

LBA-ECO LC-04 THMB Model Simulations for the Amazon and Tocantins Basins: 1939-1998

Revision date: December 14, 2012

Summary:

The model output data provided were generated by the THMB 1.2 (Terrestrial Hydrology Model with Biogeochemistry) model which simulates the flow of water through groundwater systems, rivers, lakes and wetlands. The model operates at a 5-minute latitude-by-longitude grid with a 1-hour time step and requires as boundary conditions: topography, evaporation from water surfaces, surface runoff, base flow, and precipitation.

Data are included for the mean monthly simulated water height above flood stage, mean monthly simulated river discharge, and mean monthly inundated area for the period 1939-1998 for the entire Amazon and Tocantins River basins.

There are three netCDF files (.nc) with this data set.

Data Citation:

Cite this data set as follows:

Coe, M.T., M.H. Costa, A. Botta, and C. Birkett. 2012. LBA-ECO LC-04 THMB Model Simulations for the Amazon and Tocantins Basins: 1939-1998. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. <http://dx.doi.org/10.3334/ORNLDAAC/1138>

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This data set was archived in December of 2012. Users who download the data between December 2012 and November 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 Web Site [<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: Land Use and Land Cover

Team ID: LC-04 (Foley / Costa)

The investigators were Foley, Jonathan A.; Costa, Marcos Heil; Botta, Aurelie; Cardille, Jeffrey Alan; Coe, Michael T. and Lenters, John D. You may contact Coe, Michael T. (mtcoe@whrc.org).

LBA Data Set Inventory ID: LC04_THMB-HYDRA_Model

The model output data provided were generated by the THMB 1.2 (Terrestrial Hydrology Model with Biogeochemistry) model which simulates the flow of water through groundwater systems, rivers, lakes and wetlands. The model operates at a 5-minute latitude-by-longitude grid with a 1-hour time step and requires as boundary conditions: topography, evaporation from water surfaces, surface runoff, base flow, and precipitation.

Model output data provided are included for the mean monthly simulated water height above flood stage, mean monthly simulated river discharge, and mean monthly inundated area for the period 1939-1998 for the entire Amazon and Tocantins River basins.

Related Data Set:

- Botta, A., N. Ramankutty, and J.A. Foley. 2012. LBA-ECO LC-04 THMB Model Simulations for the Amazon and Tocantins Basins: 1939-1998. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. <http://dx.doi.org/10.3334/ORNLDAAC/1139>

2. Data Characteristics:

The data files are provided as netCDF (.nc) format for the period January 1939 to December 1998. There are 720 months of data (60 years, 12 months).

| File Name | Description | Units/format |
|--------------|---|---------------------|
| sflux_v2.nc | mean monthly simulated river discharge provided in cubic meters per second (m ³ /s) | (m ³ /s) |
| height_v2.nc | mean monthly simulated water height above flood stage, provided in meters (m) | m |
| warea_v2.nc | mean monthly simulated inundated area (the fraction of land area in a grid cell inundated by floodwaters) | |

These files are gridded at 5-minute latitude-by-longitude grid (~9 km at the equator) resolution for the entire Amazon and Tocantins River basins (21S-6N; -45E-80W). The upper left corner of the data is 21S-80W.

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

| Site (Region) | Westernmost Longitude | Easternmost Longitude | Northernmost Latitude | Southernmost Latitude | Geodetic Datum |
|--|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------------------|
| Tocantins - Tocantins River Basin (Acre) | -67.62900 | -67.62900 | -10.07300 | -10.07300 | World Geodetic System, 1984 (WGS-84) |
| Amazon Basin (Amazon Basin) | -80 | -45 | 6 | -21 | World Geodetic System, 1984 (WGS-84) |

Time period:

- The data set covers the period 1939/01/01 to 1998/12/31.
- Temporal Resolution: Monthly

Platform/Sensor/Parameters measured include:

- COMPUTER MODEL / MODEL ANALYSIS / INUNDATION
- COMPUTER MODEL / MODEL ANALYSIS / STAGE HEIGHT
- COMPUTER MODEL / MODEL ANALYSIS / DISCHARGE/FLOW

3. Data Application and Derivation:

The data set was created by linked simulations using the Integrated Biosphere Simulator model (IBIS) ecosystem model (Kucharik et al., 2000), and the HYDRA water transport model.

IBIS was first run on a 0.5-deg-by-0.5-deg latitude/longitude grid, extending over the entire Amazon River basin (21S-6N; 45W-80W) for the period 1935-1998 to generate runoff estimates. Then the IBIS results from 1939 to 1998 were used in the THMB simulations along with the local climate data (precipitation and estimated lake surface evaporation) to generate hourly output from THMB. This output was then averaged to monthly mean values.

As an example of the utility of the model in evaluating GCM simulations, it was forced with monthly mean estimates of runoff from the National Centers for Environmental Prediction (NCEP) reanalysis data set (Coe et al., 2000). This model was also applied in conjunction with long time series climate data to simulate the river discharge and flooded area of the Amazon/ Tocantins River basins over the last 60 years (Coe et al., 2002).

4. Quality Assessment:

Because these data files were generated by numerical models, their accuracy is dependent on the assumptions applied in these models.

5. Data Acquisition Materials and Methods:

The data set was created by linked simulations using the IBIS ecosystem model (Kucharik et al., 2000) and the HYDRA water transport model (Coe et al., 2002).

IBIS was first run on a 0.5-deg-by-0.5 deg latitude/longitude grid, extending over the entire Amazon River basin (21S-6N; 45W-80W). for the period 1935-1998 to generate runoff estimates. Then the IBIS results from 1939 to 1998 were used in the THMB simulations along with the local climate data (precipitation and estimated lake surface evaporation) to generate hourly output from THMB. This output was then averaged to monthly mean values.

THMB operates at a 5-minute latitude-by-longitude grid (~9 km at the equator) with a 1-hour time step and requires as boundary conditions topography (from digital elevation models), evaporation from water surfaces (estimated from local climate data, using a simple Penman energy balance model), surface runoff (supplied by IBIS), base flow (drainage from the soil column, supplied by IBIS), and precipitation (from local climate data).

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

References

Botta, A., N. Ramankutty, and J.A. Foley. 2012. LBA-ECO LC-04 IBIS Model Simulations for the Amazon and Tocantins Basins: 1935-1998. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Coe, M.T., M.H. Costa, A. Botta, and C. Birkett. 2002. Long-term simulations of discharge and floods in the Amazon Basin. *Journal of Geophysical Research-Atmospheres* 107(D20):Article-8044.

Coe, M.T. 2000. Modeling terrestrial hydrological systems at the continental scale: Testing the accuracy of an atmospheric GCM. *Journal of Climate* 13(4):686-704.

Kucharik, C.J., J.A. Foley, C. Delire, V.A. Fisher, M.T. Coe, S.T. Gower, J. Lenters, C. Molling, J.M. Norman and N. Ramankutty, 2000. Testing the performance of a dynamic global ecosystem model: Water balance, carbon balance, and vegetation structure. *Global Biogeochemical Cycles* 14, 795-825.