

# SubX Data Quick Reference Guide

## 1. Where can I find the data?

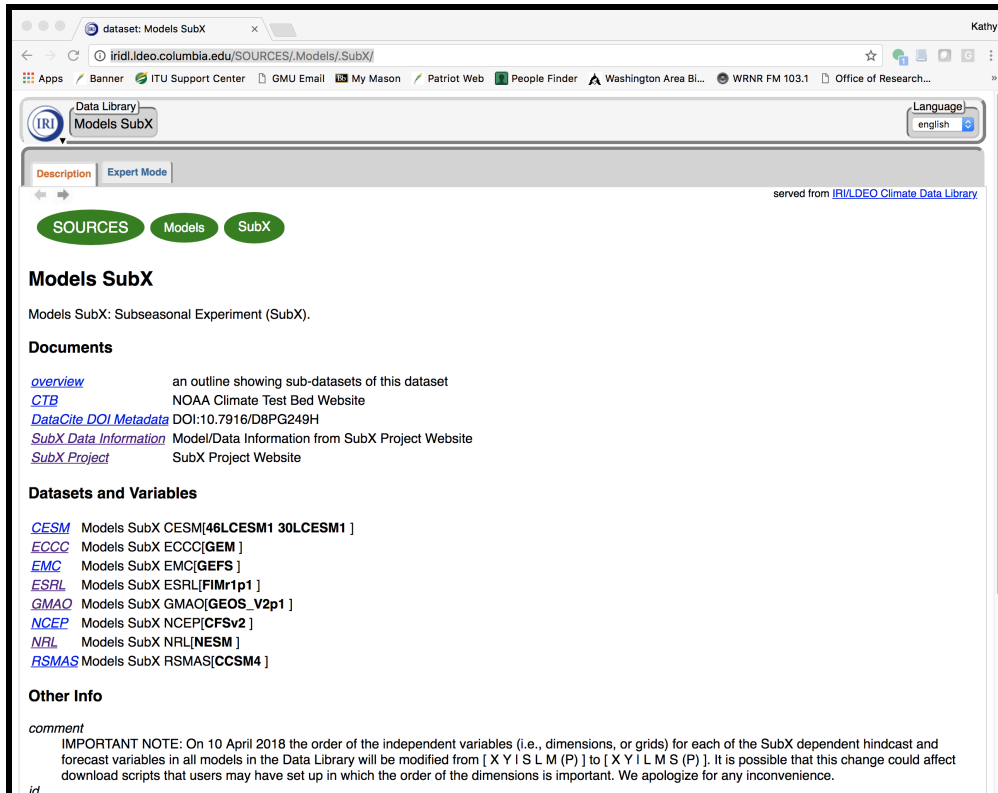
SubX retrospective and real-time forecast data are located on the International Research Institute for Climate and Society Data Library (IRIDL). The URL for this data is:

<http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/>

## 2. How do I know what data are available?

A brief summary of the data available can be found on the SubX website under “Data Description” (<http://cola.gmu.edu/kpegon/subx/data/descr.html>)

You can find more specific details about the data available by navigating to the SubX database at the IRIDL. The web interface allows you to click through the metadata and see what data is provided .

