

- Data Discovery
- Data Centers
- Community
- Science Disciplines



Distributed Active Archive Center for  
Biogeochemical Dynamics


[About Us](#)
[Products](#)
[Data](#)
[Tools](#)
[Help](#)
[home](#)   [sign in](#)

Data

[DAAC Home](#) > [Data](#) > [Field Campaigns](#) > [NACP \(North America\)](#) > [Data Set Documentation](#)

## NACP Regional: Gridded 1-deg Observation Data and Biosphere and Inverse Model Outputs

### Get Data

Revision Date: May 2, 2013

#### Summary:

This data set contains standardized gridded observation data, terrestrial biosphere model output data, and inverse model simulations of carbon flux parameters that were used in the North American Carbon Program (NACP) Regional Synthesis activities. The data set provides five observation data files (MODIS GPP, MODIS NPP, FIA forest biomass/forest area, NASS crop NPP, and NASS agricultural land fraction) and simulation results from 18 terrestrial biosphere models (TBM) (28 variables; 114 files) and seven inverse models (IM) (two variables; 8 files).

To produce this data set, the NACP Modeling and Synthesis Thematic Data Center (MAST-DC) resampled original model simulation results and observation measurement data to 1-degree spatial resolution for North American region, interpolated into monthly or yearly temporal resolution, and reformatted into Climate and Forecast (CF) convention compatible netCDF format.

This data set is related to two other processed regional data sets (i.e., NACP Regional: Supplemental Gridded Observations, Biosphere and Inverse Model Outputs; and NACP Regional: National Greenhouse Gas Inventories and Aggregated Gridded Model Data) and the originally-submitted NACP Regional: Original Observation Data and Biosphere and Inverse Model Outputs.

Detailed descriptions of observation data, TBMs, and IMs can be found in the companion file [Regional-Description\\_of\\_Observations\\_and\\_Models.pdf](#).

MAST-DC was a component of the NACP ([www.nacarbon.org](http://www.nacarbon.org)) designed to support NACP by providing data products and data management services needed for modeling and synthesis activities. The overall objective of MAST-DC was to provide data management support to NACP investigators and agencies performing modeling and synthesis activities.

#### Data and Documentation Access:

**Get Data:** [http://daac.ornl.gov/cgi-bin/dsviewer.pl?ds\\_id=1157](http://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=1157)

**Companion Documentation for this Data Set:**

- Regional Synthesis Documentation: [Regional-Description\\_of\\_Observations\\_and\\_Models.pdf](#).

**Model Characteristics Overview and References:** [NACP\\_Model\\_Characteristics.pdf](#)

**Related Data Products:**

- NACP Regional: Supplemental Gridded Observations, Biosphere and Inverse Model Outputs [[http://daac.ornl.gov/cgi-bin/dsviewer.pl?ds\\_id=1158](http://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=1158)]
- NACP Regional: National Greenhouse Gas Inventories and Aggregated Gridded Model Data
- NACP Regional: Original Observation Data and Biosphere and Inverse Model Outputs

#### Data Citation:

**Cite this data set as follows:**

Wei, Y., W.M. Post, R.B. Cook, D.N. Huntzinger, P.E. Thornton, A.R. Jacobson, I. Baker, J. Chen, F. Chevallier, F.M. Hoffman, A. Jain, S. Liu, R. Lokupitiya, D.A. McGuire, A. Michalak, G.G. Moisen, R.P. Neilson, P. Peylin, C. Potter, B. Poulter, D. Price, J. Randerson, C. Rödenbeck, H. Tian, E. Tomelleri, G. van der Werf, N. Viovy, T.O. West, J. Xiao, N. Zeng, and M. Zhao. 2013. NACP Regional: Gridded 1-deg Observation Data and Biosphere and Inverse Model Outputs. 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/1157>

## Table of Contents:

- [1 Data Set Overview](#)
- [2 Data Description](#)
- [3 Applications and Derivation](#)
- [4 Quality Assessment](#)
- [5 Acquisition Materials and Methods](#)
- [6 Data Access](#)
- [7 References](#)

## 1. Data Set Overview:

**Project:** North American Carbon Program (NACP)

The NACP (Denning et al., 2005; Wofsy and Harriss, 2002) is a multidisciplinary research program to obtain scientific understanding of North America's carbon sources and sinks and of changes in carbon stocks needed to meet societal concerns and to provide tools for decision makers. Successful execution of the NACP has required an unprecedented level of coordination among observational, experimental, and modeling efforts regarding terrestrial, oceanic, atmospheric, and human components. The program has relied upon a rich and diverse array of existing observational networks, monitoring sites, and experimental field studies in North America and its adjacent oceans. It is supported by a number of different federal agencies through a variety of intramural and extramural funding mechanisms and award instruments.

NACP and MAST-DC organized several synthesis activities to evaluate and inter-compare biosphere model outputs and observation data at local to continental scales for the time period of 2000 through 2005. The synthesis activities have included three component studies, each conducted on different spatial scales and producing numerous data products: (1) site-level analyses that examined process-based model estimates and observations at over 30 AmeriFlux and Fluxnet-Canada tower sites across North America; (2) a regional, mid-continent intensive study centered in the agricultural regions of the United States and focused on comparing inventory-based estimates of net carbon exchange with those from atmospheric inversions; and (3) a regional and continental synthesis evaluating model estimates against each other and available inventory-based estimates across North America. A number of other NACP syntheses were conducted, including ones focusing on non-CO<sub>2</sub> greenhouse gases, the impact of disturbance on carbon exchange, and coastal carbon dynamics. The Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) is the archive for the NACP synthesis data products.

