LBA-ECO LC-03 SAR Images, Land Cover, and Biomass, Four Areas across Brazilian Amazon

Summary:

This data set provides three related land cover products for four study areas across the Brazilian Amazon: Manaus, Amazonas; Tapajos National Forest, Para Western (Santarem); Rio Branco, Acre; and Rondonia, Rondonia. Products include (1) orthorectified JERS-1 and RadarSat images, (2) land cover classifications derived from the SAR data, and (3) biomass estimates in tons per hectare based on the land cover classification. There are 12 image files (.tif) with this data set.

Orthorectified JERS-1 and RadarSat images are provided as GeoTIFF images - one file for each study area.

- For the Manaus and Tapajos sites: The images are orthorectified at 12.5-meter resolution and then re-sampled at 25-meter resolution.
- For the Rondonia and Rio Branco sites: The images from 1978 are orthorectified at 25-meter resolution and then re-sampled at 90-meter resolution.

Each GeoTIFF file contains 3 image channels: - 2 L-band JERS-1 data in Fall and Spring seasons and - 1 C-band RadarSat data.

Land cover classifications are based on two JERS-1 images and one RadarSat image and provided as GeoTIFFs - one file for each study area. Four major land cover classes are distinguished: (1) Flat surface; (2) Regrowth area; (3) Short vegetation; and (4) Tall vegetation.

The biomass estimates in tons per hectare are based on the land cover classification results and are reported in one GeoTIFF file for each study area.

DATA QUALITY STATEMENT: The Data Center has determined that there are questions about the quality of the data reported in this data set. The data set has missing or incomplete data, metadata, or other documentation that diminishes the usability of the products.

KNOWN PROBLEMS:

The data providers note that due to limited resources, these data have been neither validated nor quality-assured for general use. For that reason, extreme caution is advised when considering the use of these data.

Any use of the derived data is not recommended because the results have not been validated.

However, the DEM and vectors (related data set), and orthorectified SAR data can be used if the user understands how these were produced and accepts the limitations.

Data Citation:

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 June of 2012. Users who download the data between June 2012 and May 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.

Table of Contents:

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-03 (Dobson / Soares)

The investigators were Burnham, Robyn J.; DeGrandi, Gianfranco; Dobson, Myron Craig; Pierce, Leland E.; Soares, Joao Vianei; Ulaby, Fawwaz T.; Valeriano, Dalton De Morisson; Xie, Hua and Zhou, Mi . You may contact Pierce, Dr. Leland E. (lep@eecs.umich.edu).

LBA Data Set Inventory ID: LC03_Orthorectified_SAR

This data set provides three spatial products for four study areas across the Brazilian Amazon: Manaus, Amazonas; Tapajos National Forest, Para Western (Santarem); Rio Branco, Acre; and Rondonia, Rondonia. Products include (1) orthorectified JERS-1 and RadarSat images, (2) land cover classifications derived from the SAR data, and (3) biomass estimates in tons per hectare based on the land cover classification.

Related data set:

- [LBA-ECO LC-03 Hypsography, Rivers, Roads, and DEM, Four Areas across Brazilian Amazon](#)

2. Data Characteristics:

There are 12 image files (.tif) with this data set described below.

Orthorectified JERS-1 and RadarSat Images:

There are four GeoTIFF image files (.tif) with the JERS-1and RadarSat images. The files are the following:

Manaus and Tapajos sites:

Spatial resolution: 25 meters

　　　Manaus_radar.tif

　　　tap_radar.tif

Rio Branco and Rondonia sites:

Spatial resolution: 90 meters

　　　rio2_radar.tif

　　　ron2_radar.tif

The images have the projection parameters listed below:

Projected Coordinate System: WGS_1984_UTM Zone can be either 19S, 20S or 21S.

- · Projection: Transverse_Mercator

- · False_Easting: 500000.000000

- · False_Northing: 10000000.000000

- · Central_Meridian: -69.000000

- · Scale_Factor: 0.999600

- · Latitude_of_Origin: 0.000000

· Linear_Unit: Meter

· Geographic Coordinate System: GCS_WGS_1984

· Datum: D_WGS_1984

· Prime Meridian: Greenwich

· Angular Unit: Degree

Land Cover Classification:

There are four GeoTIFF files showing land cover classification for four study areas in the Amazon Basin.

Manaus, Rio Branco, Rondonia, and Tapajos sites:

File names:

Manaus_classification.tif

Rio2_classification.tif

Ron2_classification.tif

Tap_classification.tif

Spatial Resolution: 25 meters

Projection: Universal Transverse Mercator, Zones 19S, 20S, 21S

Value: LULC class: 0=No Data, 1=Flat Surface, 2=Regrowth area, 3=Short vegetation, 4=Tall vegetation

Biomass Estimates:

There are four data files of biomass estimates in this data set provided as GeoTIFFs. Each GeoTIFF represents one of four study areas in the Amazon. Values in the files are in tons/hectare.

