LBA-ECO CD-32 Flux Tower Network Data Compilation, Brazilian Amazon: 1999-2006, V2

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Documentation Revision Date: 2021-09-23

Dataset Version: 2

Summary

This dataset is a compilation of carbon and energy eddy covariance flux, meteorology, radiation, canopy temperature, humidity, CO2 profiles and soil moisture and temperature profile data that were collected at nine towers across the Brazilian Amazon. Independent investigators provided the data from a variety of flux tower projects over the period 1999 thru 2006. This is Version 2 of the tower data compilation, where the data have been harmonized across projects, additional quality control checks were performed, and have been aggregated to hourly, daily, 16-day, and monthly timesteps. This integrated dataset is intended to facilitate integrative studies and data-model synthesis from a common reference point.

This dataset includes and expands upon Version 1 of this compilation (Saleska et al., 2013). Version 2 contains the flux tower data and additional calculations of ecosystem respiration, gross ecosystem productivity, and canopy storage as published in Restrepo-Coupe et al., 2013.

There are 36 data files in tab-delimited (*.txt) format included in this dataset along with CD32_Fluxes_Brazil-Readme.pdf as a companion file. For each of the nine towers, there are four files where data have been aggregated to hourly, daily, 16-day, and monthly time steps.

Figure 1. Santarem km 77 eddy flux and micrometeorological measurement pasture site (Fitzjarrold and Sakai, 2010) and the Para Western (Santaram) - km 67, Primary Forest Tower. Source: Hutyra et al., 2008

Citation

Restrepo-Coupe, N., H.R. da Rocha, L.R. Hutyra, A.C. de Araujo, L.S. Borma, B. Christoffersen, O. Cabral, P.B. de Camargo, F.L. Cardoso, A.C.L. Costa, D.R. Fitzjarrald, M.L. Goulden, B. Kruijt, J.M.F. Maia, Y.S. Malhi, A.O. Manzi, S.D. Miller, A.D. Nobre, C. von Randow, L.D. Abreu Safaj, R.K. Sakai, J. Tota, S.C. Wofsy, F.B. Zanchi, and S.R. Saleska. 2021. LBA-ECO CD-32 Flux Tower Network Data Compilation, Brazilian Amazon: 1999-2006, V2. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1842

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1. Dataset Overview

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

Activity: LBA-ECO

LBA Science Component: Carbon Dynamics

Team ID: CD-32 (Saleska / da Rocha / Artaxo / Nobre / Shimabukuro)

The investigators were Saleska, Scott R.; Rocha, Humberto Ribeiro da; Artaxo, Paulo Eduardo; Huete, Alfredo R.; Nobre, Antonio Donato; Parker, Geoffrey; Ratana, Piyachat; Restrepo-Coupe, Natalia; Shimabukuro, Monica Takako; Shimabukuro, Yosio Edemir and Tannus, Rafael Nora. You may contact Saleska, Scott R. (saleska@email.arizona.edu) and Restrepo-Coupe, Natalia (ncoupe@email.arizona.edu).

LBA Data Set Inventory ID: CD32_Brazil_Flux_Network

This dataset is a compilation of carbon and energy eddy covariance flux, meteorology, radiation, canopy temperature, humidity, and CO2 profiles, and soil moisture and temperature profile data that were collected at nine towers across the Brazilian Amazon. Independent investigators provided the data from a variety of flux tower projects over the period 1999 thru 2006. The data have been harmonized across projects, additional quality control checks performed and aggregated to several time intervals. This dataset includes and expands upon Version 1 of this compilation (Saleska et al., 2013). Version 2 contains the flux tower data and additional calculations of ecosystem respiration, gross ecosystem productivity, and canopy storage as published in Restrepo-Coupe et al., 2013. This integrated dataset is intended to facilitate integrative studies and data-model synthesis from a common reference point.

Related Publication

Restrepo-Coupe, N., Rocha, H.R. da, Christoffersen, B., Araujo, A.C. da, Borma, L.S., Cabral, O.M.R., Camargo, P.B. de, Cardoso, F.L., Costa, A.C.L. da, Fitzjarrald, D.R., Goulden, M.L., Hutyra, L.R., Kruijt, B., Maia, J.M.F., Malhi, Y.S., Manzi, A.O., Miller, S.D., Nobre, A.D., Randow, C. von, Sá, L.D. da A., Sakai, R.K., Tota, J., Wofsy, S.C., Zanchi, F.B., Saleska, S.R. 2013. What drives the seasonality of productivity across the Amazon basin? A cross-site analysis of eddy flux tower measurements from the Brasil flux network. Agricultural and Forest Meteorology. https://doi.org/10.1016/j.agrformet.2013.04.031

Related Datasets

Saleska, S.R., H.R. da Rocha, A.R. Huete, A.D. Nobre, P.E. Artaxo, and Y.E. Shimabukuro. 2013. LBA-ECO CD-32 Flux Tower Network Data Compilation, Brazilian Amazon: 1999-2006. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1174

- This dataset is Version 1 and is superseded by the current Version 2 dataset. Version 1 was the source of the original and quality assured time-series data used as the basis for Version 2.

