individuals of 45 species were collected.
- In the cerrado denso and campo sujo, 67 and 64 individuals, respectively, were collected belonging to 32 species.

All samples from the cerrado denso and campo sujo and some of the samples in the cerrado were collected during the rainy season (December 1999 to March 2000). Additional samples for seasonal comparisons were collected in the cerrado during the dry season (July to September 2000). Leaves were air dried and ground for isotopic analysis.

### Soil samples :

Soil samples were collected from two soil pits located in campo sujo, two in the cerrado denso, and from one soil pit located in the cerrado. At each depth interval, samples were taken from two walls which were 150 cm apart.

- In the campo sujo, samples were from surface to 50 cm deep at 10-cm intervals, from 50 cm to 150 cm at 50-cm intervals, and from 150 cm to 450 cm at 100-cm intervals.
- In the cerrado and cerrado denso, the same scheme was followed but to a depth of 800 cm.

### Lab methods:

All foliar samples were oven-dried at 65 degrees C until constant weight and then ground to a fine powder.

Soil samples were air-dried, sieved using a 2-mm mesh and homogenized. A smaller sub-sample was taken, handpicked to remove fine roots and other debris and then pounded. A 1-2 mg sub-sample of ground leaf

material or 15-20 mg sub-sample of pounded soil were placed and sealed in a tin capsule and loaded into a ThermoQuest-Finnigan Delta Plus isotope ratio mass spectrometer (Finnigan-MAT; CA, USA) in line with an Elemental Analyzer (Carla Erba model 1110; Milan, Italy) at the Laboratory of Isotope Ecology (CENA-USP, Brazil). From these analyses we obtained the tissue  $\delta_{13}\text{C}$  and  $\delta_{15}\text{N}$  ratios, and tissue and soil carbon and nitrogen content.

## 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](mailto:uso@daac.ornl.gov)

Telephone: +1 (865) 241-3952

## 7. References:

Bustamante, M.M.C., L.A. Martinelli, D.A. Silva, P.B. Camargo, C.A. Klink, T.F. Domingues, R.V. Santos. 2004.  $^{15}\text{N}$  Natural Abundance in Woody Plants and Soils of Central Brazilian Savannas. *Ecological Applications* 14: S200-S213.

Eiten, G. 1972. The Cerrado vegetation of Brazil. *Botanical Review* 38:201-341.