This data set contains part of the third NACP synthesis product described above: regional analyses. It provides standardized 1-degree gridded observation (OM) data, terrestrial biosphere model (TBM) output data, and inverse model (IM) simulations that were processed by MAST-DC and used in the NACP Regional Synthesis activities (Table 1). The data set includes five (5) OM data files (MODIS GPP, MODIS NPP, FIA forest biomass/forest area, NASS crop NPP, and NASS agricultural land fraction), 114 TBM data files, and eight (8) IM data files. To produce this data set, the originally-submitted data were resampled to 1-degree spatial resolution for North American region, interpolated into monthly or yearly temporal resolution, and reformatted into Climate and Forecast (CF) convention compatible netCDF format (Table 2).

This data set is related to two other processed regional data sets (i.e., supplemental observation data and biosphere and inverse model outputs; and national greenhouse gas (GHG) inventories and model outputs aggregated by GHG inventory zones) and the originally-submitted observation data and model outputs (see Related Data Products above). Detailed descriptions of observation data, TBM, and IM models can be found in a separate document: [Regional-Description\\_of\\_Observations\\_and\\_Models.pdf](#).

Table 1. Contributors

Last Name	First Name	Organization	Email	Role
Wei	Yaxing	ORNL	<a href="mailto:weiy@ornl.gov">weiy@ornl.gov</a>	MAST-DC
Post	Wilfred M.	University of Tennessee	<a href="mailto:wmp@ornl.gov">wmp@ornl.gov</a>	MAST-DC
Cook	Robert B.	ORNL	<a href="mailto:cookrb@ornl.gov">cookrb@ornl.gov</a>	MAST-DC
Huntzinger	Deborah N.	Northern Arizona University	<a href="mailto:deborah.huntzinger@nau.edu">deborah.huntzinger@nau.edu</a>	Synthesis Lead
Thornton	Peter E.	ORNL	<a href="mailto:thorntonpe@ornl.gov">thorntonpe@ornl.gov</a>	MAST-DC, CLM-CN
Jacobson	Andy	NOAA	<a href="mailto:andy.jacobson@noaa.gov">andy.jacobson@noaa.gov</a>	Synthesis Lead, CarbonTracker
Baker	Ian	Colorado State University	<a href="mailto:baker@atmos.colostate.edu">baker@atmos.colostate.edu</a>	SIB3.1
Chen	Jing	University of Toronto	<a href="mailto:chenj@geog.utoronto.ca">chenj@geog.utoronto.ca</a>	BEPS
Chevallier	Frederic	LSCE	<a href="mailto:Frederic.Chevallier@lsce.ipsl.fr">Frederic.Chevallier@lsce.ipsl.fr</a>	LSCE no.2
Hoffman	Forrest	ORNL	<a href="mailto:forrest@climatemodeling.org">forrest@climatemodeling.org</a>	CLM-CASA
Jain	Atul	University of Illinois at Urbana-Champaign	<a href="mailto:jain@atmos.uiuc.edu">jain@atmos.uiuc.edu</a>	ISAM
Liu	Shuguang	USGS	<a href="mailto:sliu@usgs.gov">sliu@usgs.gov</a>	EC-LUE
Lokupitiya	Ravi	Colorado State University	<a href="mailto:ravi@atmos.colostate.edu">ravi@atmos.colostate.edu</a>	CSU no.1
McGuire	David A.	University of Alaska Fairbanks	<a href="mailto:ffadm@uaf.edu">ffadm@uaf.edu</a>	TEM6
Michalak	Anna	Stanford University	<a href="mailto:michalak@stanford.edu">michalak@stanford.edu</a>	Michigan Geostatistical
Moisen	Gretchen G.	USDA Forest Service	<a href="mailto:gmoisen@fs.fed.us">gmoisen@fs.fed.us</a>	U.S. Forest Biomass
Neilson	Ronald P.	USDA Forest Service	<a href="mailto:rneilson@fs.fed.us">rneilson@fs.fed.us</a>	MC1
Peylin	Philippe	LSCE	<a href="mailto:Philippe.Peylin@lsce.ipsl.fr">Philippe.Peylin@lsce.ipsl.fr</a>	LSCE no.1
Potter	Chris	NASA Ames Research Center	<a href="mailto:chris.potter@nasa.gov">chris.potter@nasa.gov</a>	NASA-CASA

Poulter	Ben	Potsdam Institute for Climate Impact Research	<a href="mailto:ben.poulter@pik-potsdam.de">ben.poulter@pik-potsdam.de</a>	LPJmL
Price	David	Canadian Forest Service	<a href="mailto:dprice@nrcan.gc.ca">dprice@nrcan.gc.ca</a>	Can-IBIS
Randerson	Jim	University of California Irvine	<a href="mailto:jranders@uci.edu">jranders@uci.edu</a>	CASA-Transcom
Rödenbeck	Christian	Max Planck Institute for Biogeochemistry	<a href="mailto:christian.roedenbeck@bgc-jena.mpg.de">christian.roedenbeck@bgc-jena.mpg.de</a>	Jena
Tian	Hanqin	Auburn University	<a href="mailto:tianhan@auburn.edu">tianhan@auburn.edu</a>	DLEM
Tomelleri	Enrico	Max Planck Institute for Biogeochemistry	<a href="mailto:etomell@bgc-jena.mpg.de">etomell@bgc-jena.mpg.de</a>	MOD17-plus
van der Werf	Guido	University Amsterdam	<a href="mailto:guido.van.der.werf@falw.vu.nl">guido.van.der.werf@falw.vu.nl</a>	CASA-GFEDv2
Viovy	Nicolas	LSCE	<a href="mailto:viovy@lsce.ipsl.fr">viovy@lsce.ipsl.fr</a>	ORCHIDEE
West	Tristram O.	PNNL	<a href="mailto:tristram.west@pnnl.gov">tristram.west@pnnl.gov</a>	Crop NPP
Xiao	Jingfeng	University of New Hampshire	<a href="mailto:j.xiao@unh.edu">j.xiao@unh.edu</a>	EC-MOD
Zeng	Ning	University of Maryland at College Park	<a href="mailto:zeng@atmos.umd.edu">zeng@atmos.umd.edu</a>	VEGAS
Zhao	Maosheng	University of Montana	<a href="mailto:zhao@ntsg.umt.edu">zhao@ntsg.umt.edu</a>	MODIS GPP/NPP