Data from LBA flux tower sites for similar time periods:

- LBA-ECO CD-10 CO2 & H2O Eddy Flux Data at km 67 Tower Site, Tapajos National Forest (data for the period 2002/01/01 to 2006/01/18)
- LBA-ECO CD-10 H2O Profiles at km 67 Tower Site, Tapajos National Forest (data for the period 2002/01/01 to 2006/01/18)
- LBA-ECO CD-10 CO2 Profiles at km 67 Tower Site, Tapajos National Forest (data for the period 2002/01/01 to 2006/01/18)
- LBA-ECO CD-10 Temperature Profiles at km 67 Tower Site, Tapajos National Forest (data for the period 2002/01/01 to 2006/01/18)
- LBA-ECO CD-03 Flux-Meteorological Data, km 77 Pasture Site, Para, Brazil: 2000-2005 (data for the period 2000/09/01 to 2006/01/01)
- LBA-ECO CD-04 CO2 Profiles, km 83 Tower Site, Tapajos National Forest (data for the period 2000/07/01 to 2004/03/12)
- LBA-ECO CD-04 Meteorological and Flux Data, km 83 Tower Site, Tapajos National Forest (data for the period 2000/06/29 to 2004/03/11)
- LBA-ECO CD-02 Carbon and Oxygen Isotopes in Atmospheric CO2 in the Amazon: 1999-2004 (data for the period 1999/03/01 to 2004/03/31)
- LBA-ECO CD-04 CO2 and Heat Flux, km 83 Gap Tower Site, Tapajos National Forest (data for the period 2002/06/03 to 2004/01/30)
- LBA-ECO CD-04 Meteorological and Flux Data, km 83 Tower Site, Tapajos National Forest (data for the period 2000/06/29 to 2004/03/11)
- LBA-ECO TG-07 Soil Trace Gas Fluxes km 67 Seca-Floresta Site, Tapajos National Forest (data for the period 2000/01/12 to 2004/04/28)
- LBA-ECO CD-04 Soil Respiration, km 83 Tower Site, Tapajos National Forest, Brazil (data for the period 2001/12/19 to 2002/03/01)

2. Data Characteristics

Spatial Coverage: Flux tower sites within the Brazilian Amazon

Spatial Resolution: Point tower site

Temporal Coverage: 1999-01-01 to 2006-12-31 (Coverage varies by tower. See Table 2.)

Temporal Resolution: Hourly, daily, 16-day, and monthly

Site Boundaries: Latitude and longitude are given in decimal degrees. World Geodetic System, 1984 (WGS-84).

Site (Region)	Tower Code (Data File)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Para Western (Santarem) - km 67 Primary Forest Tower	K67	-54.959	-54.959	-2.857	-2.857
Para Western (Santarem) - km 77 Pasture Tower	K77	-54.8885	-54.8885	-3.0202	-3.0202
Para Western (Santarem) - km 83 Logged Forest Tower	K83	-54.9707	-54.9707	-3.017	-3.017

Amazonas (Manaus) - ZF2 km 34	K34	-60.2091	-60	-2.5	-2.609
Para Eastern (Belem) - FLONA Caxiuana	CAX	-51.4536	-51.4536	-1.7483	-1.7483
Rondonia - Fazenda Nossa Senhora	FNS	-62.3572	-62.3572	-10.7618	-10.7618
Rondonia - Jaru Biological Reserve Tower B	RJA	-61.9331	-61.9331	-10.078	-10.078
Tocantins - Ilha do Bananal	BAN	-50.1591111	-50.1591111	-9.824416667	-9.824416667
Sao Pablo - Reserva Pe-de-Gigante	RPG	-47.6498889	-47.6498889	-21.61947222	-21.61947222

Data File Information

There are 36 data files in tab-delimited (*.txt) format included in this dataset. That is four files at hourly, daily, 16-day, and monthly resolution for each of the nine tower sites. All files include the same 211 variables.

Tower Codes used in data file names are provided in the above table. Examples shown use the "BAN" tower.

Data File Details

1. Hourly Data

- Data source: Original and quality assured time series data. **These are the hourly base-files (_CfluxBF) for the other data products.**
- Data aggregation intervals: Data reported at 10:00 are from aggregating measurements between 10:00 and 11:00. Hour runs from 0 (zero) to 23.
- Units: Precipitation (prec) units are mm hr-1. Other variable units are averaged over the aggregation interval.
- Example file name: BAN_CfluxBF.txt

NOTE: There are no original time series hourly files for the K77, RON_RJA, and RON_FNS sites; however, there are quality control-hourly files for those sites.

2. Daily Data

- Data source: Hourly data
- Data aggregation intervals: Julian day (day)
- Units: Precipitation (prec) units are mm hr-1 as average. Other variable units are averaged over the aggregation interval.
- Example file name: BANday_CfluxBF.txt

3. 16-Day (similar to MODIS products):

- Data source: Hourly data
- Data aggregation intervals: 16-days
- Units: Precipitation (prec) units are mm hr-1 as average. Other variable units are averaged over the aggregation interval.
- Example file name: BANday16_CfluxBF.txt

4. Monthly Data

- Data source: Daily data.
- Data aggregation intervals: Month. Variable value set to missing if less than 7 days of data, except precipitation.
- Units: Precipitation (prec) units are (mm day-1) as average. Other variable units are averaged over the aggregation interval.
- Example file name: BANmonth_CfluxBF.txt

