



LBA-ECO ND-01 Georegistered Landsat Imagery for Rondonia, Brazil: 1975-2000

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Revision date: November 8, 2013

Summary:

This data set provides a time series of Landsat Multispectral Scanner (MSS), Thematic Mapper (TM), and Enhanced Thematic Mapper Plus (ETM+) scenes for five (Path/Row) areas in Rondonia, Brazil. The scenes are from the period June 1975 through June 2000, but all areas do not have scenes for all the years.

The areas and Landsat Path/Rows included are as follows: Ariquemes (P232,R67), Ji-Parana (P231, R67), Luiza (P231, R68), Cacoal (P230, R68), and Porto Velho (P232, R66). TM images are available for all five areas. Because of a paucity of digital Landsat MSS imagery from the 1970s, only two scenes could be included, a 1975 scene from Ariquemes and a 1978 scene from Ji-Parana.

Each of the Landsat scenes has been coregistered to a Path/Row-specific georectified PRODES Landsat file obtained from the Brazilian Government's National Institute for Space Research (INPE) program. For each scene, the coregistration is accurate to within (plus or minus) 1 pixel (30-m Landsat resolution) in most places.

The five INPE PRODES Landsat scenes used in the georectification process are included with this data set.

There are five compressed files (tar.gz format) with this data set. When expanded, each compressed file (which corresponds to one of the five areas) contains a directory for each scene with GeoTIFF files for individual Landsat bands, a text file of tie points, and another text file of slope and intercept values for converting radiance to reflectance. There are two dates for Landsat MSS scenes, 45 dates for TM scenes, and six dates for ETM+ scenes.

