

LBA-ECO CD-15 LAI and Productivity Data, km 67, Tapajos National Forest: 2003-2004

Summary:

This data set provides mean leaf area index (LAI), dendrometry band measurements, and litterfall mass from samples collected at the km 67 research site, Tapajos National Forest, Para, Brazil. Litterfall collections were from January 23, 2004 through December 3, 2004, dendrometer measurements were monthly between December 2003 and December 2004, and LAI measurements were collected from January 26, 2004 through November 3, 2004.

All measurements were taken at the km 67 site in the Tapajos National Forest. This site is situated in an area of Amazonian primary tropical forest belonging to the municipality of Belterra, Para, Brazil. The forest is mostly evergreen with a few deciduous species. The canopy is characterized by large emergent trees up to 55-m tall, with a closed canopy at approximately 40-m; there are few indications of recent anthropogenic disturbance other than hunting trails. Measurement plots (50) were established along 4 transects at the site and within each plot, 5 subplots were established. The longest transect (25 m x 500 m) was the location of 20 (25 m x 25 m) plots. The other 3 transects (25 m x 250 m) contain 10 plots per transect. Note that the assignment of plots to transects is not provided.

There are four comma-delimited data files (.csv) with this data set.

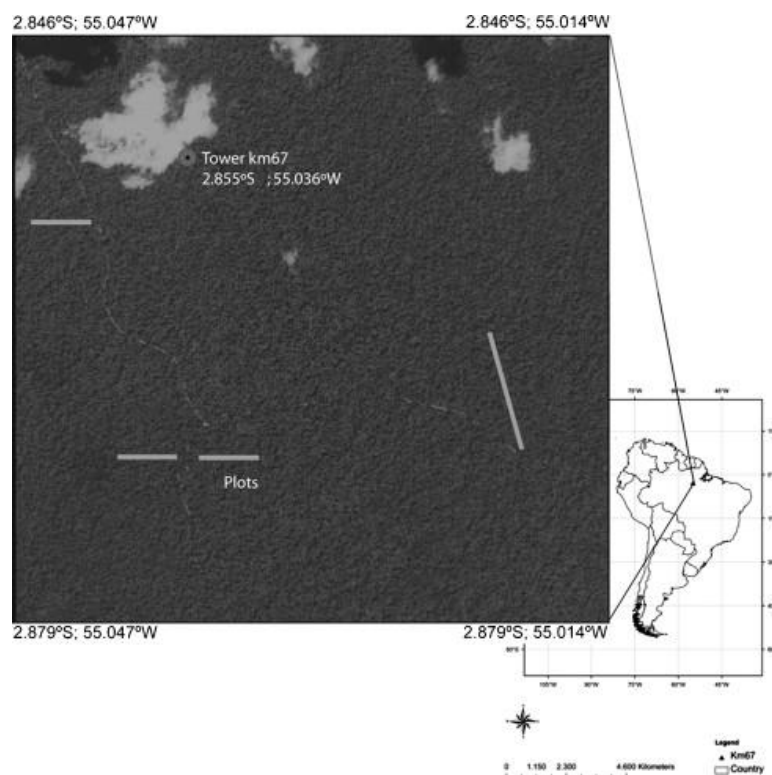


Fig. 1. Location of the study area (plots) in Tapajós National Forest, Belterra, State of Para, Brazil. This is an Ikonos image showing the layout of 4 transects. The longest transect (25 m x 500 m) shows the

location of 20 (25 m x 25 m) plots. The other 3 transects (25 m x 250 m) contain 10 plots per transect. Each plot has 5 subplots (not shown). From Malhado et al., 2009.

Data Citation:

Cite this data set as follows:

Costa, M.H. and W. Cohen. 2013. LBA-ECO CD-15 LAI and Productivity Data, km 67, Tapajos National Forest: 2003-2004. 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/ORNLDAAAC/1167>

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Data users should use the investigator contact information in this document to communicate with the data provider.

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-15 (Cohen / Costa)

The investigators were Cohen, Warren B.; Costa, Marcos Heil; Ahl, Douglas Eric; Andrade, Ricardo Guimaraes; Budney, John Walter; Castleton, Dulce; Figueiredo, Daniel Nunes; Gower, Stith Tom; Kennedy, Robert E.; Maiersperger, Thomas Krueger; Portilho, Kleber da Costa; Ritts, Dave; Senna, Monica Carneiro Alves; Filho, Jose Danilo Souza and Turner, David P. You may contact Cohen, Warren B. (warren.cohen@orst.edu) and Costa, Marcos Heil (mhcosta@ufv.br).