Table 1. Variables (211) in all data files. Missing values and values for bad data are represented as -9999. Value ranges included when provided by authors. **Note that all values are in scientific notation. See example data record below.**

#	Variable	Units	Description	Value Range	V1 and V2 notes
1	dateloc	NA			
2	Year_LBAMIP	YYYY	Year (YYYY)	1999-2006	LBA-DMIP driver added to V2
3	DoY_LBAMIP	JD	Julian day (DDD)	0-366	LBA-DMIP driver added to V2
4	Hour_LBAMIP	HR	Hour, UTC time	0-23	LBA-DMIP driver added to V2
5	Tair_LBAMIP	degK	Near surface air temperature		LBA-DMIP driver added to V2
6	Qair_LBAMIP	kg kg-1	Near surface specific humidity		LBA-DMIP driver added to V2
7	Wind_LBAMIP	m s-1	Near surface module of the wind		LBA-DMIP driver added to V2
8	Rainf_LBAMIP	kg m-2 s-1	Rainfall rate. Average of the total rainfall over a time step and grid cell.		LBA-DMIP driver added to V2
9	PSurf_LBAMIP	Pa	Surface atmospheric pressure		LBA-DMIP driver added to V2
10	SWdown_LBAMIP	W m-2	Surface incident shortwave radiation		LBA-DMIP driver added to V2

11	LWdown_LBAMIP	W m-2	Surface incident longwave radiation		LBA-DMIP driver added to V2
12	CO2air_LBAMIP	Logical	Near surface CO2 concentration. The partial pressure of CO2 concentration at the atmospheric reference level (3D variable).		LBA-DMIP driver added to V2
13	GF_Tair_LBAMIP	Logical	Near surface air temperature		GF-LBA-DMIP driver added to V2
14	GF_Qair_LBAMIP	Logical	Near surface specific humidity		GF-LBA-DMIP driver added to V2
15	GF_Wind_LBAMIP	Logical	Near surface module of the wind		GF-LBA-DMIP driver added to V2
16	GF_Rainf_LBAMIP	Logical	Rainfall rate. Average of the total rainfall over a time step and grid cell.		GF-LBA-DMIP driver added to V2
17	GF_PSurf_LBAMIP	Logical	Surface atmospheric pressure		GF-LBA-DMIP driver added to V2
18	GF_SWdown_LBAMIP	Logical	Surface incident shortwave radiation		GF-LBA-DMIP driver added to V2
19	GF_LWdown_LBAMIP	Logical	Surface incident longwave radiation		GF-LBA-DMIP driver added to V2
20	GF_CO2air_LBAMIP	Logical	Near surface CO2 concentration. The partial pressure of CO2 concentration at the atmospheric reference level (3D variable).		GF-LBA-DMIP driver added to V2
21	ta	oC (degree Celsius)	AWS Air temperature	0-40	V1
22	taed	oC (degree Celsius)	Sonic temperature	0-40	V1
23	wd	degrees	Wind direction (Cup Anemometer)		V1
24	wded	degrees	Wind direction (Sonic Anemometer)		V1
25	pressed	KPa	Pressure eddy system	90-110	V1
26	press	KPa	Pressure: Automatic Weather Station (AWS)	40-110	V1
27	rg	W m-2	Global Incident Radiation	20-1200	V1
28	rr	W m-2	Global Reflected Radiation	20-800	V1
29	par	umol photons m-2 s-1	PAR Incident Radiation	0-2600	V1
30	rpar	umol photons m-2 s-1	PAR Reflected Radiation	0-1300	V1
31	Rn	W m-2	Net Radiation	100-1010	V1
32	FG	W m-2	Soil Heat Flux	26-32	V1
33	wsed	m s-1	Wind speed (Cup Anemometer)	0-19	V1
34	ws	m s-1	Wind speed (Sonic Anemometer)	0-26	V1
35	H	W m-2	Sensible heat flux corrected for air heat capacity that can change with humidity	100-600	V1
36	Hraw	W m-2	Sensible heat flux (raw, without correction)	100-600	V1
37	LE	W m-2	Latent heat flux corrected for air heat capacity that can change with humidity	100-1000	V1
38	Leraw	W m-2	Latent heat flux (raw, without correction)	100-1000	V1
39	Fc	umol CO2 m-2 s-1	CO2 turbulent flux at the top of the canopy, corrected for air heat capacity that can change with humidity	60-70	V1
40	Fcraw	umol CO2 m-2 s-1	CO2 turbulent flux (raw, without correction) (60-70 umol CO2/m2/s)	60-70	V1
41	co2	ppm	CO2 concentration IRGA	140-170	V1
42	sco2	umol CO2 m-2 s-1	Canopy storage flux of CO2	-130	V1
43	NEE	umol CO2 m-2 s-1	Net ecosystem exchange of CO2	-140	V1
44	NEEf	umol CO2 m-2 s-	Filtered net ecosystem exchange	-140	V1