Table 2. List of Observation Measurements and Models in the Gridded 1-degree Analysis

OBSERVATION MEASUREMENTS	
Observation Data	Short Name
MODIS MOD17A2 Gross Primary Production (GPP)	MODIS GPP
MODIS MOD17A3 Net Primary Production (NPP)	MODIS NPP
Conterminous U.S. Forest Biomass/Forest Area	FIA Forest Biomass
Conterminous U.S. Crop Net Primary Production (NPP)/Agricultural Land Fraction	NASS Crop NPP
TERRESTRIAL BIOSPHERE MODELS	
Prognostic Models	Short Name
Canadian Integrated Biosphere Simulator	Can-IBIS
Community Land Model with CASA (i01.55_q15)	CLM-CASA
Community Land Model with Carbon&Nitrogen (i01.57_q15)	CLM-CN
Dynamic Land Ecosystem Model	DLEM
Integrated Science Assessment Model	ISAM
Lund-Potsdam-Jena managed Land model	LPJmL
MC1 Dynamic Vegetation Model	MC1
Organizing Carbon and Hydrology in Dynamic Ecosystems model (v1.0)	ORCHIDEE
Simple Biosphere model version 3.1	SiB3.1
Terrestrial Ecosystem Model version 6	TEM6
Vegetation Global Atmosphere and Soil model	VEGAS
Diagnostic Models	Short Name
Boreal Ecosystems Productivity Simulator	BEPS
Carnegie-Ames-Stanford-Approach model (Transcom version)	CASA-Transcom
Carnegie-Ames-Stanford-Approach model(Global Fire Emissions Database v 2 version)	CASA-GFEDv2
NASA-Carnegie-Ames-Stanford-Approach model	NASA-CASA
Eddy-Covariance Light Use Efficiency model	EC-LUE
Eddy-Covariance model with MODIS	EC-MOD
MOD17-plus	MOD17+
INVERSE MODELS	
Inversion Models	Short Name
CarbonTracker	CarbonTracker
University of Toronto Nested Global model	UToronto
Michigan Geostatistical model	Michigan Geostatistical
Laboratoire des Sciences du Climat et de l'Environnement (LSCE) no.1 (Peylin-LSCE) model	LSCE-no1 (Peylin)
Laboratoire des Sciences du Climat et de l'Environnement (LSCE) no.2 (Chevallier-LSCE) model	LSCE-no2 (Chevallier)
JENA CO <sub>2</sub> Inverse model	Jena (Rodenbeck)

CSU no. 1 (MLEF-PCTM) model	CSU-no1 (MLEF-PCTM)
-----------------------------	------------------------

Table 3. Data Packages Summary

Data Set	Sub Category	Variables	Files	File Formats
Standardized Gridded Observation and Model Output Data	Observation Measurements (OM)	6 (GPP, NPP, forest biomass, forest area, crop NPP, agricultural land fraction)	5	netCDF
	Terrestrial Biosphere Model (TBM) Outputs	28	114	netCDF
	Inverse Model (IM) Outputs	2 (NEE, FF)	8	netCDF

## 2. Data Description:

This data set contains a total of 127 data files (5 OM data files, 114 TBM output data files, and 8 IM output data files). The data have been resampled by ORNL DAAC to a standard 1-degree spatial resolution for North American region, interpolated into monthly or yearly temporal resolution, converted to a standard measurement unit (generally, kg C/m<sup>2</sup>/month or year), and reformatted into CF convention compatible netCDF format.

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
North America	-170	-50	84	10

### 2.1. Spatial Coverage

**Site:** North America

### 2.2. Spatial Resolution

1 degree x 1 degree

### 2.3. Spatial Coordinate Reference System

Sphere-based Geographic Lat/Lon. In CF-compatible netCDF files, it's defined as:

```
char crs;
crs:grid_mapping_name = "latitude_longitude";
crs:semi_major_axis = 6370997.0f;
crs:inverse_flattening = 0.0f;
```

### 2.4. Temporal Coverage

Varies (range: 1990-2007). See Tables 2-4.

### 2.5. Temporal Resolution

Monthly or yearly with a few "one time" observations. See Tables 4-6.

### 2.6. Time Variable:

Units: "days since 1990-01-01 UTC"

Calendar: "noleap"

### 2.7. Data File Information

All of the data files are Climate & Forecast (CF) convention 1.0 compatible netCDF v3 formatted. Spatial resolution for all files is 1 degree x 1 degree. Spatial extent and temporal resolution and extent vary as noted. Missing values are designated by the value -9999.0. For each .zip file there is also an accompanying .txt companion file which contains file characteristics and processing steps to convert the files into different formats.

Table 4. Observation Measurements (OM) Data Files

FILE NAMES		TEMPORAL RESOLUTION	TEMPORAL EXTENT	SPATIAL EXTENT	UNITS	VARIABLE
COMPRESSED FILE NAMES *	UNCOMPRESSED DATA FILE NAMES					
OM_MODIS_GPP_Standardized.zip	OM_MODIS_GPP_1d.nc	Monthly	2000-2006	NA	kg C/m <sup>2</sup> /month	Gross Primary Production (MODIS GPP)
OM_MODIS_NPP_Standardized.zip	OM_MODIS_NPP_1d.nc	Yearly	2000-2006	NA	kg C/m <sup>2</sup> /yr	Net Primary Production (MODIS NPP)
OM_FIA_Biomass_Standardized.zip	OM_FIA_Biomass_1d.nc	One time	~2000	CONUS	kg C/m <sup>2</sup> _of_forest	Forest biomass
					m <sup>2</sup>	Forest area
					mg C/total area of	

OM_NASS_Crop_Standardized.zip	OM_NASS_CropNPP_1d.nc	Yearly	2001-2005	CONUS	each 1-degree grid cell/year	NASS Crop NPP
	OM_NASS_AgPercent_1d.nc				percentage (%) of agricultural land in each 1-degree grid cell	Agricultural land fraction

Notes: CONUS = conterminous United States. NA = North America.