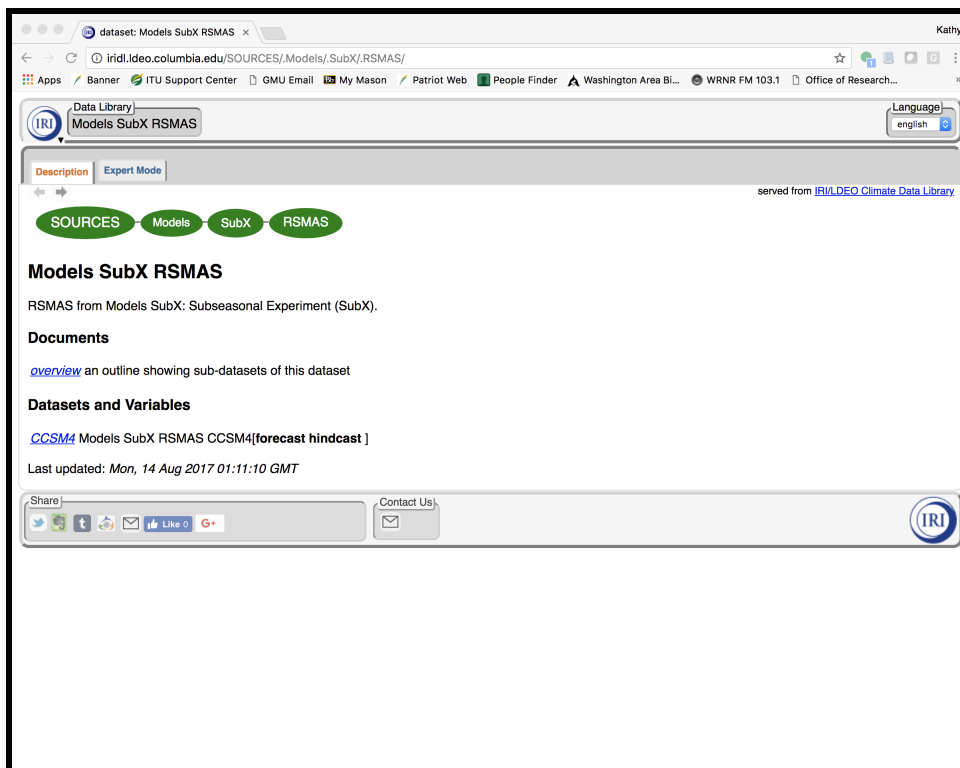


The screenshot shows a web browser window displaying the IRIDL website for the SubX dataset. The browser address bar shows the URL <http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/>. The website header includes the IRIDL logo and a language dropdown menu set to "english". Below the header, there are navigation tabs for "Description" and "Expert Mode", and a breadcrumb trail: "SOURCES" > "Models" > "SubX". The main content area is titled "Models SubX" and includes a brief description: "Models SubX: Subseasonal Experiment (SubX)". Under the "Documents" section, there are links to "overview", "CTB", "DataCite DOI Metadata", "SubX Data Information", and "SubX Project". The "Datasets and Variables" section lists various climate models such as CESM, ECCO, EMC, ESRL, GMAO, NCEP, NRL, and RSMAS. An "Other Info" section contains an important note about a change in the order of independent variables for hindcast and forecast data as of April 10, 2018.

This page shows the modeling groups providing data to SubX. Here, you can see that there are 8 groups with available data (CESM, ECCO, EMC, ESRL, GMAO, NCEP, NRL, RSMAS).

The following steps will walk through an example of how to view more information about available data:

a) Click on one of the groups to see the next level of available data. After clicking on RSMAS, the page below appears. This page shows that there is one model provided by the RSMAS group, CCSM4. If the RSMAS group provides additional models in the future, there will be multiple selections listed here.



b) Click on the model (“CCSM4”) to see the next level of available data. The results are shown in the figure below. This page shows that there are hindcast and forecast data available for this model.

The screenshot shows a web browser window displaying the IRI Data Library page for the dataset "Models SubX RSMAS CCSM4". The browser's address bar shows the URL: [iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/](http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/). The page header includes the IRI logo, the text "Data Library Models SubX RSMAS CCSM4", and a language dropdown menu set to "english". Below the header, there are tabs for "Description" (selected) and "Expert Mode". A breadcrumb trail consists of five green ovals: "SOURCES", "Models", "SubX", "RSMAS", and "CCSM4". The main content area features the title "Models SubX RSMAS CCSM4" and a description: "RSMAS CCSM4 from Models SubX: Subseasonal Experiment (SubX)". Under the "Documents" section, there is a link for "overview" with the text "an outline showing sub-datasets of this dataset". The "Datasets and Variables" section contains two links: "forecast" with the variable list "[va ts pr ua rlut zg tas]" and "hindcast" with the variable list "[va ts pr ua rlut zg dc9916 tas]". A timestamp indicates the page was last updated on "Mon, 14 Aug 2017 01:11:10 GMT". At the bottom, there is a "Share" section with social media icons (Twitter, Facebook, LinkedIn, Email, Like 0, G+) and a "Contact Us" button with an envelope icon. The IRI logo is also present in the bottom right corner.

c) Click on “hindcasts” to see the next level of available data. The results are shown in the figure below. This page shows the available variables for this model (“Datasets and Variables”), the dimensions of the data (“Independent Variables (Grids)”), and additional metadata for this datasets (“Other Info”).

dataset: Models SubX RSMAS x Kathy

iridl.ideo.columbia.edu/SOURCES/Models/SubX/RSMAS/CCSM4/hindcast/

SOURCES Models SubX RSMAS CCSM4 hindcast

## Models SubX RSMAS CCSM4 hindcast

RSMAS CCSM4 hindcast from Models SubX: Subseasonal Experiment (SubX).