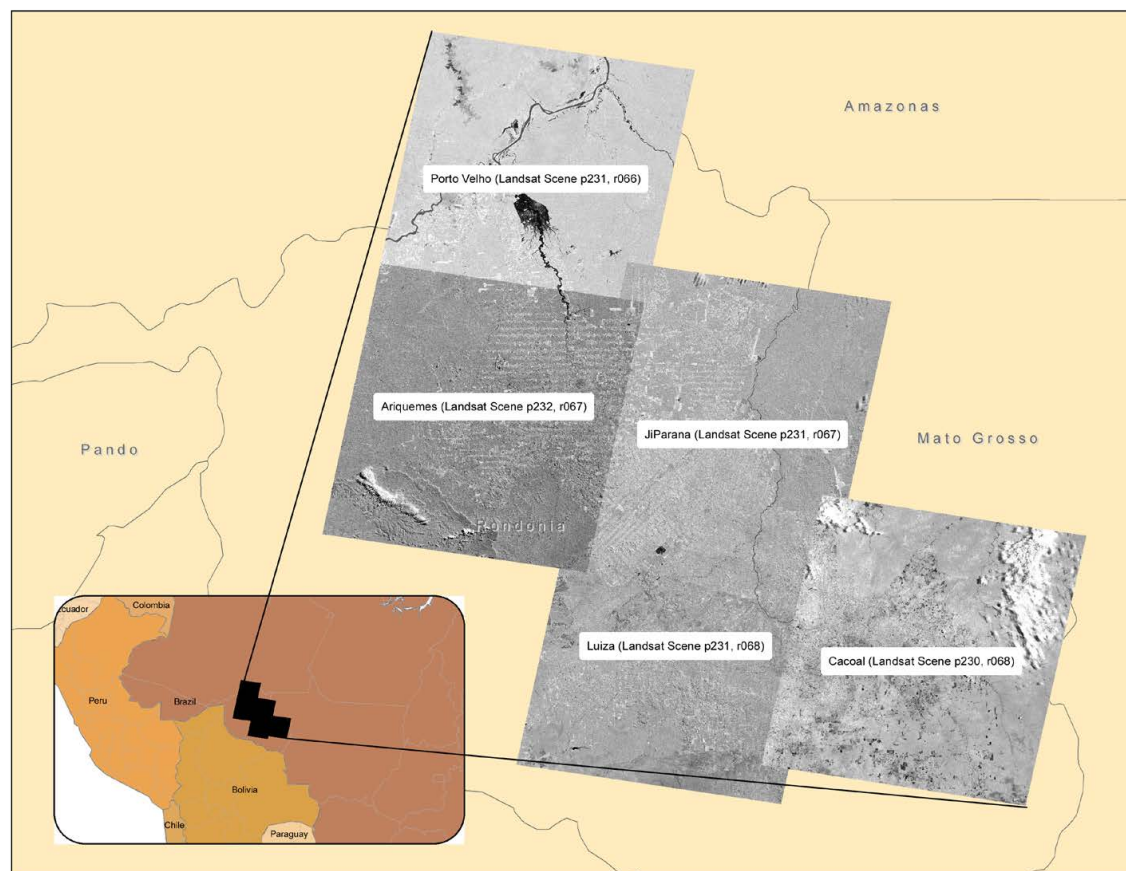


Figure 1. The five Brazilian sites and corresponding Landsat scenes in this data set.

Data Citation:

Cite this data set as follows:

Roberts, D.A., I. Numata, K.W. Holmes, G.T. Batista, T. Krug, A.L. Monteiro, B. Powell, and O.A. Chadwick. 2013. LBA-ECO ND-01 Georegistered Landsat Imagery for Rondonia, Brazil: 1975-2000. 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/ORNLDAAAC/1197>

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This data set was archived in November of 2013. Users who download the data between November 2013 and October 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: ND-01 (Chadwick / Roberts / Batista)

The investigators were Chadwick, Oliver A.; Roberts, Dar A.; Batista, Getulio T.; Biggs, Trent W.; Gessler, Paul E.; Holmes, Karen W. and Tomasella, Javier. You may contact Roberts, Dar A. (dar@geog.ucsb.edu).

LBA Data Set Inventory ID: ND01_Registered_TM_MSS_Rondonia

This data set provides a time series of Landsat Multispectral Scanner (MSS), Thematic Mapper (TM), and Enhanced Thematic Mapper Plus (ETM+) scenes for five (Path/Row) areas in Rondonia, Brazil. The scenes are from the period June 1975 through June 2000, but all areas do not have scenes for all the years.

The areas and Landsat Path/Rows included are as follows: Ariquemes (P232,R67), Ji-Parana (P231, R67), Luiza (P231, R68), Cacoal (P230, R68), and Porto Velho (P232, R66). TM images are available for all five areas. Because of a paucity of digital Landsat MSS imagery from the 1970s, only two scenes could be included, a 1975 scene from Ariquemes and a 1978 scene from Ji-Parana.

Each of the Landsat scenes has been coregistered to a Path/Row-specific georectified PRODES Landsat file obtained from the Brazilian Government's National Institute for Space Research (INPE) program. For each scene, the coregistration is accurate to within (plus or minus) 1 pixel (30-m Landsat resolution) in most places.

The five INPE PRODES Landsat scenes used in the georectification process are included with this data set.

Related Data Sets:

- [LBA-ECO ND-01 Fractional Land Cover Images, Rondonia, Brazil: 1984-2000](#) (Land cover classification maps for the five sites)
- [LBA-ECO ND-01 Landsat 28.5-m Land Cover Time Series, Rondonia, Brazil: 1984-2010](#) (land cover time series derived from Landsat Images for Rondonia, Brazil)

2. Data Characteristics:

There are five compressed files (tar.gz format) with this data set. These files contain directories which correspond to the five Brazilian locations. The locations (with the corresponding Landsat path/row) are labelled as: ariquemes (P232, R67), cacoal (P230, R68), jiparana (P231, R67), luiza (P231, R68), and portovelho (P232, R66). Each Landsat area also includes the INPE PRODES Landsat scene used in the georectification process.

There were several acquisition dates for each Landsat scene covering the time period 1975 - 2000. Each date contains several files including GeoTIFFS (.tif), a metadata file for each Landsat band (.xml), a text file of tie points (.pts), and a text file of slope/intercept values (.go). A PRODES folder is included for each area which contains the INPE PRODES base image to which all other scenes for that location were registered.

Five compressed files:

ND01_Registered_TM_MSS/data/ariquemes.tar.gz

ND01_Registered_TM_MSS/data/cacoal.tar.gz

ND01_Registered_TM_MSS/data/jiparana.tar.gz

ND01_Registered_TM_MSS/data/luiza.tar.gz

ND01_Registered_TM_MSS/data/portovelho.tar.gz

File naming convention:

For each Landsat scene there were several acquisition dates, and the files are named with a two letter abbreviation of the site followed by the acquisition date and band number.