LBA Data Set Inventory ID: CD15_Productivity

This data set provides mean leaf area index (LAI), dendrometry band measurements, and litterfall mass from samples collected at the km 67 research site, Topajos National Forest, Para, Brazil. Litterfall collections were from January 23, 2004 through December 3, 2004, dendrometer measurements were monthly between December 2003 and December 2004, and LAI measurements were collected from January 26, 2004 through November 3, 2004.

All measurements were taken at the km 67 site in the Tapajos National Forest. This site is situated in an area of Amazonian primary tropical forest belonging to the municipality of Belterra, Para, Brazil. The forest is mostly evergreen with a few deciduous species. The canopy is characterized by large emergent trees up to 55-m tall, with a closed canopy at approximately 40-m; there are few indications of recent anthropogenic disturbance other than hunting trails. Measurement plots (50) were established along 4 transects at the site and within each plot, 5 subplots were established. The longest transect (25 m x 500 m) was the location of 20 (25 m x 25 m) plots. The other 3 transects (25 m x 250 m) contain 10 plots per transect. Note that the assignment of plots to transects is not provided.

2. Data Characteristics:

Data are presented in four comma-separated ASCII files:

- File 1: CD15_Litterfall_2003_2004.csv
- File 2: CD15_LAI_2004.csv
- File 3: CD15_Dendrometer_measurements_2003_2004.csv
- File 4: CD15_dendrometry_dates.csv

File 1. **CD15_Litterfall_2004.csv**. Measurements were made from January 23, 2004 through December 3, 2004.

Column	Variable	Units/format	Description
1	Sample_date	YYYYMMDD	Sample Date
2	Plot		Plot identification: each 25 x 25 m plot was given a unique identification number: 1-50
3	Subplot		Subplot identification: each plot was divided into 5 subplots
4	Mass_litterfall	g	Weight of dry leaves in grams (g) per litter basket: each litter basket had a surface area of 0.25 meters squared

Example data records:

```
Sample_date,Plot,Subplot,Mass_litterfall
20040123,1,1,6.8
20040223,1,1,5.6
...
20040426,26,2,6.8
20040524,26,2,3.7
```

```

...
20041126,50,5,7.2
20041203,50,5,8.1

```

File 2. **CD15_LAI_2004.csv**. Measurements were made from January 26, 2004 through November 3, 2004.

Column	Variable	Units/format	Description
1	Plot		Plot identification: each 25 x 25 m plot was given a unique identification number: 1-50
2	Year	YYYY	Year of sampling
3	Month	MMM	Month in which measurements were made
4	Day	dd	Day of the month on which measurements were made
5	N		Number of point measurements (one per subplot) used in plot average
6	LAI	m2 per m2	Mean leaf area index measured with a LI-COR LAI 2000 and reported in meters squared per meter squared
7	lai_se	m2 per m2	Standard error of the leaf area index reported in meter squared per meter squared
8	fpar		Mean fraction of absorbed photosynthetic active radiation (fpar) calculated using the 'difn' output from the LAI 2000
8	fpar_se		Standard error of the mean fpar value

Example data records:

```

Plot,Year,Month,Day,N,LAI,lai_se,fpar,fpar_se
1,2004,JAN,26,5,6.53,0.21,0.99,0
2,2004,JAN,26,5,6.27,0.14,1,0
...
50,2004,MAY,24,5,5.306,0.229,0.988,0.002
1,2004,JUN,25,5,6.448,0.199,0.994,0.002
...
49,2004,NOV,3,5,5.362,0.533,0.97,0.01
50,2004,NOV,3,5,5.526,0.415,0.986,0.003

```

File #3: **CD15_Dendrometer_measurements_2003_2004.csv**. Measurements were made from December 2003 through November 2004.

