

## LBA-ECO CD-06 Water Balance of the Ji-Parana River Basin, Brazil: 1995-1996

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Revision date: September 24, 2012

### Summary:

This data set provides simulated monthly average and monthly minimum rainfall, potential evapotranspiration, water deficit and water surplus values for the JiParana river basin. The Thornthwaite–Mather climatological model integrated into a Geographic Information System (GIS) was used to obtain the data by utilizing Advanced Very High Resolution Radar (AVHRR) images, rainfall from rain gauges within and around the basin, soils, and land cover maps as model inputs. The monthly water balance for the Ji-Paraná river basin is simulated from February 1995 through December 1996.

Data are also provided from the Ji-Parana subbasin stations for total basin rainfall, basin discharge and basin evapotranspiration. This data was used to check the results of the water balance model. There are 2 comma-delimited data files with this data set.

### Data Citation:

#### Cite this data set as follows:

Victoria, D.C., M.V.R. Ballester, A.R. Pereira, L.A. Martinelli, J.E. Richey, and R.L. Victoria. 2011. LBA-ECO CD-06 Water Balance of the Ji-Parana River Basin, Brazil: 1995-1996. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

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This data set was archived in September of 2012. Users who download the data between September 2012 and August 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:** Land Surface Hydrology

**Team ID:** CD-06 (Richey / Victoria)

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**LBA Data Set Inventory ID:** CD06\_Water\_Balance\_JiParana

This data set provides simulated monthly average and monthly minimum rainfall, potential evapotranspiration, water deficit and water surplus values for the JiParana river basin. The Thornthwaite-Mather climatological model integrated into a Geographic Information System (GIS) was used to obtain the data by utilizing Advanced Very High Resolution Radar (AVHRR) images, rainfall from rain gauges within and around the basin, soils, and land cover maps as model inputs. The monthly water balance for the Ji-Paraná river basin is simulated from February 1995 through December 1996.

Data are also provided from the Ji-Parana subbasin stations for total basin rainfall, basin discharge and basin evapotranspiration. This data was used to check the results of the water balance model.

## 2. Data Characteristics:

This data set =  
 provides annual water mass balance for 10 sub-basins inside the =  
 Ji-Parana basin (Rondonia), from September 1995 to August 1996 and =  
 modeled monthly water balance estimates. =20  
 =20  
 Data are provided as two comma-delimited ASCII files:=20  
 File #1: CD06\_Water\_Mass\_Balance\_Ji\_Parana.csv=20  
 File #2: CD06\_JiParana\_Modeled\_Water\_Balance.csv=20  
 =20  
 File contents and organization:  
 =20  
 File #1: CD06\_Water\_Mass\_Balance\_Ji\_Parana.csv  
 Data description: Water mass balance for 10 sub-basins on the Ji-Parana =  
 (Rondonia) basin for September 1995 to August 1996. This data was used =  
 to check the results of a simple water balance model based on =  
 Thorthwaite-Mather water balance, spatially distributed. This data is =  
 from Table 1 in the related paper (Victoria, D., et al. 2007)

=20

Column Number, Column Heading, Variable Description  
 1, Sub\_basin, Ji Parana sub-basin, defined by the Brazilian national water = agency, ANA  
 2, Station\_code, Fluviometric station code assigned by ANA  
 3, Basin\_area, Drainage basin area in square kilometers (km2)  
 4, Rainfall, Total basin rainfall in millimeters per year (mm year-1) = between September 1995 - August 1996, calculated by interpolating rain = gauge data from ANA, interpolation method: spline with tension.  
 5, Discharge, Total basin discharge in millimeters per year (mm year-1) = for the period: September 2005 - August 1996, measured at ANA = fluviometric station  
 6, ET, Total basin evapotranspiration in millimeters per year (mm year-1) = calculated as the difference from rainfall and discharge over a water = year (September 1995 to August 1996)

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File #2: CD06\_Modelado\_Water\_Balance\_JiParana.csv  
 Data description: Ji-Parana, Rondonia, Modeled Water Balance, February = 1995 - December 1996