For each date, the following files are included:

*.tif -- geotif file for each registered Landsat single band image. There are multiple files of individual Landsat bands per scene designated within the filename by *.b1 - *.b7 respectively.

*.aux.xml -- GeoTIFF metadata file

*.pts -- a text file of tie points used to warp the raw image data to a registered PRODES data set

*.go -- a text file of slope and intercept values for the linear equation to convert radiance to reflectance

Example file names:

ar000628.b4.reg.tif: a tif file for the Ariquemes location (P232, R67) acquired on June 28, 2000.

ar000628.b5.reg.tif.aux.xml: GeoTIFF metadata file for the arquemes location acquired on June 28, 2000.

ar00to99p.pts: a text file of tie points used to warp the raw image data to a registered PRODES data set.

ar000628.go: a text file of slope and intercept values for the linear equation to convert radiance to reflectance.

The following Landsat Scenes and ancillary data are available for each of the 5 locations:

Ariquemes: 16 acquisition dates for Landsat Path 232, Row 67

ar000628
ar75
ar840624
ar860801mss
ar880721
ar890724
ar900812
ar910612
ar920622
ar931007
ar940604
ar950725
ar960711
ar970628
ar980717
ar991016
PRODES/

Cacool: Eight acquisition dates for Landsat Path 230, Row 68

ca880808
ca890912
ca920710
ca940809
ca960713
ca961017
ca980719
ca990815
PRODES/

JiParana: 11 acquisition dates for Landsat Path 231, Row 67

ji78
ji861013
ji880730
ji890802
ji900805
ji930728
ji960720
ji960922
ji970621
ji980608
ji990806
PRODES/

Luiza: 10 acquisition dates for Landsat Path 231, Row 68

lu861013mss
lu861013
lu880730
lu890802
lu900805
lu920725
lu950803
lu960720
lu970723
lu990806
PRODES/

Portovelho: Eight acquisition dates for Landsat Path 232, Row 66

pv000628
pv860716
pv881001
pv920724
pv931007
pv960626
pv970628
pv980717

PRODES/

Spatial Data Properties

All GeoTIFF files for this dataset have the same basic Spatial Data Properties. The row/column and spatial extent differences are listed below for each of the 5 areas.

Spatial Representation Type: Raster
Pixel Depth: 8 bit
Compression Type: LZW
Number of Bands: 1
Band Information: Landsat Band
Raster Format: TIFF
Source Type: continuous
Pixel Type: unsigned integer
No Data Value: none

Ariquemes (Landsat Path 232, Row 67)

Number Columns: 7881
Column Resolution: 30 m
Number Rows: 7368
Row Resolution: 30 m

Extent in the items coordinate system

North: 8990040.915
South: 8769000.915
West: 309476.996
East: 545906.996

Cell geometry: area
Point in pixel: center

Cacoal (Landsat Path 230, Row 68)

Number Columns: 7914
Column Resolution: 30 m
Number Rows: 7388
Row Resolution: 30 m

Extent in the items coordinate system

North: 8830168.000
South: 8608528.000
West: 613266.000
East: 850686.000

Cell geometry: area
Point in pixel: center

Jiparana (Landsat Path 231, Row 67)

Number Columns: 7877
Column Resolution: 30 m
Number Rows: 7373
Row Resolution: 30 m

Extent in the items coordinate system

North: 8990876.700
South: 8769686.700
West: 479838.600
East: 716148.600

Cell geometry: area
Point in pixel: center

Cell geometry: area
Point in pixel: center

Luiza (Landsat Path 231, Row 68)

Number Columns: 7818
Column Resolution: 30 m

Number Rows: 7365
Row Resolution: 30 m

Extent in the items coordinate system

North: 8830071.600
South: 8609121.600
West: 446225.000
East: 680765.000

Cell geometry: area
Point in pixel: center

Portovelho (Landsat Path 232, Row 66)

Number Columns: 7874
Column Resolution: 30 m
Number Rows: 7357
Row Resolution: 30 m

Extent in the items coordinate system

North: 9150358.000
South: 8929648.000
West: 344227.000
East: 580447.000

Cell geometry: area
Point in pixel: center

Spatial Reference Properties

The spatial reference information is the same for each Landsat scene.