Table 5. Terrestrial Biosphere Model (TBM) Output Data Files

FILE NAMES		TEMPORAL RESOLUTION	TEMPORAL EXTENT	SPATIAL EXTENT	UNITS	VARIABLE
COMPRESSED FILE NAMES *	UNCOMPRESSED DATA FILE NAMES					
TBM_BEPS_Standardized.zip	TBM_BEPS_GPP_1d.nc	Monthly	2000-2004	NA	kg C/m <sup>2</sup> /mo	Gross primary production (GPP)
	TBM_BEPS_NEE_1d.nc					Net ecosystem exchange (NEE) (derived from -1*NEP)
	TBM_BEPS_NEP_1d.nc					Net ecosystem production (NEP)
	TBM_BEPS_NPP_1d.nc					Net primary production (NPP)
	TBM_BEPS_Rh_1d.nc					Heterotrophic respiration (Rh) (derived from NPP-NEP)
TBM_CASA-GFEDv2_Standardized.zip	TBM_CASA-GFEDv2_CFire_1d.nc	Monthly	2000-2005	NA	kg C/m <sup>2</sup> /mo	Fire emissions (derived from NEEF-NEE)
	TBM_CASA-GFEDv2_GPP_1d.nc					GPP
	TBM_CASA-GFEDv2_NEE_1d.nc					NEE
	TBM_CASA-GFEDv2_NEEF_1d.nc					Net ecosystem exchange with fire emissions (NEEF)
	TBM_CASA-GFEDv2_R_1d.nc					Total respiration (R)
TBM_CASA-Transcom_Standardized.zip	TBM_CASA-Transcom_NEE_1d.nc	Monthly	2002-2003	NA	kg C/m <sup>2</sup> /mo	NEE
TBM_CLM-CASA_Standardized.zip	TBM_CLM-CASA_CWDC_1d_i01.55casa_q15.nc	Monthly	1990-2004	NA	kg C/m <sup>2</sup>	Coarse woody debris carbon (CWDC)
	TBM_CLM-CASA_FROOTC_1d_i01.55casa_q15.nc					Fine root carbon (FROOTC)
	TBM_CLM-CASA_GPP_1d_i01.55casa_q15.nc					GPP
	TBM_CLM-CASA_HR_1d_i01.55casa_q15.nc					Heterotrophic respiration (HR)
	TBM_CLM-CASA_landfrac_1d_i01.55casa_q15.nc	One time	One time	Range: 0-1	Land fraction	
	TBM_CLM-CASA_LEAFC_1d_i01.55casa_q15.nc	Monthly	1990-2004	NA	kg C/m <sup>2</sup>	Leaf carbon (LEAFC)
	TBM_CLM-CASA_LITTERC_1d_i01.55casa_q15.nc					Litter carbon
	TBM_CLM-CASA_NEE_1d_i01.55casa_q15.nc					NEE
	TBM_CLM-CASA_NEP_1d_i01.55casa_q15.nc					NEP
	TBM_CLM-CASA_NPP_1d_i01.55casa_q15.nc	NPP				
	TBM_CLM-CASA_SOILC_1d_i01.55casa_q15.nc	Monthly	1990-2004	NA	kg C/m <sup>2</sup>	Total soil organic matter carbon
	TBM_CLM-CASA_TLAI_1d_i01.55casa_q15.nc			>dimensionless ratio (m <sup>2</sup> /m <sup>2</sup> )	Total projected leaf area index	
	TBM_CLM-CASA_VegC_1d_i01.55casa_q15.nc			kg C/m <sup>2</sup>	Vegetation carbon (derived from LEAFC+WOODC+FROOTC)	
	TBM_CLM-CASA_WOODC_1d_i01.55casa_q15.nc			kg C/m <sup>2</sup>	Wood carbon (WOODC)	
TBM_CLM-CN_Standardized.zip	TBM_CLM-CN_CWDC_1d_i01.57cn_q15.nc	Monthly	1990-2004	NA	kg C/m <sup>2</sup>	Coarse woody debris carbon (CWDC)
	TBM_CLM-CN_FROOTC_1d_i01.57cn_q15.nc					Fine root carbon (FROOTC)
	TBM_CLM-CN_GPP_1d_i01.57cn_q15.nc					GPP
	TBM_CLM-CN_HR_1d_i01.57cn_q15.nc					Heterotrophic respiration (HR)