### Documents

[outline](#) an outline showing all sub-datasets and variables contained in this dataset

### Datasets and Variables

<a href="#">dc9916</a>	1999-2016 Daily Hindcast Climatology.
<a href="#">Total Precipitation</a>	Models SubX RSMAS CCSM4 hindcast pr[ X Y I L M S]
<a href="#">Outgoing Longwave Radiation at Top of Atmosphere</a>	Models SubX RSMAS CCSM4 hindcast rlut[ X Y I L M S]
<a href="#">2-meter Air Temperature</a>	Models SubX RSMAS CCSM4 hindcast tas[ X Y I L M S]
<a href="#">Surface Temperature</a>	Models SubX RSMAS CCSM4 hindcast ts[ X Y I L M S]
<a href="#">Zonal Velocity</a>	Models SubX RSMAS CCSM4 hindcast ua[ X Y I L M S P]
<a href="#">Meridional Velocity</a>	Models SubX RSMAS CCSM4 hindcast va[ X Y I L M S P]
<a href="#">Geopotential Height</a>	Models SubX RSMAS CCSM4 hindcast zg[ X Y I L M S P]

### Independent Variables (Grids)

<i>Lead</i> (forecast_period)	grid: /L (days) ordered (0.5 days) to (44.5 days) by 1.0 N= 45 pts :grid
<i>Ensemble Member</i> (realization)	grid: /M (ids) ordered (1) to (3) by 1.0 N= 3 pts :grid
<i>Pressure Level</i> (air_pressure)	grid: /P (hPa) ordered [ (850) (500) (200)] :grid
<i>Start Time</i> (forecast_reference_time)	grid: /S (days since 1960-01-01) ordered (0000 7 Jan 1999) to (0000 31 Dec 2016) by 1.0 N= 6569 pts :grid
<i>Longitude</i> (longitude)	grid: /X (degree_east) periodic (0) to (1W) by 1.0 N= 360 pts :grid
<i>Latitude</i> (latitude)	grid: /Y (degree_north) ordered (90S) to (90N) by 1.0 N= 181 pts :grid

### Other Info

*contact*  
Dughong Min (dmin@rsmas.miami.edu) and Ben Kirtman (bkirtman@rsmas.miami.edu)

*Conventions*  
CF-1.0

*frequency*  
daily

*Generator*  
NCL v.6.0

*institution*  
Univ. of Miami - Rosenstiel School of Marine & Atmosphereric Science

*institution\_id*  
UM-RSMAS

*model\_id*  
CCSM4\_0\_a02

*modeling\_realm*  
atmos

*project\_id*

d) Next, select a variable (e.g. 2-meter Air Temperature) to view the available data for that variable. The results are shown in the figure below. The dimension information is shown (“Independent Variables (Grids)” as well as other metadata (“Other Info”).

data: Models SubX RSMAS CC x

iridl.ideo.columbia.edu/SOURCES/Models/SubX/RSMAS/CCSM4/hindcast/tas/

Language: english

Models SubX RSMAS CCSM4 hindcast tas

0.5W - 0.5W 90.5S - 90.5N [0.0 45.0] days 1 - 3 7 Jan 1999 - 30 Dec 2016

Description Views Data Filters Data Selection Data Files Data Tables Expert Mode

SOURCES Models SubX RSMAS CCSM4 hindcast tas

### Models SubX RSMAS CCSM4 hindcast tas: 2-meter Air Temperature data

RSMAS CCSM4 hindcast 2-meter Air Temperature from Models SubX: Subseasonal Experiment (SubX).

