

LBA-ECO LC-04 IBIS Model Simulations for the Amazon and Tocantins Basins: 1921-1998

Revision date: December 12, 2012

Summary:

The provided data were generated by the Integrated Biosphere Simulator (IBIS) terrestrial ecosystem model using data from the East Anglia Climate Research Unit climate record for the years 1921-1998. Data are included for the annual net ecosystem exchange of the surface, microbial respiration, root respiration, total soil respiration, soil moisture, leaf area index, drainage, and surface and subsurface runoff, for the entire Amazon and Tocantins basins.

The data files are provided in netCDF format and standard ESRI ARCGIS ARC/INFO ASCII GRID format. The netCDF files consist of either annual or monthly means from 1921 to 1998. The ASCII files are available only for the annual mean files.

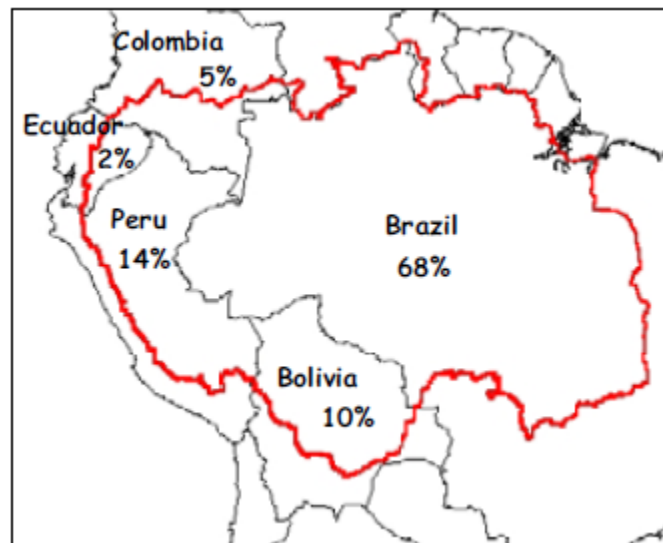


Figure 1. Amazon and Tocantins drainage basins with % of total area by country. Total area is 68.9 x 10⁶ km².

Data Citation:

Cite this data set as follows:

Botta, A., N. Ramankutty, and J.A. Foley. 2012. LBA-ECO LC-04 IBIS Model Simulations for the Amazon and Tocantins Basins: 1921-1998. 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/ORNLDAAC/1139>

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 Users who download LBA data in the five years after data have been archived must contact the investigators who collected the data, per provisions 6 and 7 in the Policy.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 December of 2012. Users who download the data between December 2012 and November 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.

Related data sets:

- Foley, J.A., C.J. Kucharik, and D. Polzin. 2005. Integrated Biosphere Simulator Model (IBIS), Version 2.5. Model product. 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/808](https://doi.org/10.3334/ORNLDAAC/808).
- Coe, M.T., M.H. Costa, A. Botta, and C. Birkett. 2012. LBA-ECO LC-04 THMB Model Simulations for the Amazon and Tocantins Basins: 1939-1998. 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/ORNLDAAC/1138>

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

Activity: LBA-ECO

LBA Science Component: Land Use and Land Cover

Team ID: LC-04 (Foley / Costa)

The investigators were Foley, Jonathan A.; Costa, Marcos Heil; Botta, Aurelie; Cardille, Jeffrey Alan; Coe, Michael T. and Lenters, John D. You may contact Botta, Aurelie (adbotta@facstaff.wisc.edu) and Diosana, Carmela (ccdiosana@facstaff.wisc.edu).

LBA Data Set Inventory ID: LC04_IBIS_Model

The provided data were generated by the Integrated Biosphere Simulator (IBIS) terrestrial ecosystem model using data from the East Anglia Climate Research Unit climate record for the years 1921-1998.

Data are included for the annual net ecosystem exchange of the surface, microbial respiration, root respiration, total soil respiration, soil moisture, leaf area index, drainage, and surface and subsurface runoff, for the entire Amazon and Tocantins basins.

2. Data Characteristics:

The data files are provided in netCDF, and ASCII formats. The ASCII files are in standard ESRI ARCGIS ARC/INFO ASCII GRID format.

- The spatial resolution is 0.5 x 0.5 degrees covering the domain 80W/45W, 6N/21S.
- Because CRU climate records are not reliable prior to 1930, we would advise only using results from years 1935-1995 (allowing for a 5-year characteristic time-scale of the deep soil).

net CDF Files:

The netCDF files consist of either annual or monthly means from 1921 to 1998 in consecutive order. The ASCII files are available only for the annual mean files.

