LBA-ECO CD-07 GOES-8 L3 Gridded Surface Radiation and Rain Rate for Amazonia: 1999

Summary

The LBA-Ecology CD-07 team collected and processed GOES-8 imager data over the LBA region as part of our effort to characterize the incoming radiation and precipitation rates at regional scales. This data set contains surface radiation parameters, such as down-welling solar, PAR and infrared radiation, as well as precipitation rates at 8x8 km and half hourly space/time resolutions. The data cover the time periods: 01Mar99-30Apr99 and 01Sep99-31Oct99. The data missing from the temporal series was filled with interpolation to create a continuous sequence of data for our carbon modeling studies.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

LBA-ecology CD-07 gridded surface radiation and precipitation rate retrieved from GOES-8 Imager data.

1.2 Data Set Introduction

Surface radiation fluxes and rainfall are the two foremost cloud modulated control variables that affect land surface processes. High space/time specification of these fields are required to adequately represent the complex coupling of energy, water, and carbon budget processes that ultimately determine the variations in carbon sequestration and release within a forest ecosystem. A high resolution gridded dataset of various surface down-welling radiation parameters and precipitation rates covering a large portion of the LBA-Ecology study area has been produced for the wet and dry seasons of 1999. The dataset, retrieved from GOES-8 imager data, has 8km/half-hourly space/time resolution.

1.3 Objective/Purpose

The primary objectives are 1) to retrieve the SRB and precipitation rates from the GOES-8 imager data over the Amazonia region at a high temporal and spatial resolution, and 2) to quantify the variability of surface radiation and precipitation during the wet and dry season.

1.4 Summary of Parameters and Variables

Thirty-minute averages of surface radiation and precipitation parameters have been interpolated onto equal area grid at 8 km resolution. The parameters include:

- Down-welling solar radiation at surface
- Down-welling PAR at surface
- Down-welling Infrared radiation at surface
- Precipitation rate at surface

1.5 Discussion

NA

1.6 Related Data Sets

LBA-Ecology CD-07 GOES-8 imager data

2. Investigator(s)

2.1 Investigator(s) Name and Title

Dr. Eric A. Smith, Professor

2.2 Title of Investigation

High Resolution Carbon Exchange Over Large-Scale Amazonia Based on Modeling and GOES Satellite Derived Radiation Inputs.

2.3 Contact Information

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3. Theory of Measurements

The GOES mission is to provide the nearly continuous, repetitive observations that are needed to predict, detect, and track severe weather. GOES spacecraft are equipped to observe and measure cloud cover, surface conditions, snow and ice cover, surface temperatures, and the vertical distributions of atmospheric temperature and humidity. They are also instrumented to measure solar X-rays and other energetics, collect and relay environmental data from platforms, and broadcast instrument data and environmental information products to ground stations. The GOES system includes the satellite (with the GOES instrumentation and direct downlink data transmission capability); the National Environmental Satellite, Data and Information Service (NESDIS) facility at Wallops Island, VA; and the ground systems at NESDIS.

4. Equipment

GOES-8, launched on April 13 of 1994, is the first of NOAA's next generation of geostationary satellites. It is stationed at 36,000km above the equator at 75W longitude. The new series of GOES introduces improved capabilities to observe weather-related phenomena.

4.1 Sensor/Instrument Description

The GOES-8 imager is an imaging radiometer designed to sense radiant and solar reflected energy from sampled areas of the earth. It has a five-band multi-spectral capability with high space/time resolution and 10-bit precision. The five spectral bands are (1) 0.52-0.72 μm (visible), (2) 3.78-4.03 μm (shortwave infrared window), (3) 6.47-7.02 μm (upper-level water vapor), (4) 10.2-11.2 μm, and (5) 11.5-12.5 μm (thermal infrared windows). The special resolutions of the imager data are 1, 4, 8, 4, and 4 km, respectively.

