

LBA-ECO TG-03 Solar Surface Irradiance and PAR, Brazilian Amazon: 1999-2004

Summary:

This data set includes unfiltered and filtered solar surface irradiance from Kipp and Zonen CM-21 pyranometers, and photosynthetically active radiation from Skye-Probetech SKE-510 PAR sensors. Measurements were made at six sites across the Brazilian Amazon during the period from 1999 to 2004. These sites were co-located with AERONET (AERosol RObotic NETwork) program sites. There are 17 comma-delimited data files (.csv) with this data set.

The AERONET program is an inclusive federation of ground-based remote sensing aerosol networks established by AERONET and the PHOTométrie pour le Traitement Opérationnel de Normalisation Satellitaire (PHOTONS) and greatly expanded by AEROCAN (the Canadian sunphotometer network) and other agency, institute and university partners. The goal is to assess aerosol optical properties and validate satellite retrievals of those properties. The network imposes standardization of instruments, calibration, and processing.

Data Citation:

Cite this data set as follows:

Schafer J.S., T. F. Eck, B.N. Holben, P.E. Artaxo, M.A. Yamasoe, and S. Procopio. 2012 .LBA-ECO TG-03 Solar Surface Irradiance and PAR, Brazilian Amazon: 1999-2004. 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/ORNLDAAC/1137>

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 Users who download LBA data in the five years after data have been archived must contact the investigators who collected the data, per provisions 6 and 7 in the Policy.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

Activity: AErosol RObotic NETwork (AERONET)

LBA Science Component: Trace Gas and Aerosol Fluxes

Team ID: TG-03 (Holben / Artaxo / Setzer)

The investigators were Holben, Brent Norman; Artaxo, Paulo; Setzer, Alberto; Eck, Thomas F.; Markham, Brian L. and Schafer, Joel S. You may contact Schafer, Joel S. (jschafer@aeronet.gsfc.nasa.gov).

LBA Data Set Inventory ID: TG03_AERONET_Solar_Flux

This data set includes unfiltered and filtered solar surface irradiance from Kipp and Zonen CM-21 pyranometers, and photosynthetically active radiation from Skye-Probetech SKE-510 PAR sensors. Measurements were made at six sites across the Brazilian Amazon during the period from 1999 to 2004. These sites were co-located with AERONET (AErosol RObotic NETwork) program sites.

Related Data Set

- [LBA-ECO TG-03 AERONET Aerosol Optical Thickness Measurements, Brazil: 1993-2005](#)

2. Data Characteristics:

There are 17 comma-delimited data files with this data set (.csv) for measurements of: solar flux (broadband surface irradiance (pyr), filtered broadband surface irradiance (fil), and photosynthetically active radiation (par).

The surface irradiance data were processed to AERONET standards of Level 1.5 (cloud-screened) and the photosynthetically active radiation (PAR) data were processed to Level 2.0 (cloud-screened and quality assured). These measurements were obtained at six sites across the Amazon Basin and are most accurately representative of conditions within a 10 km radius of the observation points. Each site's data record of each data type (pyr, fil, and par) is recorded in its own data file.

Data file naming convention:

The data files are named with the site abbreviation, followed by the year span for the data, the processed

level (with 15 representing 1.5 and 20 representing 2.0), and the data type (pyr, fil, or par). Not all sites have data for all measurement years (1999-2004), and there is no PAR data for the Belterra site.

Site and associated file names:

Site Names	File Names		
Alta Floresta, Mato Grosso (AF)	AF_1999_2004_L15_pyr.csv	AF_1999_2004_L20_par.csv	AF_2003_2004_L15_fil.csv
Abracos Hill, Rondonia (AH)	AH_1999_2004_L15_pyr.csv	AH_1999_2002_L20_par.csv	AH_2002_2004_L15_fil.csv
Balbina, Amazonas (Manaus) (BA)	BA_1999_2004_L15_pyr.csv	BA_2000_2002_L20_par.csv	BA_2000_2003_L15_fil.csv
Belterra, Para, Western Santarem (BE)	BE_1999_2004_L15_pyr.csv		BE_2003_2004_L15_fil.csv
Cuiaba, Mato Grosso (CB)	CB_2001_2002_L15_pyr.csv	CB_2001_2002_L20_par.csv	CB_2003_2004_L15_fil.csv
Rio Branco, Acre (RB)	RB_2000_2004_L15_pyr.csv	RB_2000_2001_L20_par.csv	RB_2002_2004_L15_fil.csv

The data files do not have headers and all data start on row 1. All 17 data files are organized as follows:

Variable	Units/format	Description
Date	YYYYMMDD	Day of measurement in YYYYMMDD
Time	hh:mm:ss	Time of measurement
Julian_Day	Decimal day	Decimal day of measurement, with Day 1 being January 1 of the respective year
Parameter	W/m2	Solar flux parameters measured in Watts/m2. PYR = broadband surface irradiance (spectral range 305–2800 nm); FIL = filtered broadband surface irradiance (RG695, spectral range 700–2700 nm);or PAR = photosynthetically active radiation (spectral range: 400–700 nm). Note: There is no PAR data for the Belterra site

Example data records (from the Alta Floresta data files):

AF_1999_2004_L15_pyr.csv

19990126,09:30:09,26.395937,36.065449
19990126,09:31:09,26.396632,36.065449
19990126,09:32:09,26.397326,36.065449
...

