

LBA-ECO ND-07 Nitric Oxide Flux from Cerrado Soils, Brasilia, Brazil: 2004

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Revision date: September 17, 2012

## Summary:

This data set reports the results of soil nitric oxide (NO) flux, soil moisture, and soil nitrate (NO<sub>3</sub>) and ammonium (NH<sub>4</sub>) concentration measurements on Cerrado soils receiving nitrogen fertilization. Measurements and samples were collected from control and fertilized experimental plots on Cerrado soils within the Ecological Reserve of the Brazilian Institute of Geography and Statistic (IBGE), Brasilia, Brazil. Sampling dates were from March 26, 2004 to November 25, 2004.

The soils had received nitrogen and phosphorus fertilization treatments which began in 1998. The objective of this project was to determine the long-term effects of nutrient addition (N and N+P) in native Cerrado area on N oxide fluxes from soil to the atmosphere. There is one comma delimited (.csv) ASCII file with this data set.

## Data Citation:

**Cite this data set as follows:**

Kozovits, A.R., L.T. Viana, D.M. Sousa, A.S. Pinto, M.M.C. Bustamante, and R.G. Zepp. 2012. LBA-ECO ND-07 Nitric Oxide Flux from Cerrado Soils, Brasilia, Brazil: 2004 . 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/1124>

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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-07 (Zepp / Bustamante)

The investigators were Zepp, Richard G.; Bustamante, Mercedes M.C.; Burke, Roger A.; Kozovits, Alessandra Rodrigues; Viana, Laura Tillman; Pinto, Alexandre de Siqueira and Sousa, Diana M.. You may contact Bustamante, Dr. Mercedes (mercedesmcb@gmail.com); Zepp, Dr. Richard G. (zepp.richard@epa.gov) and Kozovits, Dr. Alessandra R. (kozovits@iceb.ufop.br)

**LBA Data Set Inventory ID:** ND07\_NO\_Flux\_Cerrado

This data set reports the results of soil nitric oxide (NO) flux, soil moisture, and soil nitrate (NO<sub>3</sub>) and ammonium (NH<sub>4</sub>) concentration measurements on Cerrado soils receiving nitrogen fertilization. Measurements and samples were collected from control and fertilized experimental plots on Cerrado soils within the Ecological Reserve of the Brazilian Institute of Geography and Statistic (IBGE), Brasilia, Brazil. Sampling dates were from March 26, 2004 to November 25, 2004.

The soils had received nitrogen and phosphorus fertilization treatments which began in 1998. The objective of this project was to determine the long-term effects of nutrient addition (N and N+P) in native Cerrado area on N oxide fluxes from soil to the atmosphere.

**Related Data sets**

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

**2. Data Characteristics:**

Data are presented in one comma-delimited ASCII file: IGBE\_NO\_data\_2004.csv

Column	Heading	Units/format	Description
1	Treatment	Control, N, or NP	Experimental treatment: Control had no fertilization; N addition was at the rate of 100 kg N ha <sup>-1</sup> year <sup>-1</sup> ; NP addition was at the rate of 100 kg ha <sup>-1</sup> year <sup>-1</sup> for both N and P
2	Date	yyyymmdd	Sampling date (yyyymmdd)
3	NO_flux_mean	ng N-NO cm <sup>-2</sup> h <sup>-1</sup>	Mean measured flux of nitric oxide from the soil surface (ng N-NO cm <sup>-2</sup> h <sup>-1</sup> ); positive values indicate a flux from the soil to the atmosphere
4	NO_flux_std_err	ng N-NO cm <sup>-2</sup> h <sup>-1</sup>	Standard error of the flux of nitric oxide from the soil surface
5	Soil_moisture_mean	%	Mean soil moisture reported in percent
6	Soil_moisture_std_err	%	Standard error of soil moisture reported in percent
7	Soil_NO3_mean	mg N/kg	Mean soil NO <sub>3</sub> reported in milligrams of nitrogen in the form of nitrate per kilogram of soil (mg N/kg). Nitrate was extracted from the soil using a 2M KCl solution
8	Soil_NO3_std_err	mg N/kg	Standard error of the soil NO <sub>3</sub> concentration reported in milligrams of nitrogen in the form of nitrate per kilogram of soil
9	Soil_NH4_mean	mg N/kg	Mean soil NH <sub>4</sub> reported in milligrams of nitrogen in the form of ammonium per kilogram of soil (mg N/kg). Ammonium was extracted from the soil using a 2M KCl solution
			Standard error of the soil NH <sub>4</sub> concentration