The Imager consists of electronics, power supply, and sensor modules. The sensor module containing the telescope, scan assembly, and detectors is mounted on a base plate external to the spacecraft, together with the shields and louvers for thermal control. The electronics module provides redundant circuitry and performs command, control, and signal processing functions; it also serves as a structure for mounting and interconnecting the electronic boards for proper heat dissipation. The power supply module contains the converters, fuses, and power control for interfacing with the spacecraft electrical power subsystem. The electronics and power supply modules are mounted on the spacecraft internal equipment panel.

Imager Instrument Characteristics	Spectral Bands (micrometers)				
	VIS	IR2	IR3	IR4	IR5
Wavelength (micrometers)	0.55 to 0.75	3.80 to 4.00	6.50 to 7.00	10.20 to 11.20	11.50 to 12.50

Clouds	X	X	X	X	X
Water Vapor			X	X	X
Surface Temp		0		X	0
Winds	X		X	X	
Albedo & IR Flux	X		0	X	0
Fires & Smoke	X	X		0	0

X: Primary Spectral Channel
0: Secondary (supplementary) Spectral Channel

Field of View Defining Element:	Detector
Optical Field of View:	Square
5-channel Imaging:	Simultaneously
Scan Capability:	Full Earth/Sector/Area
Channel/Detector	Instantaneous Field of View (IFOV)
Visible/Silicon	: 1 km
Short-wave/InSb	: 4 km
Moisture/HgCdTe	: 8 km
Long-wave 1/HgCdTe	: 4 km
Long-wave 2/HgCdTe	: 4 km
Radiometric Calibration:	Space and 290 Kelvin IR internal blackbody
Signal Quantizing (NE'delta'T)	: 10 bits all channels
S/N	: Minimum 3X better than specifications
Frequency of Calibration Space	: 2.2 sec for full disk;
	: 9.2 or 36.6 sec for sector/area
Infrared	: 30 minutes typical
System Absolute Accuracy	: IR channel less than 0.1 K
Transmit Frequency	: 1676.00 MHz

4.1.1 Collection Environment

The data were acquired using the FSU Direct Readout Ground System located in Tallahassee, FL, starting on 01-Mat-1998 and continuing through 28-Feb-2001. The GOES-8 satellite orbits Earth in a geostationary orbit at an altitude of 36,000 km.

4.1.2 Source/Platform

GOES-8

4.1.3 Source/Platform Mission Objectives

The mission of the GOES satellite series is to provide the nearly continuous observations that are needed to predict, detect, and track severe weather. GOES spacecraft are equipped to observe and measure cloud cover, surface conditions, snow and ice cover, surface temperatures, and the vertical distributions of atmospheric temperature and humidity. They are also instrumented to measure solar X-rays and other energetics, collect and relay environmental data from platforms, and broadcast instrument data and environmental information products to ground stations.

For LBA GOES-8 imagery, along with the other remotely sensed images, was collected in order to provide spatially extensive information over the primary study areas at varying spatial scales. The primary objective for the GOES-8 images was to collect visible, IR, and water-vapor channel data covering the LBA region at a sufficiently high temporal frequency for subsequent use in analyzing weather events and deriving temporal surface radiation parameters and patterns.

4.1.4 Key Variables

The key variables in this data set are:

- surface downward solar flux
- surface downward PAR
- surface downward infrared flux
- surface precipitation rate

4.1.5 Principles of Operation

The GOES I-M program is a continuation of the previous National Oceanic and Atmospheric Administration (NOAA)/National Aeronautics and Space Administration (NASA) collaboration to provide continuous monitoring of Earth’s environment for weather forecasting and research. The objectives of the GOES I-M program are to maintain and expand the operational, environmental, and storm warning capabilities; to monitor Earth’s atmosphere and surface and space environmental conditions; and to introduce improved atmospheric and oceanic observations and data dissemination capabilities.