TBM_CLM-CN_Standardized.zip	TBM_CLM-CN_landfrac_1d_i01.57cn_q15.nc	One time	One time	NA	Range: 0-1	Land fraction	
	TBM_CLM-CN_LEAFC_1d_i01.57cn_q15.nc	Monthly	1990-2004		kg C/m <sup>2</sup>	Leaf carbon (LEAFC)	
	TBM_CLM-CN_LITTERC_1d_i01.57cn_q15.nc					Litter carbon	
	TBM_CLM-CN_NEE_1d_i01.57cn_q15.nc					NEE	
	TBM_CLM-CN_NEP_1d_i01.57cn_q15.nc					NEP	
	TBM_CLM-CN_NPP_1d_i01.57cn_q15.nc					NPP	
	TBM_CLM-CN_SOILC_1d_i01.57cn_q15.nc					kg C/m <sup>2</sup>	Total soil organic matter carbon
	TBM_CLM-CN_TLAI_1d_i01.57cn_q15.nc					dimensionless ratio (m <sup>2</sup> /m <sup>2</sup> )	Total projected leaf area index
	TBM_CLM-CN_TOTVEGC_1d_i01.57cn_q15.nc					kg C/m <sup>2</sup>	Total vegetation carbon (derived from LEAFC+WODC+FROOTC)
	TBM_CLM-CN_WODC_1d_i01.57cn_q15.nc						Wood carbon (WODC)
TBM_Can-IBIS_Standardized.zip	TBM_Can-IBIS_CBiomass_1d.nc			Monthly		2000-2005	NA
	TBM_Can-IBIS_CSoil_1d.nc	Soil carbon					
	TBM_Can-IBIS_GPP_1d.nc	kg C/m <sup>2</sup> /mo	GPP				
	TBM_Can-IBIS_NEE_1d.nc		NEE (derived from -1*NEP)				
	TBM_Can-IBIS_NEP_1d.nc		NEP				
	TBM_Can-IBIS_NPP_1d.nc		NPP				
	TBM_Can-IBIS_Ra_1d.nc		Autotrophic respiration (Ra)				
	TBM_Can-IBIS_Rh_1d.nc		Heterotrophic respiration (Rh)				
TBM_DLEM_Standardized.zip	TBM_DLEM_GPP_1d.nc	Monthly	2000-2005	NA	kg C/m <sup>2</sup> /mo	GPP	
	TBM_DLEM_NEE_1d.nc					NEE	
	TBM_DLEM_NPP_1d.nc					NPP	
	TBM_DLEM_Ra_1d.nc					Autotrophic respiration (Ra)	
	TBM_DLEM_Rh_1d.nc					Heterotrophic respiration (Rh)	
	TBM_DLEM_TotLivBiom_1d.nc				kg C/m <sup>2</sup>	Total live biomass carbon (monthly mean total carbon content of the living biomass including heartwood)	
	TBM_DLEM_TotSoilCarb_1d.nc					Monthly mean total soil carbon density	
TBM_EC-LUE_Standardized.zip	TBM_EC-LUE_GPP_1d.nc	Monthly	2004-2005	NA	kg C/m <sup>2</sup> /mo	GPP	
TBM_EC-MOD_Standardized.zip	TBM_EC-MOD_GPP_1d.nc	Monthly	2001-2006	NA	kg C/m <sup>2</sup> /mo	GPP	
	TBM_EC-MOD_NEE_1d.nc					NEE	
TBM_ISAM_Standardized.zip	TBM_ISAM_NEE_1d.nc	Monthly	2000-2007	NA	kg C/m <sup>2</sup> /mo	NEE	
	TBM_ISAM_NPP_1d.nc					NPP	
	TBM_ISAM_Rh_1d.nc					Heterotrophic respiration (Rh)	
TBM_LPJmL_Standardized.zip	TBM_LPJmL_ANEE_1d.nc	Annual	1990-2006	NA	kg C/m <sup>2</sup> /year	Annual net ecosystem exchange (derived from monthly NEE)	
	TBM_LPJmL_ANEEF_1d.nc					Annual net ecosystem exchange with fire emissions (derived from ANEE+FIRE)	
	TBM_LPJmL_FIRE_1d.nc					Fire emissions	
	TBM_LPJmL_GPP_1d.nc	Monthly			kg C/m <sup>2</sup> /mo	GPP	
	TBM_LPJmL_LITC_1d.nc	Annual			kg C/m <sup>2</sup>	Litter carbon	
	TBM_LPJmL_NEE_1d.nc	Monthly			kg C/m <sup>2</sup> /mo	NEE	
	TBM_LPJmL_NPP_1d.nc					NPP	
	TBM_LPJmL_RA_1d.nc					Autotrophic respiration (RA)	
	TBM_LPJmL_RH_1d.nc					Heterotrophic respiration (RH)	
	TBM_LPJmL_SOILC_1d.nc	Annual			kg C/m <sup>2</sup>	Soil carbon	
TBM_LPJmL_VEGC_1d.nc	Live vegetation carbon						
TBM_MC1_Standardized.zip	TBM_MC1_BioCons_1d.nc				kg C/m <sup>2</sup> /mo	Biomass consumed	
	TBM_MC1_NBP_1d.nc					Net biome production	
	TBM_MC1_NEE_1d.nc					NEE	
	TBM_MC1_NEEF_1d.nc					Net ecosystem exchange with fire emissions (derived	