#### Independent Variables (Grids)

**Lead** (forecast\_period)  
grid: /L (days) ordered (0.5 days) to (44.5 days) by 1.0 N= 45 pts :grid

**Ensemble Member** (realization)  
grid: /M (ids) ordered (1) to (3) by 1.0 N= 3 pts :grid

**Start Time** (forecast\_reference\_time)  
grid: /S (days since 1960-01-01) ordered (0000 7 Jan 1999) to (0000 31 Dec 2016) by 1.0 N= 6569 pts :grid

**Longitude** (longitude)  
grid: /X (degree\_east) periodic (0) to (1W) by 1.0 N= 360 pts :grid

**Latitude** (latitude)  
grid: /Y (degree\_north) ordered (90S) to (90N) by 1.0 N= 181 pts :grid

#### Other Info

**cell\_method**  
time: mean

**datatime**  
realarraytype

**level\_type**  
2 meters above ground

**missing\_value**  
9.96920997E36

**pointwidth**  
0.0

**standard\_name**  
air\_temperature

**units**  
Kelvin\_scale

**standard units\***  
degree\_Kelvin above 0

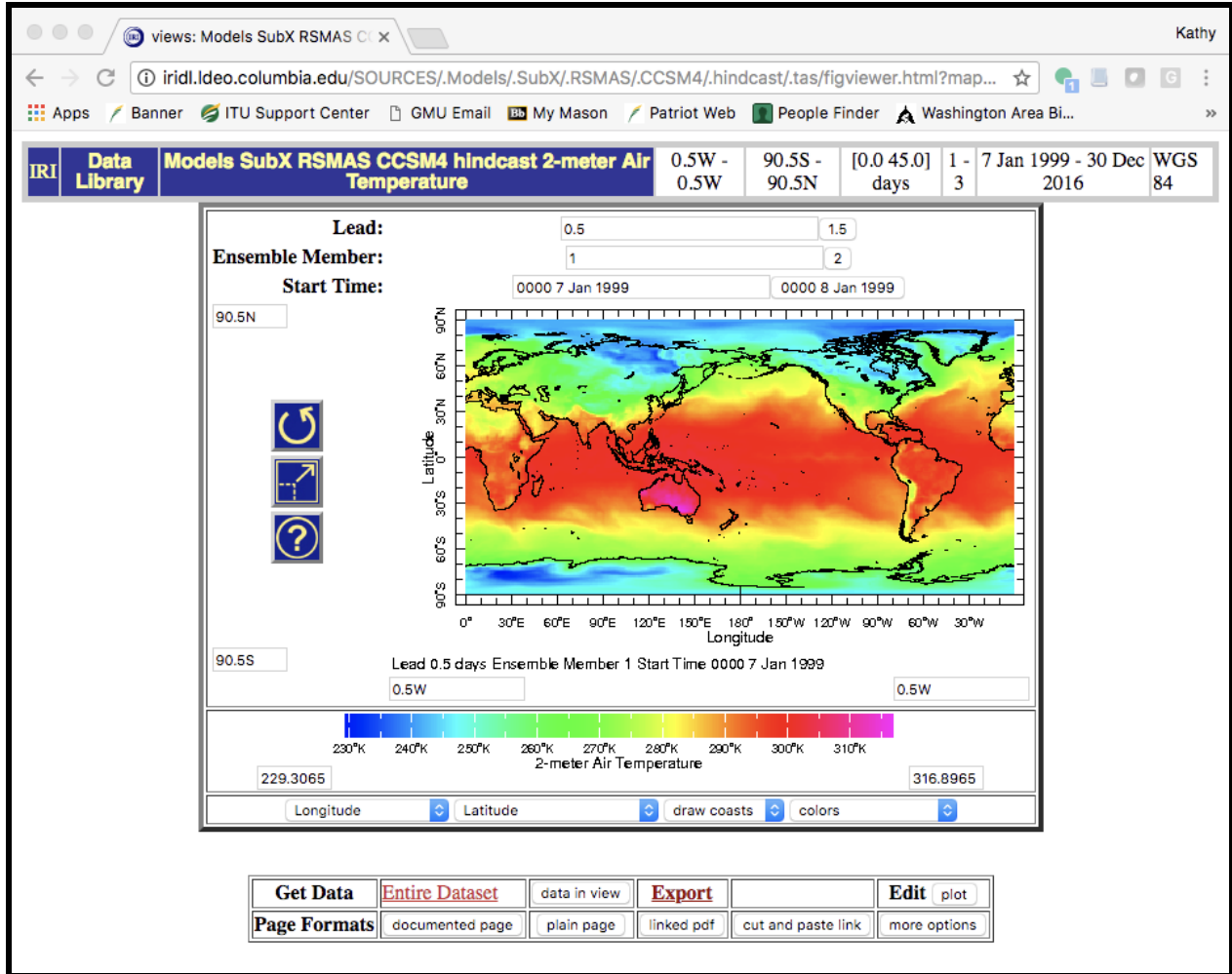
Last updated: Tue, 10 Apr 2018 20:02:08 GMT

