LBA-ECO CD-10 CO, CO2 AND METEOROLOGICAL DATA, MAXARANGUAPE, BRAZIL

Revision date: May 19, 2011

Summary

This data set reports the concentrations of carbon monoxide (CO) and carbon dioxide (CO2), wind direction, wind speed, and air temperature measured at the Maxaranguape Atmospheric Observatory in northeast Brazil, January 4, 2003 - December 27, 2006. The data are 30-minute averages. The concentrations observed at Maxaranguape are representative of upstream atmospheric boundary conditions for the Amazon basin and could be used in conjunction with Santarem data and other data sets to estimate regional budgets for these gasses (Kirchhoff et al., 2003). There is one comma-delimited ASCII text file with this data set.

Data Citation:

Cite this data set as follows:

Kirchhoff, V.W.J.H., C.B. Aires, and P.C. Alvala. 2011. LBA-ECO CD-10 CO, CO2 and Meteorological Data, Maxaranguape, 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.doi:10.3334/ORNLDAAC/1012

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 Users who download LBA data in the five years after data have been archived must contact the investigators who collected the data, per provisions 6 and 7 in the Policy.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 May of 2011. Users who download the data between May 2011 and April 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.

Table of Contents:

1. Data Set Overview:

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

Activity: LBA-ECO

LBA Science Component: Atmospheric Chemistry

Team ID: CD-10 (Wofsy / Kirchhoff / Camargo / A. Nobre)

The investigators were Wofsy, Steven C.; Kirchhoff, Volker W. J. H.; Budney, John Walter; Daube, Bruce C. and Munger, James William . You may contact Munger, J. William (jwm@io.harvard.edu)

LBA Data Set Inventory ID: CD10_CO_C02_Maxaranguape

The mixing ratios of Carbon Monoxide (CO) and Carbon Dioxide (CO2), wind direction, wind speed, and temperature were measured at the Maxaranguape Atmospheric Observatory in northeast Brazil, January 4, 2003 - December 27, 2006.

2. Data Characteristics:

Data Description: Mixing ratios of CO and CO2, wind direction, wind speed and temperature measured at the Maxaranguape Atmospheric Observatory from January 4, 2003 - December 27, 2006. The data are provided as a single comma-delimited ASCII text file.

File name: CD10_Maxaranguape_CO_CO2_2003-2006.csv

Column	Heading	Units/format	Description
1	Day_of_year		Decimal day of the year with hour indicated by fraction based on UTC (1.5 = noon on Jan 1st)
2	Seq_date_2002		Decimal day since January 1st 2002 based on UTC (local time is GMT-4)
3	Date	yyyy/mm/dd	Sampling date
4	Hour		Hour is the start of the half hourly sampling period on a 24 hour clock on UTC: (local time is GMT -4)
5	Wind_spd	m s-1	Mean wind speed in meters per second (m s-1) computed as a vector average on 30 min intervals
6	Wind_dir	degrees	Mean wind direction in degrees computed as a vector average on 30 min intervals

7	T_air	degrees C	Mean air temperature in degrees Celsius for the 30 min sampling period
8	Std_dev_T_air	degrees C	Standard deviation of the mean air temperature
9	CO2_mix_ratio	ppmv	CO2 mixing ratio in micromoles/mole (ppmv)
10	Std_dev_CO2_ratio	ppmv	Standard deviation of the calculated mean CO2 ratio
11	Npts_CO2		Number of one minute averages included in the half-hourly reported CO2 ratio
12	CO_mix_ratio	ppbv	Carbon monoxide (CO) mixing ratio reported in nanomoles/mole (ppbv)
13	Std_dev_CO_ratio	ppbv	Standard deviation of the calculated mean CO ratio
14	Npts_CO		Number of one minute averages included in the half-hourly reported CO ratio. The maximum number will be less than 30 because of the periodic zeroing
Missing data are represented by -999			

Example data records

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Day_of_year,Seq_date_2002,Date,Hour,Wind_spd,Wind_dir,T_air,Std_dev_T_air,CO2_mix_ratio,
Std_dev_CO2_ratio,
Npts_CO2,CO_mix_ratio,Std_dev_CO_ratio,Npts_CO
3.5833,368.5833,2003/01/04,14,-999,-999,-999,-999,-999,-999,-999,92.6,8.5,22
3.6042,368.6042,2003/01/04,14.5,-999,-999,-999,-999,-999,-999,-999,93.6,7.2,26
3.625,368.625,2003/01/04,15,-999,-999,-999,-999,-999,-999,-999,84.7,6,21
3.6458,368.6458,2003/01/04,15.5,-999,-999,-999,-999,-999,-999,-999,93.1,6.4,23
3.6667,368.6667,2003/01/04,16,-999,-999,-999,-999,-999,-999,-999,92.2,7.7,25
3.6875,368.6875,2003/01/04,16.5,-999,-999,-999,-999,-999,-999,-999,95.9,3.5,22
3.7083,368.7083,2003/01/04,17,-999,-999,-999,-999,-999,-999,-999,91.8,5,23
3.7292,368.7292,2003/01/04,17.5,-999,-999,-999,-999,-999,-999,-999,97.2,3.1,26
3.75,368.75,2003/01/04,18,-999,-999,-999,-999,-999,-999,-999,91.7,3,21
...
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Site boundaries: (All latitude and longitude given in degrees and fractions)