TBM_MC1_Standardized.zip	TBM_MC1_NPP_1d.nc	Monthly	2000-2007	CONUS	kg C/m <sup>2</sup>	from NEE+BioCons)
	TBM_MC1_RespH_1d.nc					NPP
	TBM_MC1_TotLivBiom_1d.nc					Heterotrophic respiration (respH)
	TBM_MC1_TSLC_1d.nc					Total living biomass
						Total soil carbon
TBM_MOD17-plus_Standardized.zip	TBM_MOD17-plus_GPP_1d.nc	Monthly	2000-2005	NA	kg C/m <sup>2</sup> /mo	GPP
	TBM_MOD17-plus_NEE_1d.nc					NEE (derived from Reco-GPP)
	TBM_MOD17-plus_Reco_1d.nc					Ecosystem respiration (Reco)
TBM_NASA-CASA_Standardized.zip	TBM_NASA-CASA_NEE_1d.nc	Monthly	2001-2004	CONUS	kg C/m <sup>2</sup> /mo	NEE (derived from -1*NEP)
	TBM_NASA-CASA_NEP_1d.nc					NEP
	TBM_NASA-CASA_NPP_1d.nc					NPP
	TBM_NASA-CASA_Rh_1d.nc					Heterotrophic respiration (Rh) (derived from NPP-NEP)
TBM_ORCHIDEE_Standardized.zip	TBM_ORCHIDEE_CO2FLUX_1d_v1.0.nc	Monthly	2001-2007	NA	kg C/m <sup>2</sup> /mo	CO <sub>2</sub> flux
	TBM_ORCHIDEE_GPP_1d_v1.0.nc					GPP
	TBM_ORCHIDEE_GROWTH_RESP_1d_v1.0.nc					Growth respiration
	TBM_ORCHIDEE_HET_RESP_1d_v1.0.nc					Heterotrophic respiration (HET_RESP)
	TBM_ORCHIDEE_LAI_1d_v1.0.nc				dimensionless ratio (m <sup>2</sup> /m <sup>2</sup> )	Leaf area index
	TBM_ORCHIDEE_NPP_1d_v1.0.nc				kg C/m <sup>2</sup> /mo	NPP
TBM_SiB3_Standardized.zip	TBM_SiB3_NEE_1d.nc	Monthly	2000-2005	NA	kg C/m <sup>2</sup> /mo	NEE
TBM_TEM6_Standardized.zip	TBM_TEM6_NACP_FireEmissions_1d.nc	Monthly	2000-2006	NA>45°	kg C/m <sup>2</sup> /mo	Fire emissions (derived from NCE-NEE)
	TBM_TEM6_NACP_GPP_1d.nc					GPP
	TBM_TEM6_NACP_NCE_1d.nc					Net exchange of carbon from the land to the atmosphere = Equals to NEEF (fire emissions included)
	TBM_TEM6_NACP_NECB_1d.nc					Net ecosystem carbon balance from the land to the atmosphere
	TBM_TEM6_NACP_NEE_1d.nc					NEE (derived from Rh-NPP)
	TBM_TEM6_NACP_NPP_1d.nc					NPP
	TBM_TEM6_NACP_RH_1d.nc					Heterotrophic respiration (RH)
	TBM_TEM6_NACP_SOILC_1d.nc				Total soil carbon	
	TBM_TEM6_NACP_VEGC_1d.nc				kg C/m <sup>2</sup>	Total vegetation carbon above and below ground
TBM_VEGAS_Standardized.zip	TBM_VEGAS_cb_1d.nc	Monthly	2000-2007	NA	kg C/m <sup>2</sup>	Total biomass carbon
	TBM_VEGAS_cfir_1d.nc				kg C/m <sup>2</sup> /mo	Fire emissions
	TBM_VEGAS_cleaf_1d.nc				kg C/m <sup>2</sup>	Leaf carbon
	TBM_VEGAS_csoil_1d.nc				kg C/m <sup>2</sup>	Soil carbon
	TBM_VEGAS_cvege_1d.nc				kg C/m <sup>2</sup>	Total vegetation carbon
	TBM_VEGAS_evap_1d.nc				W/m <sup>2</sup>	Evapotranspiration
	TBM_VEGAS_GPP_1d.nc				kg C/m <sup>2</sup> /mo	GPP
	TBM_VEGAS_LAI_1d.nc				dimensionless ratio (m <sup>2</sup> /m <sup>2</sup> )	Leaf area index
	TBM_VEGAS_NEE_1d.nc				kg C/m <sup>2</sup> /mo	NEE (fire emissions included)
	TBM_VEGAS_NEP_1d.nc					NEP
	TBM_VEGAS_NPP_1d.nc					NPP
	TBM_VEGAS_Ra_1d.nc					Autotrophic respiration (Ra)
	TBM_VEGAS_Rh_1d.nc					Heterotrophic respiration (Rh)

Notes: CONUS = conterminous United States. NA = North America. GPP = Gross Primary Production. NEE = Net Ecosystem Exchange. NEP = Net Ecosystem Production. NPP = Net Primary Production.

Table 6. Inverse Model (IM) Output Data Files

FILE NAMES		TEMPORAL RESOLUTION	TEMPORAL EXTENT	SPATIAL EXTENT	UNITS	VARIABLE
COMPRESSED FILE NAMES *	UNCOMPRESSED DATA FILE NAMES					
IM_CarbonTracker_Standardized.zip	IM_CarbonTracker_NEE_1d.nc	Monthly	2000-2007	NA	kg C/m <sup>2</sup> /mo	Net ecosystem exchange (NEE)
IM_CSU-no1_Standardized.zip	IM_CSU-no1_FF_1d.nc	Monthly	2003-2004	NA	kg C/m <sup>2</sup> /mo	Fossil Fuel emissions (FF)
	IM_CSU-no1_NEE_1d.nc					NEE
IM_JENA_Standardized.zip	IM_JENA_NEE_1d.nc	Monthly	2001-2007	NA	kg C/m <sup>2</sup> /mo	NEE
IM_LCSE-no1_Standardized.zip	IM_LCSE-no1_NEE_1d.nc	Monthly	2000-2004	NA	kg C/m <sup>2</sup> /mo	NEE
IM_LCSE-no2_Standardized.zip	IM_LCSE-no2_NEE_1d.nc	Monthly	2000-2006	NA	kg C/m <sup>2</sup> /mo	NEE
IM_Michigan-Geostatistical_Standardized.zip	IM_Michigan-Geostatistical_NEE_1d.nc	Monthly	1997-2001	NA	kg C/m <sup>2</sup> /mo	NEE
IM_UToronto_Standardized.zip	IM_UToronto_NEE_1d.nc	Monthly	1997-2001	NA	kg C/m <sup>2</sup> /mo	NEE

Notes: NA = North America.

### 2.8. Observation Data and Model Output Variables

Table 7. List of Observation Data and Model Output Variables

Short Name	Units	Long Name	Temporal Resolution	Models
<b>Gross Primary Productivity (GPP)</b>				
GPP	kg C m-2 month-1	gross primary production	monthly	MODIS GPP, BEPS, Can-IBIS, CASA-GFEDv2, CLM-CASA, CLM-CN, DLEM, EC-LUE, EC-MOD, LPJmL, MOD17-plus, ORCHIDEE (v1.0), TEM6, VEGAS, OSU-BGC
<b>Net Primary Productivity (NPP)</b>				
NPP	kg C m-2 month-1	net primary production	monthly	MODIS NPP, BEPS, Can-IBIS, CLM-CASA, CLM-CN, ISAM, LPJmL, MC1, NASA-CASA, ORCHIDEE (v1.0), TEM6, VEGAS, DLEM
NPPCrop	kg C m-2 month-1	net primary production crop	monthly	ORCHIDEE (v2.1)
CropNPP	MgC y-1	crop NPP	annual	NASS CropNPP
<b>Net Ecosystem Exchange (NEE)</b>				
NEE	kg C m-2 month-1	net ecosystem exchange	monthly	BEPS, Can-IBIS, CASA-GFEDv2, CLM-CASA, CLM-CN, EC-MOD, ISAM, LPJmL, MC1, MOD17-plus, NASA-CASA, SiB3, TEM6, VEGAS, CASA-Transcom, DLEM, CarbonTracker, UToronto, LSCE-no1, LSCE-no2, JENA, CSU-no1, Michigan-Geostatistical
CO2FLUX	kg C m-2 month-1	co2 flux	monthly	ORCHIDEE (v1.0)
ANEE	kg C m-2 year-1	annual net ecosystem exchange	yearly	LPJmL
NEEF	kg C m-2 month-1	net ecosystem exchange with fire emissions	monthly	MC1, CASA-GFEDv2
ANEEF	kg C m-2 year-1	annual net ecosystem exchange with fire emissions	yearly	LPJmL
<b>Net Ecosystem Production</b>				