10                      Soil\_NH4\_std\_err                      mg N/kg                      reported in milligrams of nitrogen in the form of ammonium per kilogram of soil

Missing data values are represented as -9999

Soil concentrations below the detection limit are represented as 0 (zero)

#### Example data records:

Treatment,Date,NO\_flux\_mean,NO\_flux\_std\_err,Soil\_moisture\_mean,Soil\_moisture\_std\_err,Soil\_NO3\_mean,Soil\_NO3\_std\_err,Soil\_NH4\_mean,Soil\_NH4\_std\_err  
 Control,3/22/2004,-9999,-9999,33.46,1.04,-9999,-9999,-9999,-9999  
 Control,3/26/2004,6.19,3.73,43.47,0.87,-9999,-9999,-9999,-9999  
 Control,4/2/2004,0.11,0.04,35.62,1.54,-9999,-9999,34.44,2.41  
 Control,4/13/2004,1.52,1.09,41.67,0.25,-9999,-9999,40.63,3.64  
 Control,5/19/2004,2.73,1.58,21.26,2.31,0.08,0.02,35.83,0.65  
 Control,6/24/2004,0.85,0.16,26.37,2.15,4.38,0.44,38.92,12.41  
 ...  
 N addition,10/7/2004,16.57,5.13,27.46,1.81,17.4,5.12,155.84,29.73  
 N addition,10/28/2004,8.78,3.3,38.96,1.24,14.51,7.22,121.9,22.51  
 N addition,11/25/2004,2.62,0.76,31.72,2.68,0.57,0.79,64.49,3.77  
 NP addition,3/22/2004,0.51,0.26,41.16,2.4,0.05,0.02,34.53,2.34  
 NP addition,3/26/2004,4.43,2.65,47.29,3.72,0.04,0.02,415.01,145.36  
 NP addition,4/2/2004,3.93,1.32,45.19,3.52,0.02,0.01,229.4,66.04

**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 2004/03/22 to 2004/11/25.
- Temporal Resolution: Weekly

#### Platform/Sensor/Parameters measured include:

- FIELD INVESTIGATION / ANALYSIS / SOIL FERTILITY
- FIELD INVESTIGATION / ANALYSIS / NITROGEN OXIDES
- FIELD INVESTIGATION / ANALYSIS / TRACE GASES
- FIELD INVESTIGATION / ANALYSIS / SOIL NOISTURE/WATER CONTENT

### 3. Data Application and Derivation:

Trace gas fluxes from undisturbed tropical forests are important components of the global nitrogen budget. These measurements of soil-atmosphere gas exchange of NO reveal important seasonal variations in flux and provide insight to the effects of soil nutrient status on NO fluxes in this ecosystem.

## 4. Quality Assessment:

For NO measurements, frequent standardization in the field was necessary. The LMA-3 is relatively unstable under the changing temperature, humidity, and background contaminant levels found in the field. Calibration curves were done twice (before and after measurements) a day to assure data quality.

## 5. Data Acquisition Materials and Methods:

### Site description

This study was carried out in an area located in the Roncador Ecological Reserve belonging to the Brazilian Institute of Geography and Statistics (RECOR / IBGE), near Brasilia's Federal District, Brazil. Soils of the study area are classified as Oxisols (Haplustox), characterized as acidic, with high Aluminum levels and low cation exchange capacity (Haridasan, 1994). Total precipitation was 1,667 mm in 2006 and 1,183.7 mm in 2007. Air temperature ranged from 10.1 to 31.9 degrees C during the study period. The vegetation is classified as cerrado sensu stricto, which is characterized by a continuous grassy layer and a woody layer of trees and shrubs varying in cover from 20 to 60%: this is the most common vegetation found in the Cerrado region (Eiten, 1972).