		1			
45	mrs	umol CO2 m-2 s-1	Soil respiration	0	V1
46	ust	m s-1	Friction velocity (m/s)	0.00-2.00	V1
47	rh	%	Relative humidity	10-130	V1
48	prec	mm	Precipitation	0-80	V1
49	h2o	mmol/mol	H2O concentration IRGA	2-80	V1
50	Fh2o	mmols m-2 s-1	Rate of vertical transfer of H2O (mmol/m2/s)	15-20	V1
51	U	m s-1	zonal wind (Cup Anemometer)	15-20	V1
52	Ued	m s-1	Zonal wind (Sonic Anemometer)	13-Oct	V1
53	V	m s-1	Meridional wind (Cup Anemometer)	19-15	V1
54	Ved	m s-1	Meridional wind (Sonic Anemometer)	30-Oct	V1
55	ee	KPa	Vapor pressure	0-20	V1
56	ees	KPa	Saturation vapour pressure	0-13	V1
57	dpt	oC (degree Celsius)	Dew point temperature	30-6-	V1
58	tsavg	oC (degree Celsius)	Avg Soil Temperature	5-40	V1
59	eqtemp	oC (degree Celsius)	Equivalent Temperature	0	V1
60	abshu	g m-3	Absolute Humidity	0	V1
61	slopee	KPa oC -1	Slope of Saturation Vapor Pressure	0	V1
62	radtop	W m -2	Hourly Theoretical Radiation	0	V1
63	rgs	W m -2	Short wave radiation in	0-1200	V1
64	rgsout	W m -2	Short wave radiation in	0-200	V1
65	rgl	W m -2	Long wave radiation in	0-600	V1
66	rglout	W m -2	Long wave radiation out	0-600	V1
67	stdW	m s-1	Standard deviation, vertical wind	0	V1
68	ang	degrees	Rotation Angle	0	V1
69	Tau	Kg m-2 s-1	Rate of vertical tranference of momentum	0	V1
70	zl	NA	Atmospheric stability parameter	0	V1
71	tprof1	oC (degree Celsius)	Canopy temperature profile	10-50	V1
72	tprof2	oC (degree Celsius)	Canopy temperature profile		V1
73	tprof3	oC (degree Celsius)	Canopy temperature profile		V1
74	tprof4	oC (degree Celsius)	Canopy temperature profile		V1
75	tprof5	oC (degree Celsius)	Canopy temperature profile		V1
76	tprof6	oC (degree Celsius)	Canopy temperature profile		V1
77	tprof7	oC (degree Celsius)	Canopy temperature profile		V1
78	tprof8	oC (degree Celsius)	Canopy temperature profile		V1
79	tprof9	oC (degree Celsius)	Canopy temperature profile		V1
80	tprof10	oC (degree Celsius)	Canopy temperature profile		V1
81	avgprofT	oC (degree Celsius)	Average Profile Temperature	10-50	V1

82	msoil1	m3 m-3	Soil humidity profile	0-5	V1
83	msoil2	m3 m-3	Soil humidity profile		V1
84	msoil3	m3 m-3	Soil humidity profile		V1
85	msoil4	m3 m-3	Soil humidity profile		V1
86	msoil5	m3 m-3	Soil humidity profile		V1
87	msoil6	m3 m-3	Soil humidity profile		V1
88	msoil7	m3 m-3	Soil humidity profile		V1
89	msoil8	m3 m-3	Soil humidity profile		V1
90	msoil9	m3 m-3	Soil humidity profile		V1
91	msoil10	m3 m-3	Soil humidity profile		V1
92	totalteta	m3 m-3	Total H20 in the soil	0-5	V1
93	pco2_1	ppm	CO2 concentration profile	200-600	V1
94	pco2_2	ppm	CO2 concentration profile		V1
95	pco2_3	ppm	CO2 concentration profile		V1
96	pco2_4	ppm	CO2 concentration profile		V1
97	pco2_5	ppm	CO2 concentration profile		V1
98	pco2_6	ppm	CO2 concentration profile		V1
99	pco2_7	ppm	CO2 concentration profile		V1
100	pco2_8	ppm	CO2 concentration profile		V1
101	pco2_9	ppm	CO2 concentration profile		V1
102	pco2_10	ppm	CO2 concentration profile		V1
103	avgsto	ppm	Average Storage	200-600	V1
104	h2o_1	mmol/mol	H20 concentration profile	10-85	V1
105	h2o_2	mmol/mol	H20 concentration profile		V1
106	h2o_3	mmol/mol	H20 concentration profile		V1
107	h2o_4	mmol/mol	H20 concentration profile		V1
108	h2o_5	mmol/mol	H20 concentration profile		V1
109	h2o_6	mmol/mol	H20 concentration profile		V1
110	h2o_7	mmol/mol	H20 concentration profile		V1
111	h2o_8	mmol/mol	H20 concentration profile		V1
112	h2o_9	mmol/mol	H20 concentration profile		V1
113	h2o_10	mmol/mol	H20 concentration profile		V1
114	avgprofW	mmol/mol	Average H20 profile	10-85	V1
115	Wind1	m s-1	Wind profile	0-25	V1
116	Wind2	m s-1	Wind profile		V1
117	Wind3	m s-1	Wind profile		V1
118	Wind4	m s-1	Wind profile		V1
119	Wind5	m s-1	Wind profile		V1
120	Wavg	m s-1	Average wind profile	0-25	V1
121	tsoil1	oC (degree Celsius)	Soil temperature profile	5-40	V1
122	tsoil2	oC (degree Celsius)	Soil temperature profile		V1
123	tsoil3	oC (degree Celsius)	Soil temperature profile		V1
124	tsoil4	oC (degree Celsius)	Soil temperature profile		V1
		oC (degree			