NEP	kg C m-2 month-1	net ecosystem production	monthly	BEPS, Can-IBIS, CLM-CASA, CLM-CM, NASA-CASA, VEGAS
<b>Total Respiration</b>				
R	kg C m-2 month-1	respiration	monthly	CASA-GFEDv2
Reco	kg C m-2 month-1	ecosystem respiration	monthly	MOD17-plus
<b>Autotrophic Respiration</b>				
Ra	kg C m-2 month-1	autotrophic respiration	monthly	Can-IBIS, VEGAS, DLEM
RA	kg C m-2 month-1	autotrophic respiration	monthly	LPJmL
<b>Heterotrophic Respiration</b>				
Rh	kg C m-2 month-1	heterotrophic respiration	monthly	BEPS, Can-IBIS, ISAM, NASA-CASA, VEGAS, DLEM
HR	kg C m-2 month-1	heterotrophic respiration	monthly	CLM-CASA, CLM-CN
RH	kg C m-2 month-1	heterotrophic respiration	monthly	LPJmL, TEM6
RespH	kg C m-2 month-1	heterotrophic respiration	monthly	MC1
HetResp	kg C m-2 month-1	heterotrophic respiration	monthly	ORCHIDEE (v1.0)
<b>Fire Emissions</b>				
Cfire	kg C m-2 month-1	fire emissions	monthly	CASA-GFEDv2
cfire	kg C m-2 month-1	fire emissions	monthly	VEGAS
FIRE	kg C m-2 year-1	fire emissions	yearly	LPJmL
BioCons	kg C m-2 month-1	biomass consumed	monthly	MC1
FireEmissions	kg C m-2 month-1	fire emissions	monthly	TEM6
<b>Total Living Biomass</b>				
TotLivBiom	kg C m-2	monthly mean total carbon content of the living biomass including heartwood	monthly	DLEM
TotLivBiom	kg C m-2	total living biomass	monthly	MC1
CBiomass	kg C m-2	biomass	yearly	Can-IBIS
cb	kg C m-2	total biomass carbon	monthly	VEGAS
Biomass	kg C m-2	forest biomass	one time	FIA Forest Biomass
<b>Total Soil Carbon: Total soil and litter carbon content vertically integrated over the entire soil column</b>				
TotSoilCarb	kg C m-2	monthly mean total soil carbon density	monthly	DLEM
CSoil	kg C m-2	soil carbon	yearly	Can-IBIS
SOILC	kg C m-2	total soil organic matter C	monthly	CLM-CASA, CLM-CN
SOILC	kg C m-2	total soil carbon	monthly	TEM6
SOILC	kg C m-2	soil carbon	yearly	LPJmL
TSLC	kg C m-2	total soil carbon	monthly	MC1
csoil	kg C m-2	soil carbon	monthly	VEGAS
<b>Leaf Area Index</b>				
LAI	(-)	leaf area index	monthly	ORCHIDEE (v1.0), VEGAS
TLAI	(-)	total projected leaf area index	monthly	CLM-CASA, CLM-CN

Evapevapotranspiration (ET)				
evap	W m-2	evapotranspiration		VEGAS
Coarse Woody Debris Carbon				
CWDC	kg C m-2	coarse woody debris C	monthly	CLM-CASA, CLM-CN
Wood Carbon				
WOODC	kg C m-2	wood C	monthly	CLM-CASA, CLM-CN
Fine Root Carbon				
FROOTC	kg C m-2	fine root C	monthly	CLM-CASA, CLM-CN
Land Fraction				
landfrac	(-)	land fraction	monthly	CLM-CASA, CLM-CN
Leaf Carbon				
LEAFC	kg C m-2	leaf C	monthly	CLM-CASA, CLM-CN
cleaf	kg C m-2	leaf carbon	monthly	VEGAS
Litter Carbon				
LITTERC	kg C m-2	litter C	monthly	CLM-CASA, CLM-CN
LITC	kg C m-2	litter carbon	yearly	LPJmL
Vegetation Carbon				
VegC	kg C m-2	vegetation C	monthly	CLM-CASA
cvege	kg C m-2	total vegetation carbon	monthly	VEGAS
VEGC	kg C m-2	live vegetation carbon	yearly	LPJmL
VEGC	kg C m-2	total vegetation above and below ground	monthly	TEM6
TOTVEGC	kg C m-2	total vegetation carbon	monthly	CLM-CN
Net Biome Production				
NBP	kg C m-2 month-1	net biome production	monthly	MC1
Growth Respiration				
GROWTH_RESP	kg C m-2 month-1	growth respiration	monthly	ORCHIDEE (v1.0)
Net Carbon Exchange				
NCE	kg C m-2 month-1	net exchange of C from the land to the atmosphere	monthly	TEM6
Net Ecosystem Carbon Balance				
NECB	kg C m-2 month-1	net ecosystem C balance from the land to the atmosphere	monthly	TEM6

