Downloading Data

Downloading data from GES DISC **requires an Earthdata account** (why? (https://wiki.earthdata.nasa.gov/display/EL/Earthdata+Login+Overview+and+Policy%2C+v1.2)). Registration is free and easy:

1. Create an Earthdata account (https://wiki.earthdata.nasa.gov/display/EL/How+To+Register+For+an+EarthData+Login+Profile)
2. Link GES DISC with your account (earthdata-login)
3. Verify by downloading this example data file URL (https://acdisc.gesdisc.eosdis.nasa.gov/data//Aqua_AIRS_Level3/AIRX3STD.006/2006/AIRS.2006.12.31.L3.RetStd001.v6.0.9.0.G1315519274

Once registered, you should be able to download GES DISC data using your browser. Additional steps might be required when accessing the data using other tools:

1. wget for Windows
2. wget for Mac/Linux
3. curl for Mac/Linux
4. IDV (Integrated Data Viewer)
5. toolsUI
6. Panoply
7. Matlab
8. Native Python
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10. Python using 'Pydap'
11. IDL (Interactive Data Language) (./information/howto?title=How%20to%20access%20data%20on%20a%20remote%20server%20using%20IDL)
12. GrADS
13. Ferret
14. ncdump
15. OPeNDAP URLs

wget for Windows

1. Make sure you have set up your Earthdata account.
2. Install wget if necessary. A version of wget 1.18 compiled with gnuTLS 3.3.3 or OpenSSL 1.0.2 or LibreSSL 2.0.2 or later is recommended.
3. Create a cookie file. This file will let you download GES DISC resources without having to re-login.
   a. Open a run-command window by pressing `WinKey + R`
   b. Next, enter "cmd" in the text field and click "OK"
   c. Navigate to the directory you wish to create the cookies file in. In this guide, we place it under the C drive, but any directory will do. You can navigate to the C drive by entering `C:`
   d. Finally, enter `NUL > .urs_cookies` .
   Note: you may need to re-create .urs_cookies in case you have already executed `wget` without valid authentication.
   Note: you can get 'Access denied' error. Enter 'dir' to verify that '.urs_cookies' file is listed in your directory.
4. Download your data using **wget:**
   a. *To download one file*:

```
wget --load-cookies C:\.urs_cookies --save-cookies C:\.urs_cookies --auth-no-challenge=on --keep-session-cookies --user=<your username> --ask-password <url>
```

   * **If you are using subsetting services through the GES DISC website:**

```
wget --load-cookies C:\.urs_cookies --save-cookies C:\.urs_cookies --auth-no-challenge=on --keep-session-cookies --user= --ask-password --content-disposition <url>
```

   - `--auth-no-challenge` may not be needed depending on your version of `wget`
   - `<your username>` is the username belonging to your Earthdata account
   - `<url>` is the link that points to a file you wish to download or to an OPeNDAP resource.
   - Only use `--content-disposition` for downloading subsetted files through the GES DISC website
   - Your Earthdata password might be requested on the first download

b. *To download multiple data files at once*, create a plain-text `<url.txt>` file with each line containing a GES DISC data file URL. Then, enter the following command:

```
wget --load-cookies C:\.urs_cookies --save-cookies C:\.urs_cookies --auth-no-challenge=on --keep-session-cookies --user=<your username> --ask-password -i <url.txt>
```

Add the `--content-disposition` to your command when using subsetting services:

```
wget --load-cookies C:\.urs_cookies --save-cookies C:\.urs_cookies --auth-no-challenge=on --keep-session-cookies --user= --ask-password --content-disposition -i <url.txt>
```