Column	Variable	Units/format	Description
1	Plot		Plot identification: each 25 x 25 m plot was given a unique identification number
2	Subplot		Subplot identification: each plot was divided into 5 subplots
3	Tree_no		Tree identification
4	Diameter	cm	Diameter at breast height at the beginning of the study
5	Band_122003	mm	Dendrometer band measurement in December 2003 reported in millimeters (mm)

6	Band_012004	mm	Dendrometer band measurement in January 2004 reported in millimeters (mm)
7	Band_022004	mm	Dendrometer band measurement in February 2004 reported in millimeters (mm)
8	Band_032004	mm	Dendrometer band measurement in March 2004 reported in millimeters (mm)
9	Band_042004	mm	Dendrometer band measurement in April 2004 reported in millimeters (mm)
10	Band_052004	mm	Dendrometer band measurement in May 2004 reported in millimeters (mm)
11	Band_062004	mm	Dendrometer band measurement in June 2004 reported in millimeters (mm)
12	Band_072004	mm	Dendrometer band measurement in July 2004 reported in millimeters (mm)
13	Band_082004	mm	Dendrometer band measurement in August 2004 reported in millimeters (mm)
14	Band_102004	mm	Dendrometer band measurement in October 2004 reported in millimeters (mm)
15	Band_112004	mm	Dendrometer band measurement in November 2004 reported in millimeters (mm) file
16	Band_final	mm	Final dendrometer band measurement done on November 30 or December 1 or December 3 2004 reported in millimeters (mm)
17	Comments		Notations from the field notebooks

missing data are represented by -9999

Example data records:

```

Plot,Subplot,Tree_no,Diameter ,Band_122003,Band_012004,Band_022004,Band_032004,
Band_042004,Band_052004,Band_062004,Band_072004,Band_082004,Band_102004,Band_11
2004,Band_final,Comments
1,1,1,80.5,-9999,37.2,-9999,-9999,
-9999,-9999,-9999,-9999,-9999,-9999,-9999,-9999,48.4,ladder
1,1,2,63.9,11.6,12.3,12.2,12.4,
12.7,12.5,12.5,10.2,12.7,12.6,12.7,13.2,-9999
...
25,2,636,-9999,-9999,-9999,-9999,-9999,
-9999,-9999,-9999,-9999,-9999,-9999,-9999,-9999,-9999
25,3,640,23.1,20.4,20.7,21.1,20.4,
21.4,21.4,21.3,21.3,21.5,21.5,22.2,20,-9999
...
50,5,783,18.6,33.5,32.2,34.2,33.3,
34.8,34.8,35.9,35.9,36.2,37,35.2,35.8,-9999
50,5,784,51.2,-9999,37,44.1,48.5,
53.7,56.8,59.2,59.3,60.4,64.9,70,78.7,-9999

```

File 4: CD15_dendrometry_dates.csv

This file contains the dates the dendrometry measurements reported in file 3, CD15_Dendrometer_measurements_2003_2004.csv, were taken in each plot, for measurements one through 11, and the final measurement date (YYYYMMDD).

Example data records:

```

Plot,First_measurement_date,Second_measurement_date,Third_measurement_date,Fourth_measurement_date,
Fifth_measurement_date,Sixth_measurement_date,Seventh_measurement_date,Eighth_measurement_date,
Ninth_measurement_date,Tenth_measurement_date,Eleventh_measurement_date,Final_measurement_date
1,20031210,20040126,20040226,
20040323,20040427,20040525,20040626,
20040726,20040825,20041004,20041103,20041130

2,20031210,20040126,20040226,
20040323,20040427,20040525,20040626,
20040726,20040825,20041004,20041103,20041130

...
49,20031222,20040127,20040226,
20040323,20040427,20040524,20040626,
20040726,20040826,20040906,20041101,20041130

50,20031222,20040127,20040226,
20040323,20040427,20040524,20040626,
20040726,20040826,20040906,20041101,20041130
    
```

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 67 Primary Forest Tower Site (Para Western (Santarem))	-54.95900	-54.95900	-2.85700	-2.85700	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 2003/12/10 to 2004/12/03.
- Temporal Resolution: Dendrometers were recorded monthly between December 2003 and November 2004.

Platform/Sensor/Parameters measured include:

- FIELD INVESTIGATION / WEIGHING BALANCE / BIOMASS
- FIELD INVESTIGATION / STEEL MEASURING TAPE / BIOMASS
- FIELD INVESTIGATION / DENDROMETERS / BIOMASS
- FIELD INVESTIGATION / LICOR PLANT CANOPY ANALYZER / CANOPY CHARACTERISTICS

3. Data Application and Derivation:

These data were collected as part of the Bigfoot Project which used field data and eddy flux measurements to validate remote sensing estimates of gross and net primary productivity across a number of biomes.

4. Quality Assessment:

Dendrometer Data:

Concerns about dendrometer data are noted in the data file (e.g. band ruptured or replaced).