### 2.9. Companion File Information

Table 8. Companion Files

FILE NAME	DESCRIPTION
Regional-Description_of_Observations_and_Models.pdf	Overview of observation measurement data and terrestrial biosphere and inverse models, including descriptions, sources, contacts, and a comprehensive reference list
NACP_Model_Characteristics.pdf	Overview of process descriptions in participating TBMs and boundary conditions and driver data used in participating TBMs with a comprehensive reference list
NACP_Model_Metadata_Survey_Results.pdf	Metadata for TBMs Intercomparison: Site Model Data Comparison and Regional Model Data Comparison: Survey Results

## 3. Data Application and Derivation:

This data product contributes to a multidisciplinary research program to obtain scientific understanding of North America's carbon sources and sinks and of changes in carbon stocks needed to meet societal concerns and to provide tools for decision makers. It is part of a NACP regional and continental

synthesis to evaluate and inter-compare models and observation measurements across North America. This work provides a valuable assessment of the current status of terrestrial carbon modeling in North America by bringing together model estimates that incorporate a wide range of modeling choices and input data. This work can also be used to compare the model results to different observational data products.

#### 4. Quality Assessment:

This data set provides the standardized, gridded observation measurements and model simulation output results that MAST-DC produced from the original data submissions. The differences (range) in estimates of regional land-atmosphere carbon fluxes in the data files in this data set appear to be driven by a combination of factors.

The participating models differ from each other because they are based on different simplifying assumptions and use different approaches (forward vs. inverse) and modeling strategies (detailed process, statistical, or observation based). They also differ structurally in how they represent the processes controlling carbon exchange between the land and atmosphere (e.g., representation of photosynthesis), in their input or environmental driver data (e.g., land cover, climate variables) and the temporal variability of those data, in their initial conditions, and in the parameter values used within their varying process descriptions. The gridded observation data also differ with regards to biome type, acquisition methods, spatial coverage and resolution, and temporal coverage and resolution. These varying approaches result in a large degree of variability in estimates of regional land-atmosphere carbon fluxes.

The variability in carbon flux estimates highlights the need for further analysis through the use of model runs following a common simulation protocol, to isolate the influences of model formulation, structure, and assumptions on flux estimates. A more formal model-data comparison is required to more definitively quantify the impact of model formulation and supporting and driver data on the accuracy of the simulation model outputs. Such efforts are underway by NACP, requiring substantial technical support for model participation, development of consistent and optimal environmental driver data sets, a unified intercomparison protocol, as well as coordination of the intercomparison effort across research groups. These NACP projects include (1) working to understand how model formulation and model choices impact overall model performance through the use of detailed simulation protocol and controlled input environmental driver data (e.g., Schwalm et al., 2010) and (2) the Multi-Scale Synthesis and Terrestrial Model Intercomparison Project (MsTMIP), which directly builds of the NACP regional synthesis products presented here.

#### 5. Data Acquisition Materials and Methods:

Original model simulation results and observation measurement data were resampled by ORNL DAAC to a standard 1-degree spatial resolution for North American region, interpolated into monthly or yearly temporal resolution, converted to a standard measurement unit (generally, kg C/m<sup>2</sup>/month or year), and reformatted into CF convention compatible netCDF format. [Note: FIA forest biomass/area data are also provided at half degree resolution.]

Information about the specific data processing steps taken by MAST-DC are available by contacting the Data Center as indicated below.

#### 6. Data Access:

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

##### Data Archive:

Web Site: <http://daac.ornl.gov>

##### Contact for Data Center Access Information:

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

#### 7. References:

Denning, A.S., et al. 2005. Science implementation strategy for the North American Carbon Program: A Report of the NACP Implementation Strategy Group of the U.S. Carbon Cycle Interagency Working Group. U.S. Carbon Cycle Science Program, Washington, DC. 68 pp.

Huntzinger, D.N., W.M. Post, Y. Wei, A.M. Michalak, T.O. West, A.R. Jacobson, I.T. Baker, J.M. Chen, K.J. Davis, D.J. Hayes, F.M. Hoffman, A.K. Jain, S. Liu, A.D. McGuire, R.P. Neilson, C. Potter, B. Poulter, D. Price, B.M. Raczka, H.Q. Tian, P. Thornton, E. Tomelleri, N. Viovy, J. Xiao, W. Yuan, N. Zeng, M. Zhao, and R. Cook. 2012. North American Carbon Program (NACP) regional interim synthesis: Terrestrial biospheric model intercomparison. *Ecological Modelling* 232(10): 144-157. doi:10.1016/j.ecolmodel.2012.02.004

Schwalm, C. R., et al. 2010. A model-data intercomparison of CO<sub>2</sub> exchange across North America: Results from the North American Carbon Program site synthesis. *J. Geophys. Res.* 115: G00H05. doi:10.1029/2009JG001229.

Wofsy, S.C., and R.C. Harriss. 2002. The North American Carbon Program (NACP). Report of the NACP Committee of the U.S. Interagency Carbon Cycle Science Program. U.S. Global Change Research Program, Washington, DC. 56 pp.

##### Additional Sources of Information:

Please see the Reference section in the [Regional-Description\\_of\\_Observations\\_and\\_Models.pdf](#) document for publications related to the observation measurements, TBMs, and IMs used in this study.



[Privacy Policy](#) | [Feedback](#) | [FAQs](#) | [Site Map](#)

[Follow @ORNLDAAC](#)

[Home](#)

[About Us](#)

Who We Are  
User Working Group  
Biogeochemical Dynamics  
Data Citation Policy

[Products](#)

Product Overview  
Field Campaigns  
Validation  
Regional/Global

[Data](#)

Complete Data Set List  
Search for Data  
Field Campaigns  
Validation

[Tools](#)

Data Search  
Site Search  
Search by DOI  
WebGIS

[Help](#)

FAQs  
Tutorials  
Data Management

[Contact Us](#)



News  
Newsletters  
Workshops

Model Archive

Regional/Global  
Model Archive

SDAT  
MODIS Land Subsets  
THREDDS

