NACP Data Center for Modeling and Synthesis (B53B-1177)

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North American Carbon Program

Introduction

The North American Carbon Program (NACP) is designed to quantify the magnitudes and distributions of carbon sources and sinks, explain the processes controlling them, and produce a consistent analysis of North America's carbon budget. To accomplish these ambitious goals, NACP requires an integrated data and information management system that will enable researchers to access, understand, use, and analyze large volumes of diverse data at multiple thematic, temporal, and spatial scales.

The Modeling and Synthesis Thematic Data Center (MAST-DC) supports NACP by providing data products and data management services needed for modeling and synthesis activities. MAST-DC is also working with the Synthesis Task Force on plans to quantify and understand interannual variations of the continental carbon budget of North America since 2000 by synthesizing and intercomparing NACP data and models.

MAST-DC Data Products

Based on NACP requirements, MAST-DC provides data products and services in a central location, in consistent and uniform grids, with common and co-registered spatial projection, in easily convertible formats.

Background

We conducted a survey of NACP investigators, who chose several projections and formats that they would like to have MAST-DC offer:

Projection: Geographic (Lat / longitude)
Albers Conical Equal Area (for MCI region and Conterminous US)
Lamberts Conformal Conic Equal Area (for North America)
Format: netCDF, GeoTIFF, HDF-EOS, ASCII

Daily Meteorological data (Daymet)

MAST-DC has compiled US meteorological station data and prepared a gridded (1 km) and daily data product for the 2004 water year. Daymet includes daily average temperature, daily maximum and minimum temperature, precipitation, radiation, and humidity

Precipitation (2003)

0 cm/yr 200
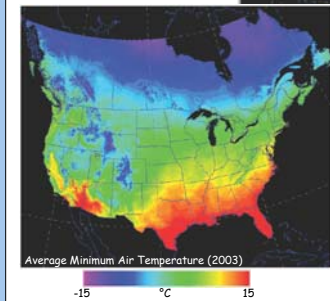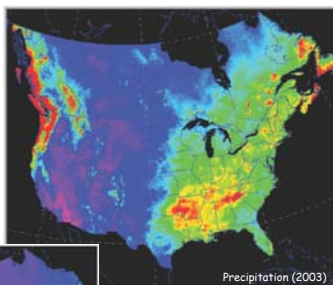
MAST-DC has made contact with sources of meteorological data in Canada and Mexico to prepare a continental version of Daymet. These maps (total precipitation and average minimum air temperature) show the merged US and Canada product.

Average Minimum Air Temperature (2003)
-15 °C 15

North American sub-pixel water mask (1- x 1-km Resolution)

To take advantage of fine resolution land-water data, we developed a 1- x 1-km resolution map that captures sub-pixel information about land and water areas. The map contains the percentage of water within each 1- x 1-km pixel.


% of water
0 100
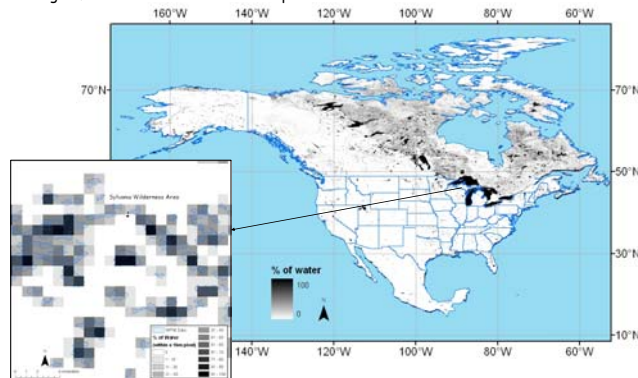
The North American sub-pixel water mask product is derived from three data sets for three geographic extents:

- North America (South of 60°N) – From the 1 arc second (~30-m) resolution Shuttle Radar Topography Mission (SRTM) Water Body data set, the number of 30-m pixels containing water within a 1-km pixel were calculated to derive the sub pixel percentage of water.