Type: Projected

Geographic Coordinate Reference: GCS_SAD69

Projection: UTM_Zone_20_Southern_Hemisphere

Open Geospatial Consortium (OGC) Well Known Text (WKT)

```
PROJCS["UTM_Zone_20_Southern_Hemisphere",
  GEOGCS["GCS_SAD69",
    DATUM["D_South_American_1969",
      SPHEROID["GRS_1967",6378160.0,298.2471674269971]],
    PRIMEM["Greenwich",0.0],
    UNIT["Degree",0.0174532925199433]],
  PROJECTION["Transverse_Mercator"],
  PARAMETER["false_easting",500000.0],
  PARAMETER["false_northing",10000000.0],
  PARAMETER["central_meridian",-63.0],
  PARAMETER["scale_factor",0.9996],
  PARAMETER["latitude_of_origin",0.0],
  UNIT["Meter",1.0]]
```

Table of Landsat MSS and TM scene dates for the five sites:

Year	Ariquemes	Ji Parana	Luiza	Cacoal	Porto Velho	Type: MSS or TM
1975	19750619					MSS*
1978		197808x				MSS**
1984	19840624					TM
1986	19860801	19861013	19861013 19861013MSS		19860716	TM
1988	19880721	19880730	19880730	19880808	19881001	TM
1989	19890724	19890802	19890802	19890912		TM
1990	19900812	19900805	19900805			TM
1991	19910621					TM

1992	19920622		19920725	19920710	19920724	TM
1993	19931007	19930728			19931007	TM
1994	19940604			19940809		TM
1995		19950725		19950803		TM
1996	19960711	19960922 19960722	19960720	19960713 19961013	19960626	TM
1997	19970628	19970621	19970723		19970628	TM
1998	19980717	19970608		19980719	19980717	TM
1999	19991016	19990806	19990806	19990815		ETM
2000	20000628				20000628	ETM

Notes:

WRS-1,P249, R67

WRS-1,P248, R67

Notes regarding specific locations / scenes:

Ariquemes, Rondonia, Registered TM:

- Temporal Coverage: 1984-2000
- Begin: 19840624 - End: 20000628
- Platform: Landsat-5

Special notes:

- 1999 scene was severely cloud contaminated.
- Collection includes Landsat ETM for 2000

Ariquemes, Rondonia, Registered MSS:

- Temporal Coverage: 1975-06-19
- Platform: There is some uncertainty whether these Landsat images were Landsat-1 or Landsat-2

Special notes: none.

JiParana, Rondonia, Registered TM:

Temporal Coverage: 1986-1999
 - Begin: 19861013 - End: 19990806
 Platform: Landsat-5

Special notes:

- Lower portions of TM3 in 1993 were corrupted. Lower portion of TM3 was estimated by developing a relationship between TM3 and all other bands for the upper half of the image.
- Includes Landsat ETM for 1999.

JiParana, Rondonia, Registered MSS:

Temporal Coverage: 1978-08-01
 Platform: Landsat-2

Special notes:

- Exact day within August 1978 unknown; August 1 selected arbitrarily.

Cacoal, Rondonia, Registered TM:

Temporal Coverage: 1988-1999
 - Begin: 19880808 - End: 19990815
 Platform: Landsat-5
 Special notes: none.

Luiza, Rondonia, Registered TM:

Temporal Coverage: 1986-1999
 - Begin: 19861013 - End: 19990806
 Platform: Landsat-5
 Special notes: none.

Porto Velho, Rondonia, Registered TM:

Temporal Coverage: 1986-2000
 - Begin: 19860716 - End: 20000628

Platform: Landsat-5

Special notes:

- Collection includes Landsat ETM for 2000.

Landsat data were originally obtained from Woods Hole Research Center, Woods Hole, Massachusetts.

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Rondonia - Ariquemes (Rondonia)	-64.64056	-62.69722	-9.18083	-11.07528	South-American Datum, 1969 (SAD-69)
Rondonia - Cacoal (Rondonia)	-61.88907	-59.85667	-10.65794	-12.49684	South-American Datum, 1969 (SAD-69)
Rondonia - Ji Parana (Rondonia)	-63.06833	-61.18167	-9.36861	-10.93583	South-American Datum, 1969 (SAD-69)
Rondonia - Luiza (Rondonia)	-63.40667	-61.48278	-10.6975	-12.43111	South-American Datum, 1969 (SAD-69)
Rondonia - PortoVelho (Rondonia)	-64.28306	-62.44778	-7.8275	-9.51889	South-American Datum, 1969 (SAD-69)

Time period:

- The data set covers the period 1975/06/19 to 2000/06/28.
- Temporal Resolution: Multiple scenes are available at every site at erratic intervals. See table provided for dates available for each site.