Share Contact Us

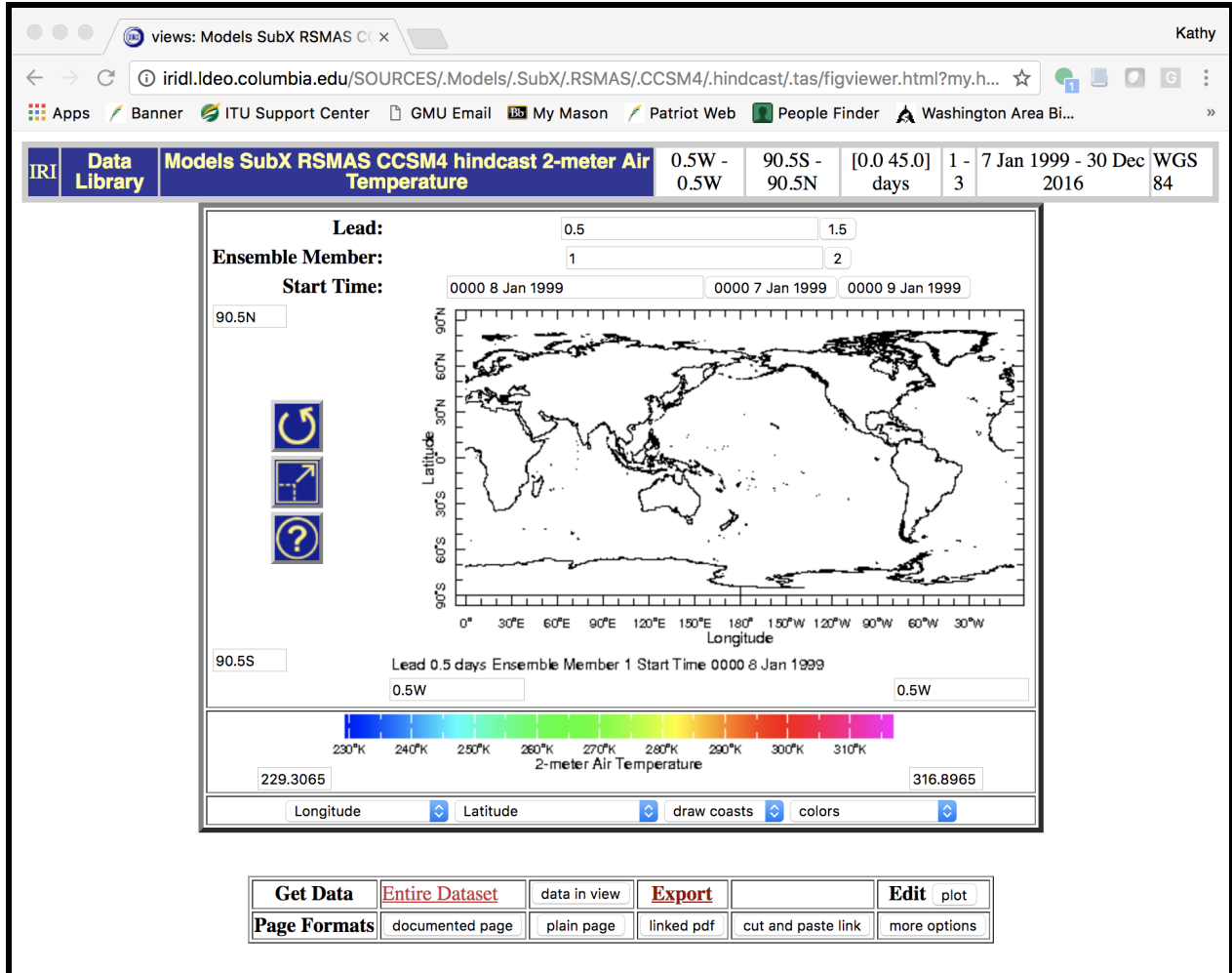
e) The IRIDL provides a data viewer that allows the user to see a graph of the data as well as various other options for working with the dataset. Near the top of the page, there are 7 tabs, one of which is labelled “Views”. Selecting this tab will bring up options for how you wish to see the data in the data viewer (see figure below).

