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LBA-ECO LC-35 GOES Imager Active Fire Detection Data, South America: 2000-2005

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Revision date: August 22, 2013

Summary:

This data set is an active fire detection product resulting from the application of The Wildfire Automated Biomass Burning Algorithm (WF_ABBA) to Geostationary Environmental Operational Satellite (GOES) imager data for all of South America from 2000 through 2005. GOES imager data are available at 30 minute intervals with a nominal 4 x 4-km resolution.

The data provided are the latitude/longitude, brightness temperature, estimates of sub-pixel fire size and temperature, Global Land Cover Characterization (GLCC) ecosystem type, and a pixel-fire flag (0-5, information regarding the probability of a fire or processing characteristics) for each active fire detected by WF_ABBA for a 30 minute imager interval.

Spatial area coverage data files are provided as a complement to individual fire detection data files because the area of the latter varied according to the GOES imager scan mode in use.

Versions 5.9 and 6.0 WF_ABBA data are provided. Differences between the two versions are assumed to be small though (typically less than 10%). An in-line temporal filter has been added to the algorithm to screen out false alarms associated with noise in the imagery and cloud edge issues in version 6.0. This is especially important for screening false alarms due to reflection off clouds at extreme view angles and at sunrise and sunset.

There are nine compressed (*.zip) files with this data set. The zip files expand to the filtered ASCII text data files (.filt), and seven coverage files text (.txt).

Data Citation:

Cite this data set as follows:

UW-Madison CIMSS GOES Biomass Burning Monitoring Program (UW-CIMSS). 2013. LBA-ECO LC-35 GOES Imager Active Fire Detection Data, South America: 2000-2005. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee USA <http://dx.doi.org/10.3334/ORNLDAAC/1180>

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This data set was archived in August 2013. Users who download the data between August 2013 and July 2018 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.

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: Land Use and Land Cover

Team ID: LC-35 (Csiszar / Longo / Setzer)

The investigators were Csiszar, Dr. Ivan Andras; Longo, Dr. Karla Maria; Brunner, Jason; Freitas, Dr. Saulo Ribeiro de; Morisette, Dr. Jeffrey Thomas; Prins, Elaine; Schmidt, Christopher C.; Schroeder, Wilfrid and Setzer, Dr. Alberto. You may contact Brunner, Jason (jasonb@ssec.wisc.edu).

LBA Data Set Inventory ID: LC35_GOES_WF_ABBA

This data set is an active fire detection product resulting from the application of The Wildfire Automated Biomass Burning Algorithm (WF_ABBA) to Geostationary Environmental Operational Satellite (GOES) imager data for all of South America from 2000 through 2005. GOES imager data are available at 30 minute intervals with a nominal 4 x 4-km resolution.

The data provided are the latitude/longitude, brightness temperature, estimates of sub-pixel fire size and temperature, Global Land Cover Characterization (GLCC) ecosystem type, and a pixel-fire flag (0-5, information regarding the probability of a fire or processing characteristics) for each active fire detected by WF_ABBA for a 30 minute imager interval.

Spatial area coverage data files are provided as a complement to individual fire detection data files because the area of the latter varied according to the GOES imager scan mode in use.

Versions 5.9 and 6.0 WF_ABBA data are provided. Differences between the two versions are assumed to be small though (typically less than 10%). An in-line temporal filter has been added to the algorithm to screen out false alarms associated with noise in the imagery and cloud edge issues in version 6.0. This is especially important for screening false alarms due to reflection off clouds at extreme view angles and at sunrise and sunset.

2. Data Characteristics:

There are nine compressed (*.zip) files that contain temporally-filtered fire product text files (.filt) and seven .txt coverage files (the coverage files contain coordinate information of the area covered for each individual file--one .txt file for each year and satellite).

File naming convention:

The nine compressed *.zip files are named as **g__?YYYY_VXX_filt.zip**

where

g__ represents the satellite (g8=GOES-8, g12=GOES-12)

? = samerica = South America

YYYY = year 2000 to 2006

_VXX = V59 or V60 to represent the version number (v59 = version 5.9, v60 = version 6.0)

_filt =filtered .zip

File names:

g08samerica2000_v59_filt.zip

g08samerica2000_v60_filt.zip

g08samerica2001_v59_filt.zip

g08samerica2002_v59_filt.zip

g08samerica2002_v60_filt.zip

g08samerica2003_v60_filt.zip

g12samerica2003_v60_filt.zip

g12samerica2004_v60_filt.zip

g12samerica2005_v60_filt.zip

When expanded, the nine .zip files contain temporally-filtered fire product text files named as follows: **fyyydddhhmm.samer.v??g?.filt**

where:

yyyy represents the four digit year

ddd represents the julian day of the year (1-365)

hhmm represents the hour and minute in UTC

samer represents the continent (samer = South America)

v?? represents the version number (v59 = version 5.9, v60 = version 6.0)

g? represents the satellite (g8=GOES-8, g12=GOES-12).