125	tsoil5	Celsius)	Soil temperature profile		V1
126	So	W m-2	Top of the Atmosphere radiation		Added to V2
127	Re_5day	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) Fc		Added to V2
128	Re_5day_ust	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) Fc ustar corrected		Added to V2
129	Re_5day_sco2	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE		Added to V2
130	Re_5day_sco2_ust	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE ustar corrected		Added to V2
131	Re_5day_ust_min	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) Fc ustar lower bound corrected		Added to V2
132	Re_5day_ust_max	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) Fc ustar upper bound corrected		Added to V2
133	Re_5day_sco2_ust_min	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE ustar lower bound corrected		Added to V2
134	Re_5day_sco2_ust_max	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE ustar upper bound corrected		Added to V2
135	Re_fourier_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al Fc		Added to V2
136	Re_fourier_ust_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al Fc ustar corrected		Added to V2
137	Re_fourier_sco2_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al NEE		Added to V2
138	Re_fourier_sco2_ust_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al NEE ustar corrected		Added to V2
139	Re_fourier_ust_min_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al Fc ustar lower bound corrected		Added to V2
140	Re_fourier_ust_max_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al Fc ustar upper bound corrected		Added to V2
141	Re_fourier_sco2_ust_min_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al NEE ustar lower bound corrected		Added to V2
142	Re_fourier_sco2_ust_max_model	umol CO2 m-2 s-1	Re: ecosystem respiration fourier: Re as in Richardson et al and Papale et al NEE ustar upper bound corrected		Added to V2
143	NEE_night	umol CO2 m-2 s-1	NEE: net ecosystem exchange nightime used for Re calculations		Added to V2
144	Fc_night	umol CO2 m-2 s-1	Fc: CO2 flux nightime used for Re calculations		Added to V2
145	NEE_night_ust	umol CO2 m-2 s-1	NEE: net ecosystem exchange nightime used for Re calculations ustar corrected		Added to V2
146	Fc_night_ust	umol CO2 m-2 s-1	Fc: CO2 flux nightime used for Re calculations ustar corrected		Added to V2
147	Re_5day_ust_Sco2_LUT	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the LUT method		Added to V2
148	Re_5day_ust_Sco2_IwataLIN	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata linear method		Added to V2
149	Re_5day_ust_Sco2_IwataLN	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata ln method		Added to V2
150	Re_5day_ust_Sco2_IwataPOL	umol CO2 m-2 s-	Re: ecosystem respiration 5day model: 5 day night-time average (used)		Added to V2

		1	NEE=Fc+Sco2 filled using Iwata 2nd degree polynomial method		
151	Re_5day_ust_Sco2_EC	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using CO2 from the EC system		Added to V2
152	Re_5day_ust_Sco2_DIEL	umol CO2 m-2 s-1	Re: ecosystem respiration 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the Diel method		Added to V2
153	NEEnogap_5day_ust_Sco2_LUT	umol CO2 m-2 s-1	NEE: net ecosystem exchange 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the LUT method		Added to V2
154	NEEnogap_5day_ust_Sco2_IwataLIN	umol CO2 m-2 s-1	NEE: net ecosystem exchange 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata linear method		Added to V2
155	NEEnogap_5day_ust_Sco2_IwataLN	umol CO2 m-2 s-1	NEE: net ecosystem exchange 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata ln method		Added to V2
156	NEEnogap_5day_ust_Sco2_IwataPOL	umol CO2 m-2 s-1	NEE: net ecosystem exchange 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata 2nd degree polynomial method		Added to V2
157	NEEnogap_5day_ust_Sco2_EC	umol CO2 m-2 s-1	NEE: net ecosystem exchange 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using CO2 from the EC system		Added to V2
158	NEEnogap_5day_ust_Sco2_DIEL	umol CO2 m-2 s-1	NEE: net ecosystem exchange 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the Diel method		Added to V2
159	GEP_5day_sco2_ust	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE ustar corrected		Added to V2
160	GEP_5day_sco2_ust_max	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE ustar lower bound corrected		Added to V2
161	GEP_5day_sco2_ust_min	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE ustar upper bound corrected		Added to V2
162	GEP_5day_ust	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) Fc ustar corrected		Added to V2
163	GEP_5day_ust_max	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) Fc ustar lower bound corrected		Added to V2
164	GEP_5day_ust_min	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) Fc ustar upper bound corrected		Added to V2
165	GEP_5day_sco2	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE		Added to V2
166	GEP_5day	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) Fc ustar lower bound corrected		Added to V2
167	GEP_5day_sco2_ust_hyperbola	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE ustar corrected		Added to V2
168	GEP_5day_sco2_ust_hyperbola	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE ustar corrected		Added to V2
169	GEP_5day_ust_hyperbola	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) Fc ustar corrected		Added to V2
170	GEP_5day_sco2_hyperbola	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE		Added to V2
171	GEP_5day_hyperbola	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) Fc		Added to V2
172	NEE_spike5_free	umol CO2 m-2 s-1	NEE: net ecosystem exchange NEE spike free		Added to V2
173	NEEnogap_5day_sco2_ust	umol CO2 m-2 s-1	NEE: net ecosystem exchange NEE filled ustar corrected		Added to V2