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Rio Grande do Norte - Maxaranguape Atmospheric Observatory (Rio Grande do Norte)	-35.2605	-35.2605	-5.496	-5.496	South-American Datum, 1969 (SAD-69)

Time period:

- The data set covers the period 2003/01/04 to 2006/12/27.
- Temporal Resolution: 30 min

Platform/Sensor/Parameters measured include:

- Tower / CARBON MONOXIDE ANALYZER / CARBON MONOXIDE
- Tower /IRGA (INFRARED GAS ANALYZER) /CARBON DIOXIDE
- Tower / ANEMOMETER / SURFACE WINDS
- METEOROLOGICAL STATION /TEMPERATURE SENSOR /SURFACE AIR TEMPERATURE

3. Data Application and Derivation:

The mixing ratios of CO and CO2 observed at Maxaranguape are representative of upstream boundary condition for the Amazon basin and will be used in conjunction with the Santarem data and other data sets to estimate regional budgets for these gases.

4. Quality Assessment:

Detection limits for CO were based on 2x the standard deviation of the repeated CO-free gas samples. The detection limit was approximately 10 ppb. Precision was based on the standard deviations of repeated sample and calibration gas measurements. The precision was approximately 10 ppb. See Kirchhoff et al (2003) for more details.

5. Data Acquisition Materials and Methods:

The Maxaranguape site is located near the ocean on the northeast coast of Brazil, approximately a one-hour drive from the INPE Natal site. The wind magnitude is strong, generally above 10 m/s, and the preferential direction is between about 100 and 140 degrees,most of the time, thus bringing pristine South Atlantic air masses to the site. However, during a few hours of the night time period, and only on a few days of the month, the direction may change to values larger than 180 degrees, when the wind may blow over city limits before it reaches Maxaranguape, and thus can bring pollution to the site (larger CO2 concentrations, and lower O3 values correlate with the wind direction change).

Wind speed and direction were measured by wind vane and propeller anemometer mounted 3 m above the building roof. Wind speed and direction were computed as vector averages on 30-minute intervals. Air temperature was measured by a thermistor housed in an aspirated radiation shield and half hourly mean and standard deviation are reported.

CO2 was measured using a LiCor 6262. Water vapor was removed from the sample stream with a Nafion dryer. The CO2 analyzer was operated in differential mode with the reference cell purged with purified air with a constant CO2 mixing ratio close to ambient level. Four times per day the analyzer was calibrated by supplying a high, medium, and low mixing ratio calibration gas that spanned the range of ambient levels. The sample mixing ratios were computed from non-linear calibration curves fit to the standards. Mixing ratios were computed from 60-second averages and subsequently averaged to half-hour intervals reported here along with the standard deviation and number of samples included. Intervals with too few observations were rejected.

Carbon monoxide was measured using a Thermoenvironmental Instruments 48CTL gas-filter correlation infra red absorption analyzer. Water vapor in sample air and standard gas was held constant by passing the sample stream through a 2C cold trap to remove condensate from the ambient sample. The instrument zero was tracked by passing ambient air over an oxidizing catalyst (Sofnocat) to remove carbon monoxide. The instrument was zeroed for 3 minutes every 15 minutes, and interpolated zeros were subtracted from the sample and calibration signals. Every 6 hours the instrument gain was determined using calibration standards with ~100 and ~500 ppbv. Sample mixing rations were determined by computing a second order least-squares fit to the zero and calibration signals. Signals were initially averaged to 1 minute intervals to compute mixing ratio, and these were further averaged to 30-minute intervals. Data are reported as the 30-minute mean and standard deviation along with the number of observations included in the average.

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:

Kirchhoff, V.W.J.H., C.B. Aires, and P.C. Alvala. 2003. An experiment to determine atmospheric CO concentrations of tropical South Atlantic air samples. Quarterly Journal of the Royal Meteorological Society 129(591):1891-1902. doi:10.1256/qj.02.142