GOES I-M is a new series of five satellites that meet these objectives, providing significant improvements in weather imagery and atmospheric sounding information in accordance with current weather service requirements, particularly in regard to the forecasting of life- and property-threatening severe storms. A novel space- and ground-based computer and communication system provides users with calibrated and navigated (i.e., Earth-located) imagery and sounding data, in real time.

The GOES I-M spacecraft meet the mission’s objectives by providing:

- Independent imaging and sounding functions with instrument resolution, navigation, channelization, and signal-to-noise characteristics representing improvements over previous GOES missions
- Full-time Weather Facsimile Transmission
- Data Collection System Transponder Functions
- Space Environment Monitor System
- Search and Rescue Transponder Functions

These functions have resulted directly from the overall system requirements developed by NOAA and NASA together with the National Weather Service (NWS), the system's primary user. Many of the requirements are continued missions from the previous GOES D-H series of spacecraft. However, technological advancements have provided significant improvements in the reliability and availability of these systems for the new GOES I-M series.

As in the previous GOES mission, the GOES I-M system provides the above services over a region covering the central and eastern Pacific Ocean, the 48 contiguous States, and the central and western Atlantic Ocean. This is accomplished by two satellites, GOES West located at 135 degrees west and GOES East (GOES-8 in this case) at 75 degrees west. A common ground station, the Command and Data Acquisition (CDA) station located at Wallops Island, Virginia, services both satellites.

The GOES I-M Imaging and Sounding instruments provide significantly improved measurement capability over the previous GOES sensors. The GOES I-M five-channel Imager processes higher spatial resolution (i.e., 4 km for its IR channels) and higher radiometric sensitivity to improve the measurement of cloud and Earth's surface features. Sounding quality is improved by having more spectral channels (18 IR and 1 visible) with greatly improved radiometric sensitivity. The three-axis stabilized platform enables higher quality imagery and sounding data to be achieved through its dwell time advantage over a spinning satellite. Flexibility of scan control by both instruments combined with the three-axis stability enables rapid small-area coverage in addition to hemispheric or full-disk coverage. The new limited-area, higher frequency observation capability permits more continuous monitoring of severe weather development.

The GOES I-M generation of spacecraft has been developed by the Space Systems/ Loral, Inc. (SS/L). These satellites are three-axis body stabilized, meaning that the three axes of the satellite remain stationary relative to nadir. These satellites use internal momentum wheels to provide attitude control and require corrective action from the ground to compensate for the effects of thermal gradients and solar winds. Unlike the previous GOES D-H series, the GOES I-M spacecraft's Imaging and Sounding instruments can be operated simultaneously and independently of one another.

The spacecraft's configuration is essentially a compact six-sided main body that carries the operational instruments, a continuous drive solar array attached to the south panel through a yoke assembly, a solar sail mounted off the north panel to offset solar pressure torque, a Telemetry and Command (T&C) antenna boom-mounted on the east end for full omni-directional coverage, and the Space Environment Monitoring (SEM) magnetometer on a boom off the anti-Earth side of the satellite.

The main body of the spacecraft accommodates the 5-channel visible and IR Imager and the 19-channel visible and IR Sounder, which sample radiance from Earth by identical two-axis scan systems and nearly identical telescopes in each unit. Scan control and data collection for the instruments are independent of each other and of most other activity on the spacecraft.

4.1.6 Sensor/Instrument Measurement Geometry

During the data collection for LBA, the GOES-8 satellite was stationed at approximately 0.0 degrees N, 75.0 degrees W.

The Imager is a multi-channel instrument designed to sense radiant and solar-reflected energy from sampled areas of Earth's surface and atmosphere.

The Imager's multi-element spectral channels simultaneously sweep an 8-km north-south (N-S) (longitudinal) swath along an east-west (E-W) (latitudinal) path by means of a two-axis gimbaled mirror scan system. Position and size of an area scan are controlled by command. Beam splitters separate the spectral channels to the various IR detector sets, which are redundant. The 1-by-8 km visible detector array consisting of eight individual detectors is not redundant.