- Alaska (North of 60°N) - Detailed hydrographic features were obtained from the Alaska State Geo-Spatial Data Clearing House and converted to 30-m raster water pixels from which, the number of 30-m pixels containing water within a 1-km pixel were calculated to derive the sub-pixel percentage of water.

- Canada (North of 60°N) – This region was replaced by a 1-km Water Fraction From National Topographic Data Base Maps. This product is a raster coverage representing the fraction of area within each 1-km grid cell over Canada's land mass covered by water bodies
Data Sources:
SRTM - http://edc.usgs.gov/products/elevation/swbd.html
Alaska Hydrography - http://fox.dnr.state.ak.us/SpatialUtility/SUC?cmd=vmd&layerid=119
Canada Water Fraction Product - http://geogratis.cgdi.gc.ca/geogratis/en/option/select.do?id=67

Gap-Filled Meteorological Data from Flux Tower Sites

For ~70 flux tower sites in the US, MAST-DC in collaboration with Colorado State University has prepared gap-filled meteorological data for use as driver data for bottom-up models.

Parameters that have been gap-filled include precipitation, short- and long-wave radiation, air temperature, relative humidity, wind speed, air pressure, and CO_2 concentration.

Howland Forest, Maine, USA

Flux tower
Gap-filled
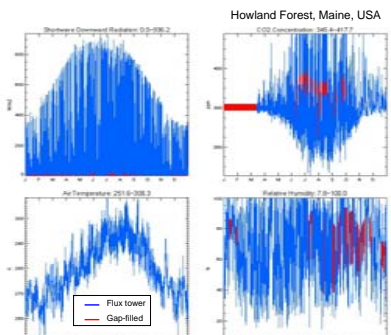
The flux tower data are provided courtesy of AmeriFlux and Dave Hollinger, USDA, Forest Service.

Provide support to synthesis activities

MAST-DC coordinates with the NACP Synthesis Task Force to provide data management support for synthesis activities and to develop the data products required at these workshops.

MAST-DC is currently assisting with a Model-Data Intercomparison Activity to quantify and understand spatial and temporal distributions of carbon sources, sinks, and inventories since 2000 by synthesizing NACP data and models, from sites to regional / continental scales.
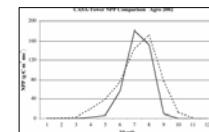
Comparison of predicted vs measured monthly NPP for the Bondville, IL flux tower site in 2002. Solid line is the measured tower fluxes whereas the dashed line is the NASA-CASA model-predicted fluxes. Source: Potter et al 2007 Earth Interactions
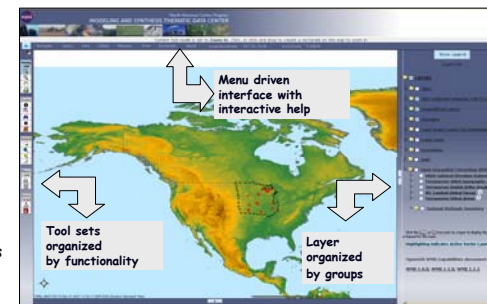
North America WebGIS

WebGIS is an Internet-based technology that enables users to browse, query, and distribute spatial data using a standard web browser. The MAST-DC WebGIS includes a number of land cover, biophysical, elevation, and geopolitical layers, as well as access to other relevant Open Geospatial Consortium (OGC) layers. This WebGIS also has MCI-relevant data including an Mid continent Intensive boundary layer and field sites within the MCI.

WebGIS Tools:
- Change layer display
- Zoom, pan
- Query data
- Download to GIS client application
- GIS Operations
- Lots of help

Layers
- Field sites
- Elevation
- Land-water masks
- Land cover
- Soils
- Ecoregions

Menu driven interface with interactive help

Tool sets organized by functionality

Layer organized by groups

MAST-DC Services

- Web Site
  http://nacp.ornl.gov/mast-dc/
- Data Clearinghouse
  - Thematic data centers
  - Modeling and synthesis data and information
- THREDSS Data Server
  (Thematic Real-time Environmental Distributed Data Services)
  http://daacdap-dev.ornl.gov/thredds/catalog.html

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