The screenshot shows a web browser window with the URL `iridl.ideo.columbia.edu/SOURCES/Models/SubX/RSMAS/CCSM4/hindcast/tas/#views`. The page title is "data: Views" and the user is logged in as "Kathy". The interface includes a navigation bar with tabs for "Description", "Views", "Data Filters", "Data Selection", "Data Files", "Data Tables", and "Expert Mode". The "Views" tab is active, displaying a "Data Views" section with five view options: "data as colors", "data as contours", "colors with land", "contours with land", and "colors with coasts". The "colors with coasts" option is highlighted. Below the view options, there is a "Share" section with social media icons and a "Contact Us" button. The IRI logo is visible in the bottom right corner.

f) Choose the “colors with coasts” to view the data on a map with coastlines drawn in (see figure below). This shows the 2m temperature data for the RSMAS, CCSM4 dataset for Lead=0.5, Ensemble Member=1, and Start Time: Jan 7, 1999 for the entire globe. In the data viewer, you can change the longitude and latitudes over which to view the data, the values over which to contour, and the lead time, ensemble member, or start time to view.

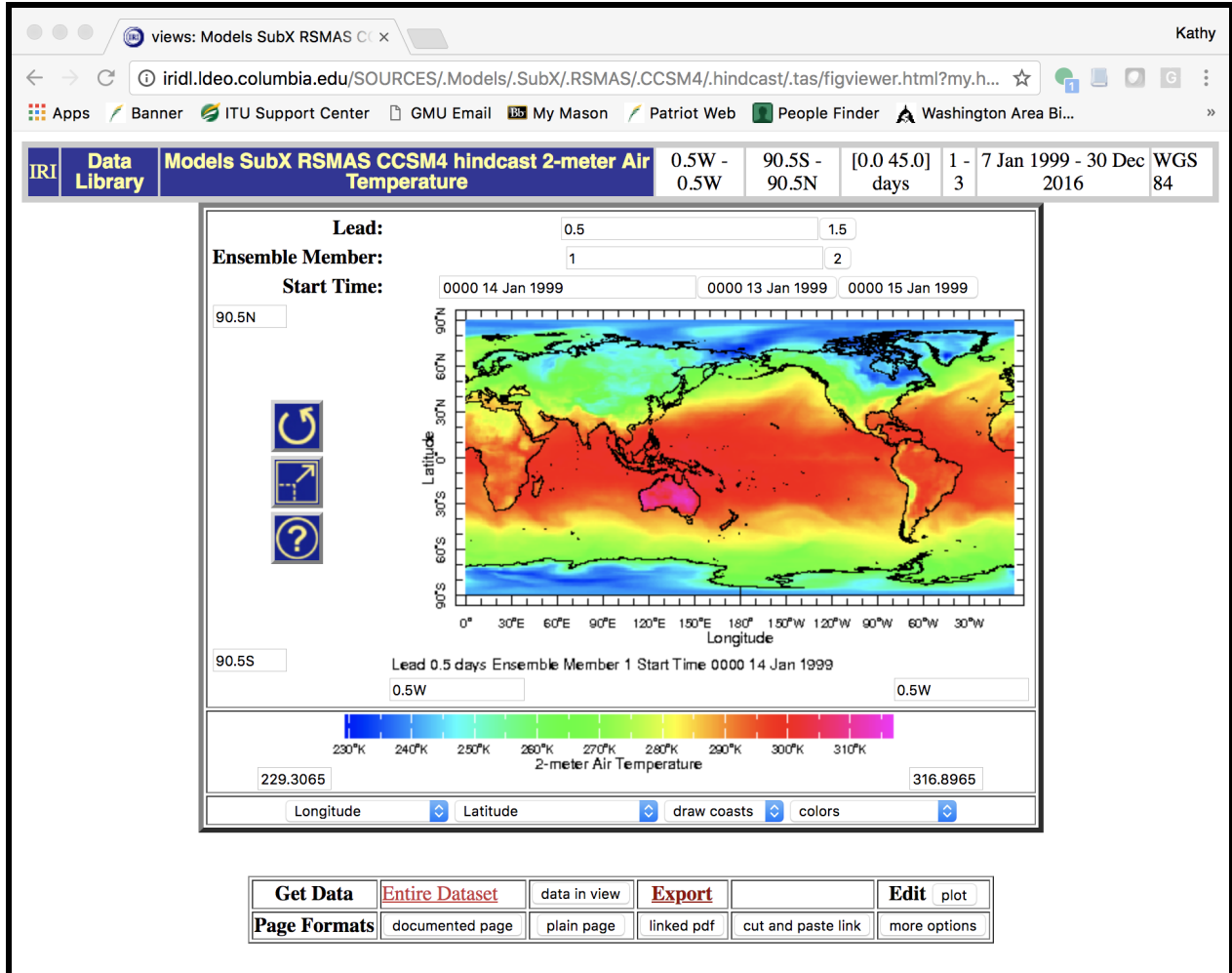


g) Since the SubX dataset contains data initialized weekly and the initialization data for the models can vary, it is helpful to use the data viewer to identify the start times for which there is data. Click the Start Time: 0000 8 Jan 1999 button to view the data for re-forecasts initialized on Jan 8, 1999. The results are shown below, which shows a map with no data. This is because no data exists for the RSMAS-CCSM4 model for start times of Jan 8, 1999.



h) The RSMAS-CCSM4 re-forecasts are initialized every 7 days (see table of this information for each model <http://cola.gmu.edu/kpegon/subx/data/descr.html>), so the next start date for which there should be available data is Jan 14, 1999. Click on the dates next to start time until Jan 14, 1999 has been selected. The results are shown below. The data viewer shows a contoured map of 2m Temperature for the RSMAS-CCSM4 model for Lead=0.5, Ensemble Member=1, and Start Time=Jan 14, 1999. All of the data for RSMAS-CCSM4 can be viewed in this way using the data viewer.