Radiometric quality of the Imager is maintained by frequent views of space for Dark Current (DC) signal restoration. Less frequent views of the full aperture blackbody (BB) establish a high temperature calibration point that determines the radiometric conversion factor for the IR channels. The frequency of radiometric calibration depends on the thermal and electrical stability of the system. In addition to radiometric calibration, the amplifiers and data stream are checked regularly from a 16-increment electronic calibration signal. This verifies the stability and linearity of the output data.

Control of the Imager comes from a defined set of command inputs. The instrument is capable of full Earth imagery, sector imagery that contains the edges of Earth, and various sizes of area scans totally enclosed within the Earth scene. Area scan selection permits rapid, continuous viewing of local areas for monitoring of mesoscale phenomena and accurate wind determination. Area scan size and location are definable to less than one visible pixel to provide complete flexibility.

The flexible nature of the Imager is used to provide a star-sensing capability. Time and location of a star is predicted very accurately and related to the spacecraft location and optical field. From a set of this data, the ground control system chooses a location and a time that is convenient within the imaging schedule. At the time for the scheduled starlook, the Imager is pointed to the predicted star location, which can be anywhere within its 21 degrees N-S by 23 degrees E-W view. (These viewing limits are for star sensing only. The maximum frame size during normal imaging operations is 19 degrees N-S by 19.2 degrees E-W.) As the star passes through one or two of the eight elements of the visible array, it is sampled for Instrument Navigation & Registration (INR) purposes. The data are in the normal format and data stream for extraction and use at the ground station.

Motion of the Imager and Sounder scan mirrors causes a small but well-defined disturbance of the spacecraft attitude. This effect is gradually reduced by spacecraft control but at a rate too slow for total compensation. Since all the physical factors of the scanners and spacecraft are known and the scan positions are continuously provided to the Imager and Sounder, the disturbances caused by each scan motion on the spacecraft and distributed to each instrument are calculated by the Attitude and Orbit Control System (AOCS). The Mirror Motion Compensation (MMC) signal is developed and used in the scan system server control loop to slightly modify the scan rate and position to offset the disturbance. This simple signal and control interface provides corrections that reduce any combination of effects. With this system in place, the Imager and Sounder are totally independent, maintaining image location accuracy regardless of the other unit's operational status. If need be, this MMC scheme can be disabled by command.

The AOCS also provides an Image Motion Compensation (IMC) signal that

counteracts the spacecraft attitude, orbit effects, and predictable structural-thermal effects within the spacecraft-instrument combination. These effects are detected from ranging, star sensing, and landmark features. Corrective algorithms developed on the ground are fed through the AOCS to the instruments as a total IMC signal, which includes the MMC described above.

Signal flow through the Imager maintains the maximum capability of each part of the optics, detection, and electronic subsystems to preserve the quality and accuracy of the sensed information. The signal flow starts with the radiation collected from the scene by the instrument's optical system. This scene radiance is separated into appropriate spectral channels and imaged onto the respective detectors for each channel. Each detector converts the scene radiance into an electrical signal that is amplified, filtered, digitized, and put into a data stream for transmission to a ground station.

The sensor assembly is mounted on a base plate external to the spacecraft, together with shields and louvers for radiation and heat control. The electronics module provides a structure for mounting and interconnecting the electronic boards with proper heat dissipation.

The sensor assembly contains the telescope, scan assembly, and detectors. A passive radiant cooler with a thermostatically controlled heater maintains the IR detector temperature for efficient operation. The IR heater maintains the IR detector temperature for efficient operation. The IR detectors operate at three patch temperatures: 94 K for 7 or 8 months that include the winter season, 101 K for the 4 or 5 months that include the summer season, and 104 K for radiative cooler contingencies. The visible detectors are at temperatures of 13 degrees C to 30 degrees C. Preamplifiers in the sensor assembly convert the low-level signals to higher level, low impedance outputs for transmission by cable to the electronics module. A passive louver assembly and electrical heaters on the base aid thermal stability of the telescope and major components.