- The time column in the netCDF files states whether the file is annual mean or monthly mean. This does not exist in the ASCII data files because it is not part of standard ESRI ASCII GRID format.
- The column labeled "nb" is the number of time layers in the file. Therefore, for an annual file, nb=78 indicates 78 years of data from 1921-1998. For a monthly file, nb=936 (75 years x 12 months), starting in 1921 and ending in 1998.
- The outputs are stored in netCDF format (.nc) compressed using gzip.

ASCII Files:

The ASCII files are the annual average (one value per year derived from monthly means). For example, awc.asc is in centimeters per year (cm/yr) and is one value for year derived from a mean of 12 monthly values.

Annual mean ASCII files

File Name	Units/format	Description
aet.asc	mm/yr	Annual average evapo-transpiration, 78 years: 1921-1998
awc.asc	cm	Annual average plant available water content, derived from a mean of 12 monthly values, 78 years: 1921-1998
co2mic.asc	kg-C/m2	Annual total microbial respiration carbon, 78 years: 1921-1998
co2root.asc	kg-C/m2	Annual total root respiration carbon, 78 years: 1921-1998
co2soi.asc	kg-C/m2	Annual total soil respiration carbon, 78 years: 1921-1998
drainage.asc	mm/yr	Annual drainage (subsurface runoff), 78 years: 1921-1998
gpptot.asc	kg-C/m2	Annual total gross primary productivity of carbon, 78 years: 1921-1998
irdown.asc	W/m2	Annual average infrared radiation downward, 78 years: 1921-1998
irup.asc	W/m2	Annual average infrared radiation upward, 78 years 1921-1998
lail.asc	m2/m2 *	Monthly average leaf area index for lower canopies, average for 12 months x 78 years: 1921-1998
laiu.asc	m2/m2*	Annual average leaf area index for upper canopies, average for 12 months x 78 years: 1921-1998
latent.asc	W/m2	Monthly average latent heat flux, average for 12 months x 78 years: 1921-1998
neetot.asc	kg-C/m2	Annual total net ecosystem exchange carbon, 78 years: 1921-1998
npptot.asc	kg-C/m2	Annual total net primary productivity of carbon, 78 years: 1921-1998. Note:

File Name	Units/format	Description
aeta.nc	mm/year	aet: annual average evapo-transpiration
biomassa.nc	kg-C/m2	biomass: annual biomass of carbon for each plant functional type totbiou: annual biomass of carbon for upper canopy totbio: annual biomass of carbon for lower canopy
co2fa.nc	kg-C/m2	gpptot: annual total gross primary productivity of carbon neetot: annual total net ecosystem exchange carbon co2mic: annual total microbial respiration carbon co2root: annual total root respiration carbon co2soi: annual total soil respiration carbon
csoia.nc	kg-C/m2	rootbio: annual total alive root biomass carbon totalit: annual total above ground litter carbon totrli: annual total below ground litter carbon totcsoi: annual total soil carbon without litter totcmic: annual total microbial carbon
fcovera.nc	fraction	fu: annual fractional cover of the upper canopy fi: annual fractional cover of lower canopy
firea.nc	fraction kg-C/m2/yr	disturbf: annual burned fraction of the grid-cell cdisturb: annual total carbon lost from fire
ira.nc	W/m2	irup: annual average infrared radiation upward irdown: annual average infrared radiation downward
latena.nc	W/m2	latent: annual average latent heat flux
sensa.nc	W/m2	sens: monthly average sensible heat flux
vegtypea.nc	number	vegtype0: annual vegetation type – ibis classification

Monthly mean netCDF files

File Name	Units/format	Description
aetam.nc	mm/year	aet: annual monthly average evapo-transpiration
co2fm.nc	kg-C/m2	gpptot: annual monthly total gross primary productivity of carbon neetot: annual monthly total net ecosystem exchange carbon co2mic: annual monthly total microbial respiration carbon co2root: annual monthly total root respiration carbon co2soi: annual monthly total soil respiration carbon
gpptotm.nc	kg-C/m2/month	gpptot: monthly total gross primary productivity of carbon
irm.nc	W/m2	irdown: monthly average infrared radiation downward irup: monthly average infrared radiation upward
laim.nc	m2/m2*	laiu: monthly average leaf area index for upper canopies lail: monthly average leaf area index for lower canopies
latentm.nc	W/m2	latent: monthly average latent heat flux
npptotm.nc	kg-C/m2/month	npptot: monthly total net primary productivity of carbon
runoffm.nc	mm/day	turnoff: monthly average total runoff (surface plus sub-surface) srunoff: monthly average surface runoff drainage: monthly average drainage (sub-surface)
sensm.nc	W/m2	sens: monthly average sensible heat flux
tsoim.nc	degrees C	dsoi: monthly average soil temperature
wsoim.nc	fraction	wsoi: monthly average soil moisture sisoi: monthly average soil ice vwc: monthly volumetric water content

	cm	awc: monthly average plant available water content
* LAI units were not specified but appear to be m ² /m ² with a range of 0-8 for both upper and lower canopies.		