Text file contents:

Each file provides the following information for each recorded fire pixel:

- Location in terms of latitude and longitude (degrees). Note that typically navigation is valid to within approximately 4-5 km at the sub-satellite point and increases to nearly 8-10 km at a satellite view angle of 50 degrees. At times it can be worse due to maneuvers and other issues.
- 4 and 11 micron observed brightness temperature values (K).
- Instantaneous estimates of sub-pixel fire size (km²) and temperature (K) when available. This is NOT an estimate of burned area!
- GLCC land cover characteristics ecosystem type (<http://edcdaac.usgs.gov/glcc/glcc.html>, version 2.0).
- Fire flag (ranging from 0 to 5) where the numbers represent the following:
 - 0 - Fire pixel that could be processed for sub-pixel instantaneous estimates of fire size and temperature.
 - 1 - Saturated pixel. The temperature of the fire pixel was higher than the sensor could evaluate and the pixel could not be processed for sub-pixel fire characteristics.
 - 2 - The fire pixel was cloudy and could not be processed for sub-pixel fire characteristics.
 - 3 - This is a high probability fire pixel. Keep monitoring for future development.
 - 4 - This is a medium probability fire pixel. Keep monitoring for future development.
 - 5 - This is a low probability fire pixel. This category is often indicative of false alarms in North America and along cloud edges and at high viewing angles at sunrise and sunset, but should be monitored over time.

NOTE:

The value -9 indicates that this parameter was not available or could not be computed for this particular fire pixel, but the fire pixel is still valid.

The temporally-filtered fire product only contains fire pixels that have appeared more than once within the past 12 hours. It is the most conservative and should be used if the user wants to minimize false alarms. Line 4 of the header in the filtered output ASCII file contains information on the number of hours/files that were available for the temporal filtering. At times, the temporally filtered file will not be available because not enough of the previous files were available to conduct the filtering.

Example file: f20002450015.samer.v59.g8.filt

```
NOAA/NESDIS/ORA University of Wisconsin-Madison/CIMSS GOES-8 ABBA (vs 5.9) Experimental Filtered
Fire Product
**NOTE: This product is preliminary and has not been quality controlled

Date: 2000245 Time: 15 UTC Filtered file: 12 hours 25 files

Longitude  Latitude  T4(K)  T11(K)  Size(km2)  Temp(K)  Ecosystem  Fire Flag
-56.02     2.00     299.9   292.2   .1014      436.     41         0
```

** This statement is in all of the files, refers to earlier processing, and should be ignored.

Coverage files (.txt): The seven coverage files are used to describe the polygon domain of the non-filtered final ASCII files. They consist of a series of locations (latitudes/longitudes) that depict the spatial domain of the non-filtered file at each time. Coverage files are divided by year and satellite.

The file naming convention is as follows: **g??samericayyyy_cov.txt**

where

g?? represents the satellite (g08 = GOES-8, g12 = GOES-12)

samerica represents the continent (samerica = South America)

yyyy represents the four digit year.

** Note that in 2003 there are two coverage files for GOES-East South America (one for GOES-8 and one for GOES-12):

- GOES-8 coverage file extends from Julian date 2003001 through 2003089
- GOES-12 coverage file extends from 2003090 through 2003365.

File names:

g08samerica2000_cov.txt

g08samerica2001_cov.txt

g08samerica2002_cov.txt
 g08samerica2003_cov.txt
 g12samerica2003_cov.txt
 g12samerica2004_cov.txt
 g12samerica2005_cov.txt

There are 14 parameters at each non-filtered file time in the coverage file. The date and time are provided, as well as 12 parameters that define the polygon outline of the domain region of the data.

The parameters are as follows:

- Four digit year and julian day (for example, 2000001 describes year 2000 and julian day 001)
- hhmmss (hour/minute/second; for example 173000 is 1730 UTC)
- Upper left coordinate and upper right coordinate of data domain (Latitude/Longitude)
- Top middle and lower middle coordinates of data domain (Latitude/Longitude)
- Left coordinate 1, left coordinate 2, and left coordinate 3 of data domain (Latitude/Longitude), not included for South America coverage, therefore assigned a -999.00
- Left coordinate 4 (Lower left coordinate) of data domain (Latitude/Longitude)
- Right coordinate 1, right coordinate 2, and right coordinate 3 of data domain (Latitude/Longitude), not included for South America coverage, therefore assigned a -999.00
- Right coordinate 4 (Lower right coordinate) of data domain (Latitude/Longitude)

Notes:

-999.00 denotes a missing coordinate.