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wget for Mac/Linux

1. Make sure you have set up your Earthdata account.
2. Install wget if necessary. A version of wget 1.18 compiled with gnuTLS 3.3.3 or OpenSSL 1.0.2 or LibreSSL 2.0.2 or later is recommended.
3. Create a .netrc file in your home directory.
   a. `cd ~` or `cd $HOME`
   b. `touch .netrc`
   c. `echo "machine urs.earthdata.nasa.gov (https://urs.earthdata.nasa.gov) login <uid> password <password>" >> .netrc` (where <uid> is your user name and <password> is your Earthdata Login password without the brackets)
   d. `chmod 0600 .netrc` (so only you can access it)
4. Create a cookie file. This file will be used to persist sessions across calls to `wget` or `curl`.
   a. `cd ~` or `cd $HOME`
   b. `touch .urs_cookies`.
   Note: you may need to re-create .urs_cookies in case you have already executed wget without valid authentication.
5. Download your data using **wget:**
   a. *To download one file:*

```
wget --load-cookies ~/.urs_cookies --save-cookies ~/.urs_cookies --auth-no-challenge=on --keep-session-cookies <url>
```

* **If you are using subsetting services through the GES DISC website:**

```
wget --load-cookies ~/.urs_cookies --save-cookies ~/.urs_cookies --auth-no-challenge=on --keep-session-cookies --content-disposition <url>
```

   - `--auth-no-challenge` may not be needed depending on your version of `wget`
   - `<url>` is the link that points to a file you wish to download or to an OPeNDAP resource.
   - Only use `--content-disposition` for downloading subsetted files through the GES DISC website.
   - Your Earthdata password might be requested on the first download

   b. *To download multiple data files at once*, create a plain-text `<url.txt>` file with each line containing a GES DISC data file URL. Then, enter the following command:

```
wget --load-cookies ~/.urs_cookies --save-cookies ~/.urs_cookies --auth-no-challenge=on --keep-session-cookies -i <url.txt>
```

Add the `--content-disposition` to your command when using subsetting services:

```
wget --load-cookies ~/.urs_cookies --save-cookies ~/.urs_cookies --auth-no-challenge=on --keep-session-cookies --content-disposition -i <url.txt>
```

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curl for Mac/Linux

1. Make sure you have setup your Earthdata account.
2. Install curl if necessary. A version of curl 7.45 complied with gnuTLS 3.3.3 or OpenSSL 1.0.2 or LibreSSL 2.0.2 or later is recommended.
3. Create a .netrc file in your home directory.
   a. `cd ~` or `cd $HOME`
   b. `touch .netrc`
   c. `echo "machine urs.earthdata.nasa.gov (https://urs.earthdata.nasa.gov) login <uid> password <password>" >> .netrc` (where <uid> is your user name and <password> is your Earthdata Login password without the brackets)
   d. `chmod 0600 .netrc` (so only you can access it)
4. Create a cookie file. This file will be used to persist sessions across calls to `wget` or `curl`.
   a. `cd ~` or `cd $HOME`
   b. `touch .urs_cookies`.
   Note: you may need to re-create .urs_cookies in case you have already executed curl without valid authentication.
5. Download your data using **curl:**
   a. *To download a single file:*

```
curl -n -c ~/.urs_cookies -b ~/.urs_cookies -LJO --url <url>
```

- `<url>` is the link that points to a file you wish to download or to an OPeNDAP resource.
- Your Earthdata password might be requested on the first download

b. *To download multiple data files at once*, create a plain-text `<url.txt>` file with each line containing a GES DISC data file URL. Then, enter the following command:

```
cat <url.txt> | tr -d '\r' | xargs -n 1 curl -LJO -n -c ~/.urs_cookies -b ~/.urs_cookies
```

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Integrated Data Viewer (IDV)

IDV is a GUI driven data client that utilizes the netCDF-Java library to access DAP resources. Download the latest version (https://www.unidata.ucar.edu/downloads/idv/current/index.jsp).

1. Set up authentication configuration the same as for ncdump.
2. Register with the Unidata website to download software.
3. Launch IDV and choose a new dataset: Data > Choose Data > From a Web Server
4. Enter the DAP URL. A pop-up window appears titled Server Authentication which asks for your credentials.