174	NEEnogap_5day_ust	umol CO2 m-2 s-1	NEE: net ecosystem exchange assumed =Fc Fc filled ustar corrected		Added to V2
175	NEEnogap_5day_sco2	umol CO2 m-2 s-1	NEE: net ecosystem exchange		Added to V2
176	NEEnogap_5day	umol CO2 m-2 s-1	NEE: net ecosystem exchange assumed =Fc		Added to V2
177	Sco2_LUT	umol CO2 m-2 s-1	Sco2: storage flux LUT method		Added to V2
178	Sco2_IwataLIN	umol CO2 m-2 s-1	Sco2: storage flux Iwata linear method		Added to V2
179	Sco2_IwataLN	umol CO2 m-2 s-1	Sco2: storage flux Iwata ln method		Added to V2
180	Sco2_IwataPOL	umol CO2 m-2 s-1	Sco2: storage flux Iwata 2nd degree polynomial method		Added to V2
181	Sco2_EC	umol CO2 m-2 s-1	Sco2: storage flux CO2 from the EC system		Added to V2
182	Sco2_DIEL	umol CO2 m-2 s-1	Sco2: storage flux Diel method		Added to V2
183	Fc_spike7_free	umol CO2 m-2 s-1	Fc: CO2 flux spike free		Added to V2
184	Sco2	umol CO2 m-2 s-1	Sco2: storage flux		Added to V2
185	GEP_5day_ust_Sco2_LUT	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the LUT method		Added to V2
186	GEP_5day_ust_Sco2_IwataLIN	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata linear method		Added to V2
187	GEP_5day_ust_Sco2_IwataLN	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata ln method		Added to V2
188	GEP_5day_ust_Sco2_IwataPOL	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Iwata 2nd degree polynomial method		Added to V2
189	GEP_5day_ust_Sco2_EC	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using CO2 from the EC system		Added to V2
190	GEP_5day_ust_Sco2_DIEL	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the Diel method		Added to V2
191	GEP_5day_ust_Sco2_UST	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using the Ustar method		Added to V2
192	GEP_5day_ust_Sco2_REG	umol CO2 m-2 s-1	GEP: gross ecosystem productivity 5day model: 5 day night-time average (used) NEE=Fc+Sco2 filled using Regression method		Added to V2
193	GEP_model	umol CO2 m-2 s-1	GEP: gross ecosystem productivity Selected for analysis Sco2 filled, ustar corrected, Re based on the 5day model		Added to V2
194	GEPmodel_ust_max	umol CO2 m-2 s-1	GEP: gross ecosystem productivity Selected for analysis ustar corrected for lower bound		Added to V2
195	GEPmodel_ust_min	umol CO2 m-2 s-1	GEP: gross ecosystem productivity Selected for analysis ustar corrected for upper bound		Added to V2
196	Re_model	umol CO2 m-2 s-1	Re: ecosystem respiration Selected for analysis Sco2 filled, ustar corrected, Re based on the 5day model		Added to V2
197	Remodel_ust_max	umol CO2 m-2 s-1	Re: ecosystem respiration Selected for analysis ustar corrected for lower bound		Added to V2
198	Remodel_ust_min	umol CO2 m-2 s-1	Re: ecosystem respiration Selected for analysis ustar corrected for upper bound		Added to V2

199	Sco2_model	umol CO2 m-2 s-1	Sco2: storage flux Selected for analysis		Added to V2
200	NEE_model_ust_max	umol CO2 m-2 s-1	NEE: net ecosystem exchange Selected for analysis ustar corrected for upper bound		Added to V2
201	NEE_model_ust_min	umol CO2 m-2 s-1	NEE: net ecosystem exchange Selected for analysis ustar corrected for lower bound		Added to V2
202	NEE_model	umol CO2 m-2 s-1	NEE: net ecosystem exchange Selected for analysis Sco2 filled, ustar corrected		Added to V2
203	par_fill	umol CO2 m-2 s-1	PAR: Photosynthetic Active Radiation filled		Added to V2
204	Pc	umol CO2 m-2 s-1	Pc: photosyntetic capacity GEP (PAR>725 and PAR<925)		Added to V2
205	Pc_GEPfill	umol CO2 m-2 s-1	Pc: photosyntetic capacity Selected for analysis GEP incl. Sco2 and ustar (PAR>725 and PAR<925)		Added to V2
206	Pc_AM	umol CO2 m-2 s-1	Pc: photosyntetic capacity morning GEP (PAR>725 and PAR<925)		Added to V2
207	Pc_PM	umol CO2 m-2 s-1	Pc: photosyntetic capacity afternoon GEP (PAR>725 and PAR<925)		Added to V2
208	Pc at med. VPD	umol CO2 m-2 s-1	Pc: photosyntetic capacity at med VPD (1-2kPa)		Added to V2
209	Pc at low VPD	umol CO2 m-2 s-1	Pc: photosyntetic capacity at low VPD (0-1kPa)		Added to V2
210	Pc at high VPD values	umol CO2 m-2 s-1	Pc: photosyntetic capacity at high VPD (2-3kPa)		Added to V2
211	VPD	kPa	Vapor pressure deficit		Added to V2