Manaus, Rio Branco, Rondonia, and Tapajos sites:

Mananus_biomass.tif

Rio2_biomass.tif

Ron2_biomass.tif

Tap_biomass.tif

Image file characteristics:

· Resolution: 30 meters

· Projection: Universal Transverse Mercator (UTM). Images are in UTM Zones 19S, 20S and 21S. The specific zone is given in the GeoTIFF file.

· Datum: WGS 1984

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Amazonas (Manaus) (Amazonas (Manaus))	-60.64694	-59.48056	-2.00167	-3.48139	South-American Datum, 1969 (SAD-69)
Acre - Rio Branco (Acre)	-68.50083	-66.76694	-9.47694	-10.50139	South-American Datum, 1969 (SAD-69)
Rondonia (Rondonia)	-63.00083	-62.4825	-9.49944	-10.49444	South-American Datum, 1969 (SAD-69)
Para Western (Santarem) - Tapajos National Forest (Para Western (Santarem))	-55.50056	-54.49889	-2.49833	-3.50556	South-American Datum, 1969 (SAD-69)

Time period:

- The data set covers the period 1974/01/01 to 1998/06/18
- SAR Images: 1978/01/01 to 1978/01/01
- Land cover: 1974/01/01 to 1998/06/18
- Biomass: 1974/01/01 to 1998/06/18
- Temporal Resolution: annual

Platform/Sensor/Parameters measured include:

- JERS-1 (JAPANESE EARTH RESOURCES SATELLITE-1) / SAR (SYNTHETIC APERTURE RADAR) / LAND COVER
- RADARSAT-1 / SAR (SYNTHETIC APERTURE RADAR) / BIOMASS
- RADARSAT-1 / SAR (SYNTHETIC APERTURE RADAR) /LAND USE CLASSES

3. Data Application and Derivation:

This data set provides three spatial products for four study areas across the Brazilian Amazon: Manaus, Amazonas; Tapajos National Forest, Para Western (Santarem); Rio Branco, Acre; and Rondonia, Rondonia. Products include (1) orthorectified JERS-1 and RadarSat images, (2) land cover

classifications derived from the SAR data, and (3) biomass estimates in tons per hectare bases on the land cover classification.

4. Quality Assessment:

Orthorectification from slant-range SAR data was performed using software derived from a program written by Vexcel Corp. This software also enabled the correction of the backscattered power from that over a smooth ellipsoid to that over the particular facet of the DEM, allowing for a more accurate sigma-0 value.

KNOWN PROBLEMS:

Due to limited resources, these data have been neither validated nor quality-assured for general use. For that reason, extreme caution is advised when considering the use of these data.

Any use of the derived data is not recommended because the results have not been validated.

However, the DEM and vectors (related data set) and orthorectified SAR data can be used if the user understands how these were produced and accepts the limitations.

5. Data Acquisition Materials and Methods:

Orthorectified JERS-1 and RadarSat Images:

For the Manaus and Tapajos sites:
The images are orthorectified at 12.5-meter resolution and then re-sampled at 25-meter resolution.

For the Rondonia and Rio Branco sites:
The images are orthorectified at 25-meter resolution and then re-sampled at 125-meter resolution.

Land Cover Classification:

The land cover classification for four study areas in the Brazilian Amazon: Manaus, Tapajos, Rio Branco, and Rondonia was based on two JERS-1 images and one RadarSat images and are provided as GeoTIFFs.

Four major land cover classes are distinguished:

(1) Flat surface
(2) Regrowth area
(3) Short vegetation
(4) Tall vegetation

The land-cover classes were derived using combination of the 3 SAR channels available using the ISODATA clustering algorithm, followed by manual re-interpretation of the cluster numbers into land-cover classes. This process was based on expert opinion as well as the existence of a few training sites graciously donated to our project from Prof. Richard Lucas (personal communication), who had measured some regrowth areas a few years earlier.

Biomass Estimates:

Biomass was estimated using the land-cover class first, with flat areas being set to zero biomass, and tall vegetation areas set to 255, the short vegetation areas were set to 10 tons/ha, and the regrowth areas used a formula based on the ground truth we had for several regrowth areas, as supplied by Prof. Richard Lucas (personal communication). The formula used to estimate biomass is included in the following figure. The L-band data used was from the dry season data set.

```
! ================================================
! Amazon biomass model
! assumes input L and C are scaled dB from -40 to 0
! in a single 8-bit unsigned integer.
! ================================================

!  title '==========Amazon Biomass Estimation==========';

input 'L-band channel:' %inputL;
input 'C-band channel:' %inputC;
input 'class  channel:' %class;
input 'output channel:' %output;

%output = 0;


! scale back to dB power values:
#L = %inputL*40.0/255. - 40.0;
#C = %inputC*40.0/255. - 40.0;

! short veg:
if(%class=2) then %output=10;
endif;

! trees:
if(%class>2) then
     if(%class=3) then %output = exp(5.725039 + 0.052083*#L + 0.044223*#C) + 0.5;
     endif;
     if(%class=4) then %output=255;
     endif;
endif;
```

Figure 1. Summary of calculation methods used to estimate biomass from L-and C- bands.

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:

None cited.