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ToolsUI

ToolsUI is a GUI driven data client based around the CDM/netCDF data model and utilizes netCDF-Java library to access remote DAP datasets.

1. Unidata recommends using the latest version of toolsUI (at least version 4.6 or greater). Download (ftp://ftp.unidata.ucar.edu/pub/netcdf-java/v4.6/toolsUI-4.6.4.jar)
2. Launch with the following command line: java -Xmx1g -jar toolsUI-4.6.4.jar "-Xmx[size]" specifies the maximum size in bytes of the memory allocation pool. It must be greater than 2 MB and a multiple of 1024. "-jar" executes the program encapsulated in a JAR file.
3. Select Viewer tab. Enter DAP data URL and hit enter. An HTTP Authentication box pops up. You may need to expand the pop up window to see all four fields. Enter your credentials and hit Apply.

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Panoply

Panoply is a sophisticated GUI driven data client based around CDM/netCDF data model and utilizes netCDF-Java to access remote DAP datasets.

1. Download latest version of Panoply (https://www.giss.nasa.gov/tools/panoply/download.html).
2. File > Open Remote Dataset
3. Enter DAP data URL and hit Load. Authentication box pops up. Enter credentials and hit Load.

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Matlab and other applications that use netCDF-C library

1. Set up authentication configuration the same as for ncdump.
2. Check the version of the netCDF-C library that the application uses. This requires Matlab R2017a or later.

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Native Python

There are multiple ways to work with GES DISC data resources using Python. For example, the data can accessed using techniques that rely on a native Python code (https://wiki.earthdata.nasa.gov/display/EL/How+To+Access+Data+With+Python).

Still, there are several third-party libraries that can further simplify the access. In the sections below, we describe two techniques that make use of Requests and Pydap libraries.

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Python using 'Requests'

'Requests' is a popular Python library that simplifies Python access to Internet-based resources. In the following code, we demonstrate how to use 'Requests' to access GES DISC data using cookies created by a host operating system.

1. Make sure you have setup your Earthdata account.
2. Create a .netrc file in your home directory.

   On **Mac/Linux**:

a. `cd ~` or `cd $HOME`
b. `touch .netrc`
c. `echo "machine urs.earthdata.nasa.gov (https://urs.earthdata.nasa.gov) login <uid> password <password>" >> .netrc` (where <uid> is your user name and <password> is your Earthdata Login password without the brackets)
d. `chmod 0600 .netrc` (so only you can access it)

On **Windows**:

a. Open Notepad
b. Enter (without quotes): `machine urs.earthdata.nasa.gov (https://urs.earthdata.nasa.gov) login <uid> password <password>`
c. Save as: C:\Users\<username>\.netrc

3. Install Requests (https://pypi.org/project/requests/) library (we recommend version 2.22.0 or later).
4. Download GES DISC data using the following Python3 code:

```
# Set the URL string to point to a specific data URL. Some generic examples are:
#   https://servername/data/path/file
#   https://servername/opendap/path/file[.format[?subset]]
#   https://servername/daac-bin/OTF/HTTP_services.cgi?KEYWORD=value[&KEYWORD=value]
URL = 'your_URL_string_goes_here'

# Set the FILENAME string to the data file name, the LABEL keyword value, or any customized name.
FILENAME = 'your_filename_string_goes_here'

import requests
result = requests.get(URL)
try:
   result.raise_for_status()
   f = open(FILENAME,'wb')
   f.write(result.content)
   f.close()
   print('contents of URL written to '+FILENAME)
except:
   print('requests.get() returned an error code '+str(result.status_code))
```

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Python using 'Pydap'

A convenient access to GES DISC OPeNDAP resources can be also achieved with Pydap, a Python library that both provides an interface for Python programs to read from OPeNDAP servers and the netCDF4 Python module which uses the netCDF-C library to actually access data.