The Imager instrument acquires radiometric data simultaneously for five distinct channels. These five radiometric channels are characterized by a central wavelength denoting primary spectral sensitivity within these channels. The five channels are split into two distinct classes, visible and IR, and comprise a total of 22 detectors as follows:

- **Visible-Channel 1 of the Imager contains eight visible detectors arranged in a linear fashion (v1-v8). Each detector provides an Instantaneous Geometric Field of View (IGFOV) of 28 microradians on a side. At the subsatellite point, this corresponds to a square pixel of 1 km per side.**

- **IR-Channel 3 (6.75 µm) contains two square detectors, one primary and one redundant. Each provides an IGFOV of 224 microradians corresponding to an 8-km resolution at the subsatellite point.**

- **IR-Channels 2 (3.9 µm), 4 (10.7 µm), and 5 (12.0 µm) each contain four detectors: two of these are the primary detectors and the other two provide redundancy. Each of these detectors is square, providing an IGFOV of 112 microradians. At the subsatellite point, this corresponds to a square pixel having dimensions of 4 km per side.**

The Imager scans the selected image area in alternate directions on alternate lines. The imaging area is defined by a coordinate system related to the instrument's orthogonal scan axis. During imaging operations a scan line is generated by rotating the scanning mirror in the E-W direction while

concurrently sampling each of the active imaging detectors. At the end of the line, the Imager scan mirror performs a turnaround, which involves stepping the mirror to the next scan line and reversing the direction of the mirror. The next scan line is then acquired by rotating the scanning mirror in the opposite, west-east direction, again with concurrent detector sampling. Detector sampling occurs within the context of a repeating data block format. In general, all visible detectors are sampled four times for each data block (four times 1 km wide), while each of the active IR detectors is sampled once per data block (one times 4 km wide).

4.1.7 Manufacturer of Sensor/Instrument

The new generation GOES system is developed by Space Systems/Loral (Palo Alto, CA) under NASA supervision. The imager is manufactured by ITT (Ft. Wayne, IN).

4.2 Calibration

Calibration information could be found from following sources:

1) GOES databook at http://rsd.gsfc.nasa.gov/goes/text/goes.databook.html
2) Weinreb et al., 1997.
3) Gu et al., 2002.

4.2.1 Specifications

IFOV
- Visible 28 μrad
- Infrared 112 μrad
- H_2O band 224 μrad

RESOLUTION (subsatellite)
- Visible 1.0 km
- Infrared 4.0 km
- H_2O band 8.0 km

ALTITUDE 35,788 km
SCAN RANGE approx. 60°N to 60°S
ORBIT POSITION: 0.0°N, 75.0°W

4.2.1.1 Tolerance

Not Available.

4.2.2 Frequency of Calibration

Calibration of the visible and infrared channels is performed after every scan using internal calibrators that are part of the imager instrumentation. However, routine calibrations are not made on the visible sensor.

4.2.3 Other Calibration Information

None

5. Data Acquisition Methods

The SRB and precipitation data were created from raw GOES-8 imager data. The Imager data was obtained by Dr. Eric Smith at FSU using the FSU Direct Readout Ground System located in Tallahassee, FL.

6. Observations

6.1 Data Notes

None given.

6.2 Field Notes

Not applicable.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

	Latitude	Longitude
Northwest	5 N	75 W
Northeast	5 N	40 W
Southwest	16 S	75 W
Southeast	16 S	40 W

Please Note: The spatial Coverage above is an approximate extent of the study area. For the exact spatial coverage refer the 477x295_latlon.bin file. The first data value is for Coordinate (-15.801867 S and -75.173599 W)

7.1.2 Spatial Coverage Map

Not available at this time.