AF_2003_2004_L15_fil.csv

```

20031025,19:32:06,298.813958,291.063332
20031025,19:34:06,298.815347,284.042709
20031025,19:36:05,298.816725,277.022086
...

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AF_1999_2004_L20_par.csv

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19990126,09:30:09,26.395937,28.482538
19990126,09:31:09,26.396632,28.482542
19990126,09:32:09,26.397326,23.065620
...

```

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Mato Grosso - Alta Floresta (Mato Grosso)	-56.1049	-56.1049	-9.872	-9.872	World Geodetic System, 1984 (WGS-84)
Mato Grosso - Cuiaba (Mato Grosso)	-56.0208	-56.0208	-15.7295	-15.7295	World Geodetic System, 1984 (WGS-84)
Acre - Rio Branco (Acre)	-67.8689	-67.8689	-9.9567	-9.9567	World Geodetic System, 1984 (WGS-84)
Para Western (Santarem) - Belterra (Para Western (Santarem))	-54.9517	-54.9517	-2.6484	-2.6484	World Geodetic System, 1984 (WGS-84)
Amazonas (Manaus) - Balbina (Amazonas (Manaus))	-59.4866	-59.4866	-1.9235	-1.9235	World Geodetic System, 1984 (WGS-84)
Rondonia - Abracos Hill (Rondonia)	-62.3579	-62.3579	-10.7621	-10.7621	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 1999/01/01 to 2004/12/31.

Platform/Sensor/Parameters measured include:

- FIELD INVESTIGATION / PYRANOMETERS / SOLAR IRRADIANCE
- FIELD INVESTIGATION / QUANTUM SENSOR / PHOTOSYNTHETICALLY ACTIVE RADIATION

3. Data Application and Derivation:

The limited number of aerosol and solar flux monitoring networks and the relative scarcity of operational sites in many large regions of the world creates a significant source of uncertainty in attempts to fully understand the global dynamics of earth-atmosphere interactions (Schafer et al., 2002). These products have applicability to improving satellite remote sensing of the earth, forest ecology and agricultural research, human health studies, and most prominently, global climate modeling projects.

4. Quality Assessment:

See Section 5.0.

5. Data Acquisition Materials and Methods:

Sampling Sites

Measurements were made at six sites across the Brazil Amazon during the period from 1999-2004. These sites were co-located with AERONET program sites. Each site was composed of two flux sensors—a Skye-Probetech SKE 510 PAR (photosynthetically active radiation) energy sensor (spectral range: 400–700 nm) and Kipp and Zonen CM-21 pyranometers, unfiltered (305–2800 nm) and filtered (RG695, 700-2700 nm), for measuring the total solar spectrum. The flux sensors record the instantaneous irradiance at 1-minute intervals.

The AERONET program is an inclusive federation of ground-based remote sensing aerosol networks established by AERONET and the PHOTométrie pour le Traitement Opérationnel de Normalisation Satellitaire (PHOTONS) and greatly expanded by AEROCAN (the Canadian sunphotometer network) and other agency, institute, and university partners. The goal is to assess aerosol optical properties and validate satellite retrievals of those properties. The network imposes standardization of instruments, calibration, and processing. Descriptions of program objectives, affiliations, instrumentation, operational issues, data products, data-base browser demonstrations, research activities, links to similar data sets, NASA Earth Observing System (EOS) links and personnel involved in AERONET may be found at: <http://aeronet.gsfc.nasa.gov/>.

Calibration

Calibration of the PAR sensors was accomplished by using in situ comparisons to a radiative transfer model on selected optimal days. Because of the greater degree of accuracy (2%) provided by the manufacturer (Kipp and Zonen), the factory calibrations were used for the pyranometers. Daily integrated insolation (PAR and total solar) for 1999 was determined with instantaneous 1-minute sampling interval flux measurements.

Data Acquisition and Processing

The surface irradiance data were processed to AERONET standards of Level 1.5 (cloud-screened) and the PAR data were processed to Level 2.0 (cloud-screened and quality assured).

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:

Schafer, J. S., B. N. Holben, T. F. Eck, M. A. Yamasoe, and P. Artaxo, Atmospheric effects on insolation in the Brazilian Amazon: Observed modification of solar radiation by clouds and smoke and derived single scattering albedo of fire aerosols, *J. Geophys. Res.*, 107(D20), 8074, doi:10.1029/2001JD000428, 2002.

Related Publications

- Echalar, F., P. Artaxo, J.V. Martins, M. Yamasoe, F. Gerab, W. Maenhaut, and B. Holben. 1998. Long-term monitoring of atmospheric aerosols in the Amazon Basin: Source identification and apportionment. *Journal of Geophysical Research-Atmospheres* 103(D24):31849-31864.
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- Procopio, A.S., et al. 2004. Multiyear analysis of amazonian biomass burning smoke radiative forcing of climate. *GRL VOL. 31, L03108*, doi:10.1029/2003GL018646, 2004.
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- Schafer, J.S., et al. 2008. Characterization of the optical properties of atmospheric aerosols in Amazonia from long-term AERONET monitoring (1993-1995 and 1999-2006). *Journal of Geophysical Research*, Vol. 113, D04204, doi:10.1029/2007JD009319, 2008.
- Yamasoe, M.A.. 2006. Effect of smoke and clouds on the transmissivity of photosynthetically active radiation inside the canopy. *Atmos. Chem. Phys.*, 6, 1645-1656.