The Cerrado biome covers 2 million km<sup>2</sup>. It is a species rich wet tropical savanna classified as a hotspot because of its large number of endemic species and the rapid loss of habitats. The fragmentation of Cerrado areas and the rapid conversion into agroecosystems may lead to higher nutrient inputs in adjacent native areas.

### Fertilization treatments

The fertilization experiment began in 1998 and the experimental design was completely randomized, with four nutrient addition treatments and four replicates randomly divided into 16 plots of 225 m<sup>2</sup>, separated by a 10 m buffer area. The treatments were: control (C; without fertilization), +N (single addition of ammonium sulfate (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub>), +P (single addition of 20% superphosphate - Ca (H<sub>2</sub>PO<sub>4</sub>)<sub>2</sub> + CaSO<sub>4</sub>. 2H<sub>2</sub>O) and +NP (simultaneous addition of Ammonium sulfate / 20% superphosphate) applied in the litter layer without incorporation. Between 1998 and 2006, 100 kg ha<sup>-1</sup> of N, P and N plus P was added, applied twice a year (at beginning and end of rainy the season). The study area burned accidentally twice, in 1994 (before the beginning of the treatments) and in 2005. After the accidental fire in 2005, the plots were re-installed in the same locations.

### Soil sampling and analysis

In October 2007, composite soil samples were collected and consisted of two samples in each plot, at five depths (0-10, 10-20, 20-30, 30 - 40; 40-50 cm). Analyses were performed to determine pH in water and CaCl<sub>2</sub> (0.01 M), total N (Microkjeldahl method), P (extraction with Mehlich 1 and colorimetric determination) and Al (extraction with 1M KCl and titulation with NaOH) (EMBRAPA, 1999).

### NO flux and ancillary data

Soil surface fluxes of NO were measured using dynamic chamber technique and a Scintrex LMA-3 as described by Pinto et al. (2002). Two PVC rings per plot (314.2 cm<sup>2</sup>), totaling six rings per treatment, were installed at least 30 minutes before the beginning of flux measurements. NO concentration was recorded over a period of 5 minutes in each chamber. Fluxes were calculated from the rate of increase of NO concentration using the linear portion of the accumulation curve. Calibration curves were done twice (before and after measurements) a day.

Flux measurements occurred almost monthly, except for measurements in April 2004, when fluxes were measured some hours before fertilization (April 22), and three and ten days after it. Chamber and soil (2.5 and 5.0 cm 166 depth) temperatures were measured during flux measurements.

### Soil sampling and analysis

Soil samples from 0-5 cm were collected within the chambers every sampling day for gravimetric water content, NO<sub>3</sub>- and NH<sub>4</sub><sup>+</sup> determination. Soil samples were extracted with 1 mol/L KCl for 1 hour. NH<sub>4</sub><sup>+</sup> was determined through reaction with Nessler reagent and NO<sub>3</sub><sup>-</sup> was determined by UV-absorption according to the method proposed by Meier (1991).

## 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:

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

EMBRAPA, 1999. Manual de análises químicas de solos, plantas e fertilizantes, first ed. Embrapa, Brazil.

Haridasan, M., 1994. Solos do Distrito Federal, in: Novaes-Pinto, M. (Ed.), *Cerrado: Caracterização, ocupação e perspectivas O caso do Distrito Federal*. Editora da Universidade de Brasília/SEMATEC, Brasília, pp. 321-344.

Meier, M., 1991. Nitratbestimmung in Boden-Proben (N-min-Methode). *Labor Praxis*, 244-247.

Pinto, A.S., Bustamante, M.M.C., Kisselle, K., Burke, R., Zepp, R., Viana, L.T., Varella, R.F., Molina, M., 2002. Soil emissions of N<sub>2</sub>O, NO, and CO<sub>2</sub> in Brazilian Savannas: Effects of vegetation type, seasonality, and prescribed fires. *Journal of Geophysical Research* 107, 571-579.