ORNL DAAC Data Tools

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Background

The ORNL DAAC archives and distributes terrestrial biogeochemical dynamics data collected as part of the NASA's Earth Observing System (EOS) Program. ORNL DAAC's data sets are primarily from ground-based field investigations and augmented by data collected through remote-sensing techniques. The types of data held by the ORNL DAAC are Field Campaign, Land Validation, Regional and Global Data, and Model Products.

http://daac.ornl.gov/

Introduction

ORNL DAAC provides various tools and services to help researchers readily find, visualize and access data sets of interest. Three ORNL DAAC tools are described here:

MODIS Subsetting and Visualization Tools

ORNL DAAC MODIS tools provide subsets of selected MODIS Land Products in a scale and format useful for terrestrial ecology researchers. The subsets are offered in tabular ASCII format and in GIS compatible GeoTIFF format. Time series plots and grid visualizations of the subsets are also provided.

Users can access pre-defined 7 x 7 km subsets for selected field sites such as FLUX tower locations, or obtain subsets up to 201 x 201 km for any land location around the globe. For users interested in obtaining MODIS subsets from within computer code, ORNL DAAC has created a SOAP based Web Service.

Spatial Data Access Tool (SDAT)

SDAT provides visualization and access to a number of land cover, biophysical, elevation, ecosystem, climate, soil, and model output data sets using Open Geospatial Consortium (OGC) services. Google Earth visualizations of the data sets are also provided through SDAT.

Satellite Product Evaluation Center (SPEC)

SPEC provides access to co-located data subsets from field observations, model output, and remote sensing records. SPEC is a web-based tool and is aimed to support quantitative calibration, validation and algorithm and model improvement. SPEC is developed in collaboration with staff from the National Climatic Data Center, NOAA.

MODIS Subsetting and Visualization Tools

MODIS (Moderate Resolution Imaging Spectroradiometer) sensor data are highly useful for field research. However, the volume of MODIS data and the complexity in data format makes MODIS data less usable by field researchers in some cases. To solve this usability issue, the ORNL DAAC prepares and distributes subsets of selected MODIS Land Products in a scale and format useful for field researchers.

MODIS Products Subsetted
Surface Reflectance
Surface Temperature
Land Cover
Phenology
NDVI / EVI
LAI / fPAR
Gap-Filled and Smoothed LAI/fPAR
Net Photosynthesis
Annual NPP
Albedo (Model and Calculated)
Reflectance – BRDF Adjusted

- Products Subsetted: Terra and Aqua MODIS
- Sinusoidal Projection
- 2000 to present
- 8-day, 16-day, and annual composite periods
- 250-m, 500-m, or 1000-m resolution (depends on product)

MODIS Land Product Subsets for Selected Field Sites

http://daac.ornl.gov/modisfixedsite

MODIS ASCII and GeoTIFF Subsets are available for over 1,000 field sites worldwide. Subsetted data (original size: 25 x 25 km) are received from the MODIS processing stream (MODAPS) and converted at the ORNL DAAC into ASCII (7 x 7 km) and GeoTIFF (25 x 25 km) formats.
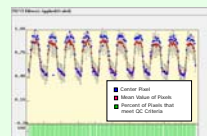
1,147 Sites

Site Selection options for MODIS subsets

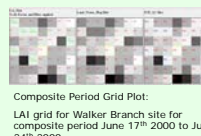Menu of options for visualizing and downloading MODIS Subsets

ASCII (Tabular) Subsets

ASCII Example: NDVI for Walker branch site.

Composite Period Grid Plot:
LAI grid for Walker Branch site for composite period June 17th 2000 to June 24th 2000

Users also have the option of choosing their own quality control criteria.

Time-series graphs: NDVI Time series for Walker Branch FLUXNET site.

MODIS Land Product Subsets for any location

http://daac.ornl.gov/modisglobal

The ORNL DAAC also offers subsets of MODIS Land Products in ASCII and GeoTIFF format for user-selected areas (from one pixel up to 201 x 201 km) worldwide and for any time period during the MODIS record.

- User places an order through a Web interface
- The tool will send an email message containing a URL where the output can be accessed
- Subset generation including generation of time series data file, graphs, and statistics takes 10 to 60 minutes (depends on area, time period, and product)

NDVI (MOD13Q1) 2000-2009

MOD13Q1 2000193

Multi year stacked

NDVI for Composite Period
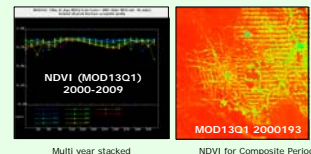
- Plots generated on the fly for a user selected time period
- Stacked time series for all years for inter-annual data comparison
- Statistics are provided for all pixels in selected area that have the same land cover class as center pixel.
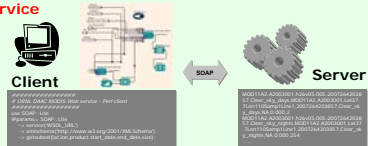
Data Download

MODIS Land cover and Phenology plots for the subset area

MODIS Land Product Subsets Web Service (SOAP)

http://daac.ornl.gov/modiswebservice

Simple Object Access Protocol (SOAP) based Web Service for programmatically accessing MODIS subsets.

- Programmatically retrieve subsets
- Real time data delivery
- Integrate with client side tools
- Connect with workflow software

Client

SOAP

Server

Spatial Data Access Tool (SDAT)

http://webmap.ornl.gov/wcsdown

Traditional methods of geospatial data delivery require users to visualize and download the data in the original format, projection and extent. Processing of these data layers requires specialized expertise and software. These drawbacks add additional burden to users and often reduce the potential usage of the data beyond those with expertise in that spatial product.

The SDAT tool has overcome the limitations of traditional methods by using OGC standards to deliver geospatial data through OGC Web Map Service (WMS) and Web Coverage Service (WCS) standards.

Functions of SDAT

- Explore and discover ORNL DAAC's spatial data resources
- Preview data for user selected spatial area, projection, and resolution
- View data layers in Google Earth
- Download map and data file in customized projection, resolution, interpolation method, and file format
- Includes Help files and metadata links.

Example Data sets served

- ❖ Land Cover (MODIS, AVHRR etc)
- ❖ Field campaign (LBA, BIGFOOT)
- ❖ Elevation (GTOPO30, SRTM)
- ❖ Ecoregions map of the continents
- ❖ Global distribution of cultivation intensity
- ❖ Derived soil properties
- ❖ Plant-Extractable Water Capacity of Soil

Satellite Product Evaluation Center (SPEC)

http://daacds.ornl.gov:8080/spec/

ORNL DAAC and NOAA NCDC are collaborating to develop a Web-based system that allows users to access co-located data subsets from field observations, model output, and remote sensing records. The system aims to support quantitative evaluation of remote sensing products and models, and algorithm and model development.

Key Benefits

- ❖ Provide a uniform approach (Common Data Model-based) for the extraction of grid/swath from point, line, polygon and trajectory data, and thereby maximize reusability
- ❖ Provide a large, high-performance cache of satellite/model data for select locations.
- ❖ Provide a desktop and command-line tool for:
  - ❑ Locating other sources of data for field sites
  - ❑ Integration of user's data with the SPEC database cache
  - ❑ Statistical analysis and export to common formats
  - ❑ Monitoring and automated alerts
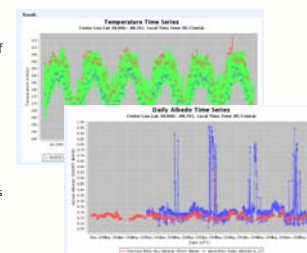
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