Example Data Records: BANmonth_CfluxBF.txt

This very short excerpt is included to show the tab delimited structure for the 211 all numeric variables – the first row is variable names, and the second row is units. Data start in row three and **note that all values are in scientific notation.**

```
dateloc    Year_LBAMIP    DoY_LBAMIP    Hour_LBAMIP    Tair_LBAMIP    Qair_LBAMIP    Wind_LBAMIP
…
NA    YYYY    JD    HR    degK    kg kg-1    m s-1
…
  7.3155100000000000e+05      2.0020000000000000e+03      3.3500000000000000e+02      0.0000000000000000e+00
-9.9990000000000000e+03     -9.9990000000000000e+03     -9.9990000000000000e+03
…
  7.3258600000000000e+05      2.0050000000000000e+03      2.7400000000000000e+02      0.0000000000000000e+00
3.0059477504607167e+02      1.4361542797276887e-02      2.4486677385065501e+00
…
```

3. Application and Derivation

This data product is an assimilation of eddy flux data that was independently produced and generously provided by the PIs of a variety of tower projects in the Amazon of Brazil. This integrated dataset is intended to facilitate integrative studies and data-model synthesis from a common reference point.

4. Quality Assessment

Uncertainty analysis can be performed by comparing the results of different methods included in this dataset as published in Restrepo-Coupe et al., 2013.

5. Data Acquisition, Materials, and Methods

Study Areas

This dataset is an assimilation of eddy flux data that was independently produced and provided by the investigators of a variety of tower projects in the Amazon of Brazil. Data are provided from nine flux network towers for the period 1999 thru 2006.

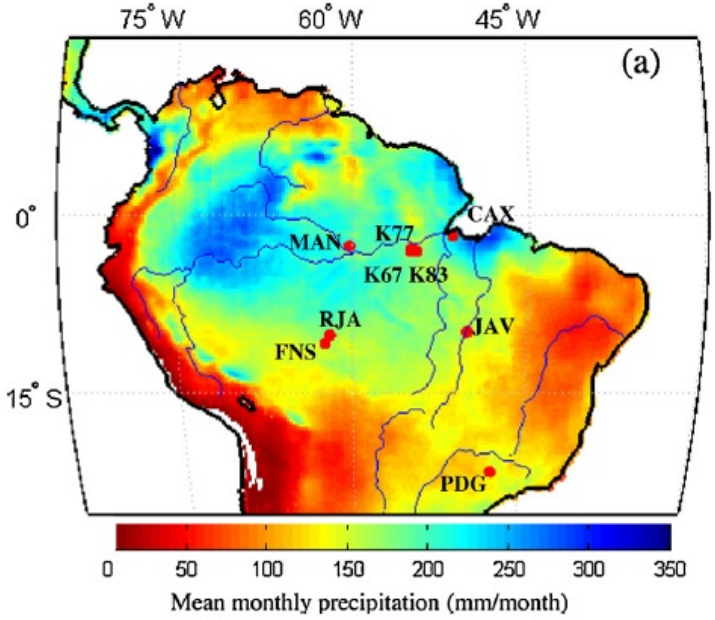

Figure 2. Location of Brazil flux network sites: Santarém forests (K67 and K83), Santarém converted site (K77), Manaus forest (K34), Caxiuanã forest (CAX), Reserva Jarú southern forest (RJA), Fazenda Nossa Senhora southern converted site (FNS), Javés River-Bananal Island (JAV) and savanna Pe-de Gigante (PDG). Shown is average monthly (1998–2012) precipitation (mm month−1) in the Amazon region according to Tropical Rainfall Measuring Mission (TRMM). From Restrepo-Coupe et al., 2013.

Tower site descriptions and codes used in Figure 2.

- Reserva Cuieiras near Manaus (K34 forest tower) (MAN)
- Tapajos National forest, near Santarem (K67 and K83 forest towers, and K77 pasture/agriculture tower)
- Caxiuana National forest (CAX forest tower), near Belem
- Reserva Jaru (RJA forest tower)
- Fazenda Nossa Senhora (FNS pasture tower), near Ji-Parana
- Tocantins-Javaes site (JAV seasonally flooded ecotone tower). Alternate code is BAN.
- Reserva Pe-de-Gigante in Sao Paulo state (PDG savanna tower)

Table 2. Nine towers and corresponding study areas. Information for these sites may also be found at the AmeriFlux site (https://ameriflux.lbl.gov/).

Study Area_Tower	Tower Code	Description	Fluxnet Site Name/Site Code	Altitude (m)	Measurement Height (m)	Time Series
TOC_BAN	BAN	Tocantins State, Bananal seasonally flooded forest, mixture of cerrado, cerrado and campo (natural grassland)	Ecotone Bananal Island/BR-Ban	120	40	24-Oct-03 to 8-Dec-06
MAN_K34	K34	Manaus, km 34 tropical forest site	Manaus-ZF2 K34/BR-Ma2	130	50	14-Jun-99 to 30-Sep-06
STM_K67	K67	Santarem, km 67 tropical forest site	Santarem-Km67-Primary Forest/BR-Sa1**	130	63	2-Jan-02 to 23-Jan-06
STM_K77	K77	Santarem, km 77 pasture-agriculture site	Santarem-Km77-Pasture/BR-Sa2	130	18	1-Jan-00 to 30-Dec-05
STM_K83	K83	Santarem, km 83 selectively logged tropical forest	Santarem-Km83-Logged Forest/BR-Sa3***	130	64	29-Jun-00 to 12-Mar-04
RON_RJA	RJA	Rondonia State, Reserva Jaru, tropical dry forest	Rond.- Rebio Jaru Ji Parana-Tower B/BR-Ji3	191	60	23-Mar-99 to 14-Nov-02
RON_FNS	FNS	Rondonia State, Fazenda Nossa Senhora, pasture	Rond.- Faz. Nossa Senhora-Ji Parana-pasture/BR-Ji1	306	8.5	4-Feb-99 to 4-Nov-02
PA_CAX	CAX	Para State, Caxiuana tropical forest	Caxiuana Forest-Almeirim/BR-Cax	130	51.5	1-Jan-99 to 30-Jul-03
SP_PDG	PDG	Sao Paulo State, Reserva Pe-de-Gigante (PDG) cerrado	Sao Paulo Cerrado/BR-Sp1	690	21	1-Jan-04 to 31-Dec-06