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Column Number, Column heading, Variable description  
 1, Date, Date (mm/dd/yyyy)  
 2, P\_min, Monthly minimum basin rainfall (P) in millimeters (mm)  
 3, P\_med, Monthly average basin rainfall (P) in millimeters (mm)  
 4, P\_max, Monthly maximum basin rainfall (P) in millimeters (mm)  
 5, PET\_min, Monthly minimum basin potential evapotranspiration (PET) in = millimeters (mm)  
 6, PET\_med, Monthly average basin potential evapotranspiration (PET) in = millimeters (mm)  
 7, PET\_max, Monthly maximum basin potential evapotranspiration (PET) in = millimeters (mm)  
 8, ET\_min, Monthly minimum basin evapotranspiration (ET) in millimeters = (mm)  
 9, ET\_med, Monthly average basin evapotranspiration (ET) in millimeters = (mm)  
 10, ET\_max, Monthly maximum basin evapotranspiration (ET) in millimeters = (mm)  
 11, DEF\_min, Monthly minimum basin water deficit (DEF) in millimeters (mm)  
 12, DEF\_med, Monthly average basin water deficit (DEF) in millimeters (mm)  
 13, DEF\_max, Monthly maximum basin water deficit (DEF) in millimeters (mm)  
 14, SUR\_min, Monthly minimum basin water surplus (SUR) in millimeters (mm)  
 15, SUR\_med, Monthly average basin water surplus (SUR) in millimeters (mm)  
 16, SUR\_max, Monthly maximum basin water surplus (SUR) in millimeters (mm)

Example data records:

File #1: CD06\_Water\_Mass\_Balance\_Ji\_Parana.csv  
 Sub\_basin, Station\_code, Area, Rainfall, Discharge, ET, , , , , ,  
 Minerao Jacunda, 15590000, 1130, 2180, 719, 1461, , , , , ,  
 Fazenda Expanso, 15553500, 3575, 1998, 678, 1320, , , , , ,  
 Jaru, 15565000, 3952, 1768, 815, 953, , , , , ,  
 Fazenda Flor do Campo, 15552600, 4299, 2187, 810, 1377, , , , , ,  
 Piratininga, 15575000, 4379, 2280, 867, 1413, , , , , ,  
 Comemorao, 15552700, 5800, 2201, 844, 1357, , , , , ,  
 Cachoeira Primavera, 15556010, 9599, 1975, 791, 1184, , , , , ,  
 Pimenta Bueno, 15558000, 10080, 1978, 745, 1233, , , , , ,  
 Ji-Parana, 15560000, 32893, 2018, 796, 1222, , , , , ,  
 Tabajara, 15580000, 60205, 2024, 806, 1218, , , , , ,

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Example data records:

File #2: CD06\_JiParana\_Modelado\_Water\_Balance.csv  
 Date, P\_min, P\_med, P\_max, PET\_min, PET\_med, PET\_max, ET\_min, ET\_med, ET\_max, DEF\_m= in, DEF\_med, DEF\_max, SUR\_min, SUR\_med, SUR\_max, , ,  
 2/1/1995, 124, 349, 587, 59, 99, 138, 59, 99, 138, 0, 0, 0, 9, 251, 527, , 251  
 3/1/1995, 94, 225, 356, 79, 121, 162, 82, 121, 162, 0, 2, 19, 0, 109, 269, , 107  
 4/1/1995, 65, 201, 378, 73, 108, 130, 73, 108, 130, 0, 2, 22, 0, 101, 290, , 99  
 5/1/1995, 23, 125, 251, 76, 99, 140, 66, 99, 138, 0, 2, 36, 0, 38, 171, , 36  
 6/1/1995, 0, 24, 106, 78, 97, 131, 15, 79, 117, 0, 18, 78, 0, 6, 20, , -11  
 7/1/1995, 0, 11, 58, 104, 125, 156, 3, 68, 127, 5, 57, 140, 0, 0, 0, , -57  
 8/1/1995, 0, 6, 42, 105, 136, 159, 0, 54, 112, 23, 82, 151, 0, 0, 0, , -82  
 9/1/1995, 0, 78, 159, 105, 133, 159, 1, 90, 143, 0, 45, 146, 0, 0, 0, , -45  
 10/1/1995, 71, 155, 232, 113, 134, 164, 91, 131, 164, -3, 16, 63, 0, 0, 47, , -15

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
					World Geodetic

Rondonia - Rio Ji-Parana (Rondonia)	-63.41528	-60.015	-8.0333	-12.92694	System, 1984 (WGS-84)
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**Time period:**

- The data set covers the period 1995/10/01 to 1996/08/31.=20
- Temporal Resolution: Monthly

**Platform/Sensor/Parameters measured include:**

- COMPUTER MODEL / MODEL ANALYSIS / TOTAL SURFACE WATER

### 3. Data Application and Derivation:

Data set can be used to determine water deficit period in basin as well as the mean basin evapotranspiration.