7.1.3 Spatial Resolution

8 km

7.1.4 Projection

Lambert Azimuthal equal area grid.

7.1.5 Grid Description

Not available at this revision.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage

The dataset provides continuous coverage for the period of 01-Mar. to 30-Apr., and from 01-Sep. to 31-Oct. of 1999.

7.2.2 Temporal Resolution

The dataset was every 30 minutes.

7.3 Data Characteristics

Not Available.

7.4 Sample Data Record

Not available.

8. Data Organization

8.1 Data Granularity

The smallest unit of data contains all the parameters for a 30 minute period.

8.2 Data Format(s)

The files are written in SGI binary format. Each file contains all the radiation and rainfall parameters for one 30-minute period. Each parameter takes one record of 477x295 real numbers. The series of records in each file is:

Record Number	Content	Storage format
1	Downwelling Solar Flux	Real
2	Downwelling PAR	Real
3	Downwelling Infrared Flux	Real
4	Precipitation Rate	Real

The naming convention for the tar files is as follows:

The first two digits of each tar file name 99 is the year of the data.

The last three digits of the name is the day of the year.

After untarring each file, you should see 48 compressed binary files, such as A990600000.sat.gz.

The 99 and 060 are again the year and the day of the year.

The next 2 digits is the hour, followed with a 2-digit minute. The time is in UTC.

Each of these compressed binary files are of size 477 x 295 (477 Columns/Samples and 295 Rows/Lines) with four bands. Each of these bands is in Floating point (Real) format. The first 4 bytes of the data contains the number of bytes in the record. Same information is stored at the end of the record.

9. Data Manipulations

9.1 Formulae

9.1.1 Derivation Techniques and Algorithms

The solar and PAR parameters were retrieved from GOES-8 imager data using a physical retrieval algorithm (Gu and Smith, 1997; Gu et al., 2002). The algorithm includes parameterization of Rayleigh scattering, water vapor and ozone absorption, aerosol and cloud attenuation, and surface reflection.

The surface infrared flux was obtained from surface downward solar flux and in situ measured near-surface temperature using a statistical algorithm described in Gu et al. (1997) and Gu et al. (2002). The basic theory behind this approach is that solar radiation provides the primary energy load modulating the fundamental daily cycle of net LW flux. Variation of surface temperature is the response of the surface to the incident solar energy, which affects the net LW flux through its effect on upward LW flux.

9.2 Data Processing Sequence

None given.

9.2.1 Processing Steps

None given.

9.2.2 Processing Changes

None given.

9.3 Calculations

None given.

9.3.1 Special Corrections/Adjustments

None given.

9.3.2 Calculated Variables

None given.

9.4 Graphs and Plots

None.

10. Errors

10.1 Sources of Error

Potential sources of error include:

- -- Calibration
- -- Model parameterization: cloud optical properties, Rayleigh scattering
- -- Uncertainties in input: column water vapor amount, aerosol optical depth
- -- Wobbling of the satellite

10.2 Quality Assessment

10.2.1 Data Validation by Source

The retrieved radiation and precipitation were validated using data collected at EUSTACH and TRMM-LBA sites near Rondonia and Belem. See Gu et al.(2002) for details.

10.2.2 Confidence Level/Accuracy Judgment

In comparison to the in situ measurements collected at the EUSTACH sites during the wet and dry season 1999 on the half hourly and 8 km scales, the bias errors for solar, PAR and infrared radiation are under 4, 6, and 3% of the mean values. Precision errors are on the order of 20, 20, and 5%. The bias of rain rate is on the order of 25%. (see Gu et al. 2002 for details)

10.2.3 Measurement Error for Parameters

See Section 11.2.

10.2.4 Additional Quality Assessments

None given.

10.2.5 Data Verification by Data Center

Not available.

11. Notes

11.1 Limitations of the Data

See Section 11.2.

11.2 Known Problems with the Data

Use the data over mountainous areas with great caution because they are not validated.