** Site information and data are also available from AmeriFlux (https://ameriflux.lbl.gov/sites/siteinfo/BR-Sa1).
*** Site information and data are also available from AmeriFlux (https://ameriflux.lbl.gov/sites/siteinfo/BR-Sa3).

Data Processing

The data compilation provided in Version 2 follows data harmonization across projects, quality control checks, flux modeling, uncertainty analyses, and includes LBA MIP Project drivers and validation data aggregated to the various time intervals that were performed as described in detail in Restrepo-Coupe et al. (2013) and Restrepo-Coupe et al. (2017).

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

LBA-ECO CD-32 Flux Tower Network Data Compilation, Brazilian Amazon: 1999-2006, V2

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

Hutyra, L.R., S.C. Wofsy, and S.R. Saleska. 2007. LBA-ECO CD-10 CO2 and H2O Eddy Flux Data at km 67 Tower Site, Tapajos National Forest. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/860

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Related Publications

- da Rocha, H.R., A.O. Manzi, O.M. Cabral, S.R. Saleska, S.D. Miller, M.L. Goulden, S.C. Wofsy, N. R.-Coupe, L.S. Borma, A.D. Nobre, G. Vourlitis, J.S. Nogueira, F.L. Cardoso, B. Kruijt, H. Freitas, C. von Randow, R.G. Aguiar, and J.F. Maia. 2009. Patterns of water and heat flux across a biome gradient from tropical forest to savanna in Brazil. Journal of Geophysical Research - Biogeosciences, 114 (G00B12), doi:10.1029/2007JG000640.
- Saleska, S.R., Rocha, H.R. da, Kruijt, B., Nobre, A.D., 2009. Ecosystem Carbon Fluxes and Amazonian Forest Metabolism, in: Amazonia and global change. American Geophysical Union, Washington DC.
- Restrepo-Coupe, N., Christoffersen, B., Rocha, H.R. da, Araujo, A.C. da, Borma, L.S., Cabral, O.M.R., Camargo, P.B. de, Cardoso, F.L., Costa, A.C.L. da, Fitzjarrald, D.R., Goulden, M.L., Hutyra, L.R., Kruijt, B., Maia, J.M.F., Malhi, Y.S., Manzi, A.O., Miller, S.D., Nobre, A.D., Randow, C. von, Sá, L.D. da A., Sakai, R.K., Tota, J., Wofsy, S.C., Zanchi, F.B., Saleska, S.R., submitted. Gross Ecosystem Productivity Seasonality in the Tropics: Issues Posed by the Absence of Co2 Profile Measurements at Eddy-Flux Systems. Agricultural and Forest Meteorology.
- Restrepo-Coupe, N., Rocha, H.R. da, Christoffersen, B., Araujo, A.C. da, Borma, L.S., Cabral, O.M.R., Camargo, P.B. de, Cardoso, F.L., Costa, A.C.L. da, Fitzjarrald, D.R., Goulden, M.L., Hutyra, L.R., Kruijt, B., Maia, J.M.F., Malhi, Y.S., Manzi, A.O., Miller, S.D., Nobre, A.D., Randow, C. von, Sá, L.D. da A., Sakai, R.K., Tota, J., Wofsy, S.C., Zanchi, F.B., Saleska, S.R., submitted. What drives the seasonality of productivity across the Amazon basin? A cross-site analysis of eddy flux tower measurements from the Brasil flux network. Agricultural and Forest Meteorology.
- Saleska, S.R., Didan, K., Huete, A.R., da Rocha, H.R., 2007. Amazon Forests Green-Up During 2005 Drought. Science 318, 612.

8. Dataset Revisions

Changes made to Version 1 implemented in Version 2

- Added VPD and Pc (Photosynthetic Capacity) for different VPD conditions.
- Missing values set to -9999.
- C-flux products added: Gross Ecosystem Exchange, ecosystem respiration, filled Net Ecosystem Exchange, using different methods.
- Canopy storage (Sco2) analysis added.
- LBA-DMIP drivers added.
- New variables added: Top of the Atmosphere radiation, filled PAR, among others
- Change time vector from local time to UTM
- Additional QAQC added:
    - Pe-de-Gigante atmospheric pressure corrected accordingly to near-by study site (mean adjusted) probably a problem with the calibration of the sensor
    - K67 PAR included even if filled (after 2005)
    - K83 PAR included even if a downward trend was observed (probably due to sensor degradation)