### 4. Quality Assessment:

Modeled results were compared with annual water mass balance. For a more detailed quality assessment, as well as methods and results, see Victoria et al., (2007).

### 5. Data Acquisition Materials and Methods:

**Site Description**

In the state of Rondonia, Brazil, (Western Amazonia), the confluence of the Comemoracao and Pimenta Bueno Rivers results in the Ji-Parana River, which also receives water from the Rolim de Moura, Urupa, Jaru, Machadinho and Preto tributaries. The Ji-Parana River Basin drains an area of 75,000 km<sup>2</sup>, and is characterized by extensive development in the upper part, and slight alteration in the lower 400 km. From headwaters to its middle sectors, the river is highly impacted, with a predominance of pastures and agriculture. The lower reach, below the intersection with Jaru and Machadinho Rivers, reverts to relatively pristine natural forest surroundings (Ballester et al., 2002).

**Thornthwaite–Mather water balance model**

The Thornthwaite and Mather (Thornthwaite and Mather 1955) climatological water balance is a bucketlike model and was chosen because of its simplicity and small quantity of input data needed. Actual evapotranspiration (ET) is computed using an estimate of potential evapotranspiration (PET) and observed rainfall (P). When  $P \geq PET$ , then  $ET = PET$ , and water surplus (SUR) can be generated. If soil water content ( $St_o$ ) is below the defined plant available water (PAW), then part of  $P - PET$  is used to recharge the soil moisture. When  $P < PET$ , water will be removed from the soil. Since there is a restriction to water removal from the soil, ET can be less than PET, resulting in a water deficit (DEF) (Victoria et al., 2007).

**Model inputs**

Model inputs were Advanced Very High Resolution Radar (AVHRR) images, rainfall from rain gauges within and around the basin, soils, and land cover maps. Mean monthly temperature images, estimated from

AVHRR, were used to calculate monthly potential evapotranspiration images. Rainfall measurements were interpolated to obtain monthly rainfall images using the spline method.

### **Rainfall maps**

Rainfall gauges located inside and close to the Ji-Paraná river basin were used to interpolate monthly total rainfall maps for the period February 1995 to December 1996. Data from 36 rain gauges with daily measurements, 17 located inside the basin (4400 km<sup>2</sup> per gauge), were obtained. Monthly rainfall for each station was calculated, excluding months with 5 or more days with missing measurements. On average, 34 stations were available for each month (Victoria et al., 2007).

### **Mean monthly temperature maps**

Mean monthly temperature maps from February 1995 to December 1996 were obtained from daily images of the Advanced Very High Resolution Radiometer (AVHRR) sensor on board the National Oceanic and Atmospheric Administration- 14 (NOAA-14) satellite (Victoria et al., 2007).

### **Water mass balance**

The Ji-Parana river basin was divided into 10 subbasins where discharges were available. For each subbasin, a simple annual water mass balance was applied for comparison with the modeled water balance. Mass balance was obtained for an entire hydrological year (September 1995–August 1996) by the difference between rainfall and discharge over each subbasin (Victoria et al., 2007).

## **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](mailto:uso@daac.ornl.gov)

Telephone: +1 (865) 241-3952

## **7. References:**

Thornthwaite, C.W. and J. R. Mather. 1955. The water balance. Publications in Climatology, Drexel = Institute of Technology, 104 pp.

Victoria, D.D., A.V. Santiago, M.V.R. Ballester, A.R. Pereira, R.L. Victoria, and J.E. Richey. 2007. Water Balance for the Ji-Parana River Basin, Western Amazon, Using a Simple Method through Geographical Information Systems and Remote Sensing. Earth Interactions. Volume 11 (2007). Paper No. 5. DOI 10.1175/EI198.1 [LBA-ECO Pub # 837]