1. Install Pydap (https://www.pydap.org) (we recommend using version 3.2.1)
2. Use the code below to access data on OPeNDAP servers (read more (https://pydap.readthedocs.io/en/latest/client.html#urs-nasa-earthdata)):

```
from pydap.client import open_url
from pydap.cas.urs import setup_session
dataset_url = 'https://server.example.com/path/to/dataset'
session = setup_session(username, password, check_url=dataset_url)
dataset = open_url(dataset_url, session=session)
```

Note: some PyDAP distributions do not include this module. Look at PyDAP HOWTO (https://wiki.earthdata.nasa.gov/display/EL/How+To+Access+Data+With+PyDAP) for sample code to manually include in your PyDAP applications.

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Interactive Data Language (IDL)

Please refer to the how-to document on accessng data remotely using IDL (./information/howto?title=How%20to%20access%20data%20on%20a%20remote%20server%20using%20IDL)

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Grid Analysis and Display System (GrADS)

1. Download GrADS version 2.1.0 or later from here (http://cola.gmu.edu/grads/downloads.php)
2. Create a .netrc file in your home directory and a cookie file as described in above curl download instructions
3. Create .dodsrc file in your home directory and add to it location of .urs_cookies and .netrc files:

HTTP.NETRC=<YourHomeDirectory>/.netrc
HTTP.COOKIEJAR=<YourHomeDirectory>/.urs_cookies

4. Run curl to populate .urs_cookies file, e.g.:

   curl -n -c ~/.urs_cookies -b ~/.urs_cookies -L --url "https://airsl1.gesdisc.eosdis.nasa.gov/data/.dummy.hdf" -o /dev/null

5. Start GrADS. With all these pieces in place, you should be able to use sdfopen with data URL as is:

   ga-> sdfopen https://server[:port]/path/file[.format[?subset]]
   for example: ga-> sdfopen https://goldsmr4.gesdisc.eosdis.nasa.gov/dods/M2TMNXSLV

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Ferret

Ferret is tool developed at NOAA tool to provide analysis and visualization for remote data accessible via OPeNDAP

1. Download latest Ferret version from https://ferret.pmel.noaa.gov/Ferret/
2. Create a .netrc file in your home directory and a .urs_cookie file as described in above curl and wget download instructions
3. Create .dodsrc file in your home directory and add to it location of .urs_cookies and .netrc files:

   HTTP.NETRC=<YourHomeDirectory>/.netrc
   HTTP.COOKIEJAR=<YourHomeDirectory>/.urs_cookies

4. Start Ferret. With all these pieces in place, you should be able to access OPeNDAP files like in this example:

   yes? use
   https://measures.gsfc.nasa.gov/opendap/GSSTF/GSSTF.3/2008/GSSTF.3.2008.01.01.he5
   yes? vector/x=20:140/y=-60:30 STU, STV

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ncdump

ncdump is a tool that utilizes the NetCDF-C library to access Data Access Protocol resources (Use netCDF version 4.4.0 and greater)

1. Create .netrc and .urs_cookies files as described above for wget
2. Create a .dodsrc file in your home directory so that it tells DAP clients to use the .netrc file for password information

Lines to add to .dodsrc file:

```
HTTP.COOKIEJAR=<your home path>/.urs_cookies
HTTP.NETRC=<your home path>/.netrc
```

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OPeNDAP URLs

OPeNDAP (https://earthdata.nasa.gov/esdis/eso/standards-and-references/data-access-protocol-2) URLs can be downloaded just like any other GES DISC URL using different tools as described above. Generally, such URLs conform to the following convention:

```
https://server[:port]/path/file[.format[?subset]] -O output[.format]
```

where

- `[:port]` is the optional port number
- `[.format]` can be `.ascii`, `.nc`, `.nc4`, or `.dods`
- `[?subset]` is the subset for variables, e.g. `/group/dataset[100:1:100][50:1:54]`

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