11.3 Usage Guidance

None available.

11.4 Other Relevant Information

None available.

12. Application of the Data Set

These data were derived for the purpose of modeling biosphere/atmosphere interaction.

13. Future Modifications and Plans

Not Available.

14. Software

14.1 Software Description

There are README files and FORTRAN programs at web site (http://metsat.met.fsu.edu/LBA).

14.2 Software Access

Free to public.

15. Data Access

15.1 Contact for Data Center/Data Access Information

These data are available from the Earth Observing System Data and Information System (EOS-DIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

16. Output Products and Availability

16.1 Tape Products

None.

16.2 Film Products

None.

16.3 Other Products

None.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation

Menzel, W. P., and J. F. W. Purdom, 1994: Introducing GOES-I: The first of a new generation of geostationary operational environmental satellite. Bull. Amer. Meteor. Soc., 75, 757-781.

Kelly, K.A. 1989: GOES I-M image navigation and registration and user Earth location. GOES I-M Operational Satellite Conf., Arlington, VA, US. Department of Commerce, NOAA, 154-167.

Rossow, W.B., C.L. Brest, and M. Roiter, 1996: International Satellite Cloud Climatology Project (ISCCP) New Radiance Calibrations. WMO/TD-No. 736. World Meteorological Organization.

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Weinreb, M., M. Jamieson, N. Fulton, Y. Chen, J.X. Johnson, C. Smith, J. Bremer, and J. Baucom, 1997: Operational Calibration of the Imagers and Sounders on the GOES-8 and –9 Satellites. NOAA Technical Memorandum NESDIS 44.

17.2 Journal Articles and Study Reports

Gu, J. and E.A. Smith. 1997. High-resolution estimates of total solar and PAR surface fluxes over large-scale BOREAS study area from GOES measurements. Journal of Geophysical Research 102(D24):29,685-29,705.

Gu, J., E.A. Smith, G. Hodges, and H.J. Cooper, 1997: Retrieval of Daytime Surface Net Longwave Flux over BOREAS from GOES Estimates of Surface Solar Flux and Surface Temperature. Submitted to Canadian Journal of Remote Sensing.

Gu, J., E.A. Smith, H.J. Cooper, A. Grose, G. Liu, J.D. Merritt, M.J. Waterloo, A.C. Araujo, A,D. Nobre, A. O. Manzi, J. Marengo, P. J. Oliveira, C. Randow, J. Norman, P. S. Dias, 2002: Modeling carbon sequestration over large scale Amazon basin aided by satellite observations. Part 1: Wet and dry season SRB flux & Precipitation variability based on GOES retrievals. J. Appl. Meteoro.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None given.

19. List of Acronyms

- DAAC - Distributed Active Archive Center
- EOS - Earth Observing System
- EOSDIS - EOS Data and Information System
- FSU - Florida State University
- GOES - Geostationary Operational Environmental Satellite
- GSFC - Goddard Space Flight Center
- GVAR - GOES VARiable
- IFOV - Instantaneous Field of View
- ISCCP - International Satellite Cloud Climatology Project
- NASA - National Aeronautics and Space Administration
- NESDIS - National Environmental Satellite, Data and Information Service
- NLUT - Normalization Look-Up Table
- NOAA - National Oceanic and Atmospheric Administration
- ORNL - Oak Ridge National Laboratory
- PAR - Photosynthetically Active Radiation
- PMT - Photomultiplier Tube
- RSS - Remote Sensing Science
- SRB - Surface Radiation Budget

20. Document Information

20.1 Document Revision Dates

Written: 08-Nov-2002

20.2 Document Review Dates

20.3 Document ID

20.4 Citation

When using these data, please include the following acknowledgment as well as citations of relevant papers in Section 17.2:

The SRB data were provided by E.A. Smith, J. Gu and H.J. Cooper of the Department of Meteorology, FSU.

20.5 Document Curator

20.6 Document URL

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