Important Quality Note:

- The tree species and size classes determined during a 2001 reconnaissance trip are unavailable.

5. Data Acquisition Materials and Methods:

Site Description:

All measurements were taken at the km 67 site in the Tapajos National Forest. This site is situated in an area of Amazonian primary tropical forest belonging to the municipality of Belterra, Para state, Brazil. The forest is mostly evergreen with a few deciduous species. The canopy is characterized by large emergent trees up to 55-m tall, with a closed canopy at approximately 40-m; there are few indications of recent anthropogenic disturbance other than hunting trails.

- Abundant tree species include the tauari (*Couratari guianensis*), matamata (*Eschweilera* sp.), massaranduba (*Manilkara huberi*), andiroba (*Carapa guianensis*), tachi (*Sclerolobium paniculatum*), abiu (*Pouteria* sp.), breu (*Protium decandro*), and louro (*Licaria guianensis*).
- Soils are nutrient-poor clay oxisols with low organic content. The monthly incident photosynthetically active radiation (PAR) values vary from 640 to 850 mmol per m² per s (Senna et al., 2005).
- The annual mean precipitation is 1911 mm, the mean temperature is 25 degrees C, and the dry season extends from July to November (Juarez et al., 2009).

50 plots were established along 4 transects at the site and within each plot, 5 subplots were established. The longest transect (25 m x 500 m) was the location of 20 (25 m x 25 m) plots. The other 3 transects (25 m x 250 m) contain 10 plots per transect. Note that the assignment of plots to transects is not provided. See Figure 1.

Litterfall:

Litterfall was collected in 250 litter baskets (0.25 m² surface area each) installed in each subplot and collected every month. The leaves were separated, dried in an oven for 24 h, and then weighed. Branches, fruits and seeds were discarded. The exact date of each collection is recorded in the data file. Samples were collected from January 23, 2004 through December 3, 2004.

LAI Measurements:

LAI measurements were made monthly from samples in the 25 x 25-m plots using three LAI-2000 Plant Canopy Analysers (Li-Cor, 1992). This technique is referred to as the indirect non-contact method and

represents the projected area of leaves taking into account individual leaf inclinations (Scurlock et al., 2001). One of the instruments was installed on the top of a tower to measure the diffuse radiation on the top of the canopy, while the other two measured diffuse radiation at about 1-m high. The Plant Canopy Analyser measures diffuse radiation with a light sensor, in the 320 to 490 nm range where the radiation scattering by leaves is minimal. LI-COR software was used to determine the canopy transmittance and the LAI (m² leaf area per m² ground area) per subplot using an instrument specific formulation. The fraction of photosynthetically active radiation (fPAR) was estimated from the DIFN variable provided by the Li-Cor LAI-2000 Plant Canopy Analyzer (Gower et al., 1999). LAI data are included from January 26 through November 3, 2004.

Dendrometry Measurements:

Dendrometer measurements were made in 25 x 25-m plots and subplots. Woody biomass increment was determined from radial growth, measured using rust-resistant dendrometer bands (Walker and Whiteaker, 1988) to measure annual diameter growth. Dendrometer measurements were read monthly between December 2003 and November 2004. Actual dates for each reading are included in file 4, CD15_dendrometry_dates.csv.

Important Quality Note:

- The tree species and size classes determined during a 2001 reconnaissance trip are unavailable.

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:

Gower, S.T., Kucharik, C.J., and J.M. Norman. 1999. Direct and indirect estimation of leaf area index, fAPAR and net primary production of terrestrial ecosystems. *Remote Sensing of Environment* 70:29-51.

Juarez, R.I.N., Rocha, H.R., Figueira, A.M.S., Goulden, M.L., Miller, S.D., 2009. An improved estimate of leaf area index based on the histogram analysis of hemispherical photographs. *Agricultural and Forest Meteorology* 149, 920-928.

Malhado, Ana C.M., Marcos H. Costa, Francisca Z. de Lima, Kleber C. Portilho, and Daniel N. Figueiredo. 2009. Seasonal leaf dynamics in an Amazonian tropical forest. *Forest Ecology and Management*, Volume 258, Issue 7, Pages 1161-1165, 10.1016/j.foreco.2009.06.002

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Senna, M.C.A., Costa, M.H., Shimabukuro, Y.E., 2005. Fraction of photosynthetically active radiation absorbed by Amazon tropical forest: a comparison of field measurements, modeling, and remote sensing. *Journal of Geophysical Research* 110, G01008.

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