Tutorial: Access Distributed NASA Earth Science Data from OPeNDAP Services using Matlab

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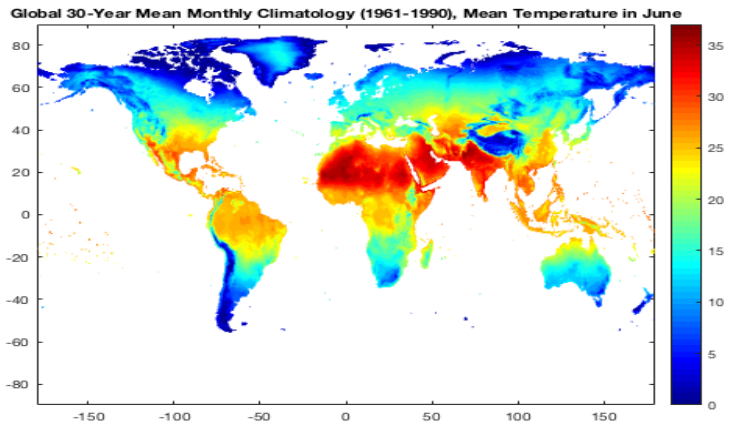
Overview

In this tutorial, we will explore how to use ORNL DAAC data from THREDDS Data Server through OPeNDAP protocol using Matlab. THREDDS is a web server that provides direct access to scientific data sets and OPeNDAP is a protocol that allows access to remote data without having to download the data. This example uses temporal subset of mean temperature in global 30-year monthly climatology dataset. The mean monthly temperature data is read and its attributes, dimensions and size are retrieved. A subset of mean temperature data in June is created and plotted.



Source Data

Spatial subsets of 30-year(1961-1990) mean monthly surface climate over global land areas, excluding Antarctica. In this example, monthly mean temperature climatology data is obtained from this ORNL DAAC's THREDDS server. Get its OPeNDAP Data URL (https://thredds.daac.ornl.gov/thredds/dodsC/ornldaac/542/climate6190_TMP.nc4) from the OPeNDAP Dataset Access Form.

Prerequisites:

Matlab R2012a or later

Procedure:

1. Retrieve data file and all metadata

```
% Define data access URL
url='https://thredds.daac.ornl.gov/thredds/dodsC/ornldaac/542/climate6190_TMP.nc4';
% Retrieve all the metadata including the groups, dimensions, variable definitions and all attributes in the NetCDF file
ncdisp(url);
```

```
Source:
           https://thredds.daac.ornl.gov/thredds/dodsC/ornldaac/542/climate6190_TMP.nc4
Format:
           classic
Global Attributes:
           Conventions = 'CF-1.0'
           history     = 'version 1.0, created on 11/05/2007-10:50'
           institution = 'Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC)'
           comment     = 'A dataset of mean monthly surface climate over global land areas, excluding Antarctica. Interpolated from station data to
           title       = 'CRU05 0.5 Degree 1961-1990 Mean Monthly Climatology (New et al.): Mean Temperature'
           references  = 'New, M., M. Hulme, and P.D. Jones. 2000. Global 30-Year Mean Monthly Climatology, 1961-1990 (New et al.). ORNL DAAC, Oak
Dimensions:
           lat  = 360
           lon  = 720
           nv   = 2
           time = 12
Variables:
    lat
           Size:       360x1
           Dimensions: lat
           Datatype:   double
           Attributes:
                       bounds        = 'lat_bnds'
```

```
                    standard_name = 'latitude'
                    long_name     = 'latitude'
                    units         = 'degrees_north'
    climatology_bounds
           Size:       2x12
           Dimensions: nv,time
           Datatype:   int16
    lat_bnds
           Size:       2x360
           Dimensions: nv,lat
           Datatype:   double
           Attributes:
                    units = 'degrees_north'
    lon_bnds
           Size:       2x720
           Dimensions: nv,lon
           Datatype:   double
           Attributes:
                    units = 'degrees_east'
    time
           Size:       12x1
           Dimensions: time
           Datatype:   int32
           Attributes:
                    climatology   = 'climatology_bounds'
                    long_name     = 'month'
                    units         = 'months since 1960-01'
                    valid_range   = [1  12]
                    standard_name = 'time'
                    _ChunkSizes   = 12
    lon
           Size:       720x1
           Dimensions: lon
           Datatype:   double
           Attributes:
                    bounds        = 'lon_bnds'
                    long_name     = 'longitude'
                    standard_name = 'longitude'
                    units         = 'degrees_east'
                    valid_range   = [-180  180]
                    _ChunkSizes   = 720
    TMP
           Size:       720x360x12
           Dimensions: lon,lat,time
           Datatype:   int16
           Attributes:
                    _FillValue   = -9999
                    cell_methods = 'time: mean within months time: mean over years'
                    long_name    = 'Mean Temperature'
                    units        = 'degreeC'
                    valid_range  = [0  1000]
                    _ChunkSizes  = [6  180  360]
```

2. Read data and information from `TMP` variable

```
% Read data from TMP variable
tmpData  = ncread(url,'TMP');
% Display information about the tmpData output
whos tmpData;
```

```
  Name           Size                  Bytes  Class     Attributes

  tmpData      720x360x12            24883200  double
```

```
% Read the attribute associated with TMP variable
tmpDesc  = ncreadatt(url,'TMP','_FillValue');
tmpDesc
```

```
tmpDesc = int16
    -9999
```

3. Subset `TMP` variable along `time` dimension

```
% Read and display data from time variable
timeData = ncread(url,'time');
timeData
```

```
timeData = 12×1 int32 column vector
```

```
0
1
2
3
4
5
6
7
8
9
```

```
% TMP variable is three-dimensional 720(longitude)x360(latitude)x12(time), We set the start index of time as 6 to subset the data in June
start = [1 1 6];
% Set count of latitude and longitude as Inf to reads data until the end of these two dimensions.
count = [Inf Inf 1];
% Subset mean temperature data in June
subsetdata = ncread(url,'TMP',start,count);
```

4. Plot your data

```
% create Y vector
Y = ncread(url,'lat');
% create X vector
X = ncread(url,'lon');
% convert data matrix in [Y x X]
C=transpose(subsetdata);
% Draws a pseudo color plot of mean temperature
pcolor(X, Y, C);
colormap(jet);
shading flat;
colorbar;
title('Global 30-Year Mean Monthly Climatology (1961-1990), Mean Temperature in June');
```