Left 2,3,4 and Right 2,3,4 define the bound coordinates for the lower half part of the coverage area. These coordinates are used to help create a more realistic representation of the image area as the latter does not describe an exact square.

Example data record (g08samerica2000_cov.txt):

DATE	hhmmss	UPPER LEFT COORD	UPPER RIGHT COORD	TOP MIDDLE COORD	LOWER MIDDLE COORD	LEFT 1	LEFT 2	LEFT 3	LEFT 4	RIGHT 1	RIGHT 2	RIGHT 3	RIGHT 4									
2000	0014500	12.99 -81.99	12.97 -28.64	12.97 -74.00	-18.77 -60.60	10.66	-81.98	-3.78	-82.00	-	11.03	-81.99	-18.69	-81.98	-999.00	-999.00	-3.96	-30.41	-11.61	-29.04	-19.81	-25.76

The spatial domain consists of full coverage of South America every three hours (at Full Disk satellite imagery times: 0245, 0545, 0845, 1145, 1445, 1745, 2045, and 2345 UTC).

Coverage extends to a latitude of 20 degrees South every half hour except when the satellite is in Rapid Scan Operations mode. When Rapid Scan Operations occurs coverage extends only to a latitude of approximately 2 degrees South (No coverage for most of South America). For RSO coverage; L2, L3, R2, and R3 coordinates are assigned a value of -999.00 (since there is no data at these locations for RSO).

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
South America Regular Coverage (South America Regular Coverage)	-82	-25.75	13	-20	1924 International Standard Geodetic Datum

Time period:

- The data set covers the period 2000/01/01 to 2005/12/31.
- Temporal Resolution:30-minute

Platform/Sensor/Parameters measured include:

- GOES-8 (GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE-8) / GOES-8 IMAGER / FIRE OCCURRENCE
- COMPUTER MODEL /ALGORITHM / FIRE OCCURRENCE
- GOES-12 (GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE-12) / GOES I-M IMAGER / FIRE OCCURRENCE

3. Data Application and Derivation:

The geographic coordinates contained in this data set correspond to areas of thermal anomalies identified primarily in the fire sensitive mid-infrared spectral region data of the multispectral imager on board the GOES 8 and 12 satellites. Although the occurrences are mostly associated with vegetation fires, other surface features (e.g., warm bright soils) can also cause abnormal high responses in the mid-infrared channel and therefore produce a

detection. The user must also be aware that, despite the 4 x 4 km nominal spatial resolution of the product, vegetation fires will normally occupy only a small fraction of the pixel. Similarly, multiple fire lines may be also described by a single detection. Lastly, navigation drifts must be accounted for when analyzing multi-temporal detections.

4. Quality Assessment:

A thorough validation of this product was implemented by Schroeder et al. (2008). Commission errors were estimated to represent 3% of all detections. Omission errors vary as a function of fire size (graphs available in the referred publication).

5. Data Acquisition Materials and Methods:

The WF_ABBA is a dynamic multispectral thresholding contextual algorithm that uses the visible (daytime only), 3.9 micron, and 10.7 micron infrared bands to locate and characterize hot spot pixels. The product has a nominal spatial resolution of 4 x 4 km at the sub-satellite point. The algorithm is based on the sensitivity of the 3.9 micron band to high temperature subpixel anomalies and is derived from a technique originally developed by Matson and Dozier (1981) for NOAA Advanced Very High Resolution Radiometer (AVHRR) data.

The algorithm incorporates statistical techniques to automatically identify hot spot pixels in the GOES imagery. Once the algorithm locates a hot spot pixel, it incorporates ancillary data in the process of screening for false alarms and correcting for water vapor attenuation, surface emissivity, solar reflectivity, and semi-transparent clouds.

The AVHRR-derived Global Land Cover Characteristics (GLCC) data base (version 2.0) is used to assign surface emissivity and to screen for false alarms (<http://edcdaac.usgs.gov/glcc/glcc.html>).

The National Centers for Environmental Prediction (NCEP) Aviation model total column precipitable water products are utilized to correct for water vapor attenuation.

Numerical techniques are used to determine instantaneous estimates of subpixel fire size and average temperature.

An in-line temporal filter has been added to the algorithm to screen out false alarms associated with noise in the imagery and cloud edge issues. This is especially important for screening false alarms due to reflection off clouds at extreme view angles and at sunrise and sunset. The temporal filtering technique uses a time series of GOES fire products from previous hours to compare with the current fire product.

A fire pixel must appear at least twice (within 0.1 degrees) within the past 12 hours in order to be retained in the final filtered fire product. The filtered fire product can result in delayed identification of a fire start time and eliminates short-lived agricultural management fires. For more information on the algorithm and the determination of subpixel fire characteristics, refer to Prins and Menzel (1992, 1994) and Prins et al. (1998a; b; 2001a; b).

6. Data Access:

These data are 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:

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