Data Center Note: This data set was documented from <http://www.sage.wisc.edu/download/LBA.lba.html/LBA-IBIS.zip>. From this zip file distribution, the following files were found to be unreadable, and therefore are not included in this data set:

Compressed File Name/Expanded File Name	Units/format	Description
NPPA.GZ/npp.nc npp npptot anpptot	kg-C/m ² /yr	npp: annual net primary productivity of carbon for each pft
		npptot: annual total npp
		anpptot: annual total above-ground npp
PLAIA.GZ/plai.nc totlaiu totlail		totlaiu: annual leaf area index for upper canopy
		totlail: annual leaf area index for lower canopy
RUNOFFA.GZ/runoff.nc trunoff srunoff drainage rratio tratio	mm/yr	trunoff: annual total runoff (surface plus sub-surface)
		srunoff: annual surface runoff
		drainage: annual drainage (subsurface runoff)
	fraction	rratio: annual average runoff/aet ratio
		tratio: annual average transpiration/aet ratio
WSOIA.GZ/wsoi.nc wsoi wisoi vwc awc	fraction	wsoi: annual average soil moisture
		wisoi: annual average soil ice
		vwc: annual average volumetric water content
	cm	awc: annual average plant available water content

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Amazon Basin (Amazon Basin)	-80	-45	6	-21	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 1921/01/01 to 1998/12/31.
- Temporal Resolution: Monthly and Annual

Platform/Sensor/Parameters measured include:

- COMPUTER MODEL / ANALYSIS / BIOGEOCHEMICAL CYCLES
- COMPUTER MODEL / ANALYSIS / CARBON DIOXIDE
- COMPUTER MODEL / ANALYSIS / FIRE OCCURRENCE
- COMPUTER MODEL / ANALYSIS / PRIMARY PRODUCTION

3. Data Application and Derivation:

This data set can be used as input, development, and validation of similar models.

4. Quality Assessment:

The CRU05 data set before 1935 contains a gap in the data for the Amazon basin, so this study focused on data from 1935-1995 (allowing for a 5-year characteristic time-scale of the deep soil). The CRU05 data were analyzed by Botta, Ramankutty, and Foley (2002).

Because CRU climate records are not reliable prior to 1930, we would advise only using results from years 1935-1995 (allowing for a 5-year characteristic time-scale of the deep soil).

These data files are generated by numerical models, therefore their accuracy is dependent on the assumptions applied in these models.

5. Data Acquisition Materials and Methods:

IBIS is a terrestrial biosphere model designed to simulate a variety of ecosystem processes:

- energy, water, and carbon dioxide exchange between plants, the atmosphere, and the soil
- physiological processes of plants and soil organisms, including photosynthesis and respiration
- seasonal changes of vegetation, including spring budburst, fall senescence, and winter dormancy
- plant growth and plant competition
- nutrient cycling and soil processes

For this study, long-term climate records for the Amazon basin were linked to IBIS in order to examine long-term variations in the basin-wide carbon balance.

The data provided were generated by IBIS (Foley et al. 1996, Kucharik et al. 2000) using data from the CRU05 climate record for the years 1921-1998 (New et al. 2000). However, the CRU05 data set before 1935 contains a gap in the data for the Amazon basin, so this study focused on data from 1935-1995.

Data were generated for the annual net ecosystem exchange of the surface, microbial respiration, root respiration, total soil respiration, soil moisture, leaf area index, drainage, surface and subsurface runoff, for the entire Amazon and Tocantins basins.

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:

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References

Botta, A., N. Ramankutty, and J.A. Foley. 2002. Long-term variations of climate and carbon fluxes over the Amazon basin. *Geophysical Research Letters* 29(9):Article-1319.

Foley, J.A., I.C. Prentice, N. Ramankutty, S. Levis, D. Pollard, S. Sitch, and A. Haxeltine. 1996. An integrated biosphere model of land surface processes, terrestrial carbon balance, and vegetation dynamics. *Global Biogeochemical Cycles* 10(4):603-628.

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