Platform/Sensor/Parameters measured include:

- LANDSAT-5 (LAND REMOTE-SENSING SATELLITE-5) / LANDSAT TM (LANDSAT THEMATIC MAPPER) / VISIBLE IMAGERY
- LANDSAT-5 (LAND REMOTE-SENSING SATELLITE-5) / LANDSAT ETM+ / VISIBLE IMAGERY
- LANDSAT-5 (LAND REMOTE-SENSING SATELLITE-5) / LANDSAT TM (LANDSAT THEMATIC MAPPER) / INFRARED IMAGERY
- LANDSAT-2 (LAND REMOTE-SENSING SATELLITE-2) / MSS (MULTISPECTRAL SCANNER) / VISIBLE IMAGERY
- LANDSAT-2 (LAND REMOTE-SENSING SATELLITE-2) / MSS (MULTISPECTRAL SCANNER) / INFRARED IMAGERY

3. Data Application and Derivation:

Typical application of the data: These images may be used cartographically, as base data upon which other spatial data layers are displayed. Additionally, the data may be used to derive LULC classifications that may be used to calculate deforestation rates or pattern metrics, as well as to produce change detections.

4. Quality Assessment:

Horizontal Accuracy: MSS Images that have been geo-rectified all have a horizontal accuracy of plus or minus one pixel. TM and ETM Images that have been geo-rectified all have a horizontal accuracy of plus or minus one pixel

5. Data Acquisition Materials and Methods:

Two Landsat MSS scenes, 45 TM scenes, and six ETM+ scenes were assembled into a comprehensive time series for five areas:

Ariquemes (P232, R67), Ji-Parana (P231, R67), Luiza (P231, R68), Cacoal (P230, R68), and Porto Velho (P232, R66). Because of a paucity of digital Landsat MSS from the 1970s, only two early scenes could be included, a 1975 scene from Ariquemes and a 1978 scene from Ji-Parana.

The best temporal coverage was obtained for Ariquemes, which, in addition to a 1975 scene, included fifteen TM scenes, one from 1984, and annual coverage from 1988 to 1999.

All Landsat data were coregistered to 1998 or 1999 georectified digital PRODES data supplied by the Instituto Nacional de Pesquisas Espaciais [INPE, 2000]. PRODES is an INPE project which utilizes Landsat data and digital analysis to monitor tropical forest deforestation. The Digital PRODES data were considered by INPE collaborators to have the highest quality spatial accuracy and thus were chosen for a base map.

Landsat data were georectified using between 30 and 40 tie points and rubber sheet stretching. All images were resampled using nearest neighbor resampling.

Landsat MSS data were originally obtained from Woods Hole Research Center, Woods Hole, Massachusetts. Landsat TM data were obtained from various sources, including INPE.

6. Data Access:

This data set is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Data Archive Center:

E-mail: uso@daac.ornl.gov
Telephone: +1 (865) 241-3952

7. References:

INPE, 2000. Monitoramento da floresta Amazonica Brasileira por satelite 1998-1999, 22 pp., Inst. Nac. de Pesqui. Espaciais, Sao Jose Dos Campos SP, Brazil.

Related Publications

- Holmes, K.W., D.A. Roberts, S. Sweeney, I. Numata, E. Matricardi, T.W. Biggs, G. Batista, and O.A. Chadwick. (2004) Soil databases and the problem of establishing regional biogeochemical trends. *Global Change Biology* 10(5):796-814.
- Roberts, D.A., I. Numata, K. Holmes, G. Batista, T. Krug, A. Monteiro, B. Powell, and O.A. Chadwick. 2002. Large area mapping of land-cover change in Rondonia using multitemporal spectral mixture analysis and decision tree classifiers. *Journal of Geophysical Research-Atmospheres* 107(D20): Article-8073.
- Souza, C.M.J., D.A. Roberts, and A.L. Monteiro. 2005. Multitemporal Analysis of Degraded Forests in the Southern Brazilian Amazon. *Earth Interactions* 9(19):1-25.



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