### 3. How do I download the data?

#### Overview

The IRI Data Library is an OPeNDAP Server. Therefore various languages and environments can be used to access the SubX data via OPeNDAP. Once an OPeNDAP connection has been established, the data are stored as netCDF. To establish an OPeNDAP connection, you supply the application a URL and the data can be directly downloaded.

To determine the URL for the data you wish to download, you can click through the available data until you arrive at a dataset you wish to download (see section 2). Following the example from section 2 and arriving at Figure 5, select the tab "Data Files" and "OPeNDAP". The URL for this dataset is provided as:

<http://iridl.ideo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods> (Figure 10)

DODS download for Models Su x

iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods

**DODS data downloads**

DODS allows one to give an application a url and have it directly download data. In this case the url is **http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods**

**Examples of using DODS**

<b>ingrid</b>	(http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods)readdods
<b>GrADS*</b>	sdfopen http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods
<b>ferret</b>	set data "http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods"
<b>matlab</b>	loaddap('http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/.RSMAS/.CCSM4/.hindcast/.tas/dods')

When you give that url to a DODS client, it actually sends a url with one of the following six file extensions: .das, .dds, .dods, .info, .ver or .help. The extensions tell the DODS server which object to return (see table).

**Note:** Many DODS clients supply these extensions for you so you don't need to append them (for example when using interfaces supplied by DODS or software re-linked with a DODS client-library). Generally, you only need to add these extensions if you are typing a URL directly into a WWW browser.

<b>das</b>	attribute object
<b>dds</b>	data type object
<b>dods</b>	data object
<b>info</b>	info object (attributes, types and other information)
<b>ver</b>	return the version number of the server
<b>help</b>	help information (this text)

\*On GrADS startup, the config line should read **Config: ... DODS-enabled ...**, otherwise DODS is not installed and giving GrADS a URL will result in a file-not-found error.

Figure 10

### Sample Programs & Tutorial

Sample programs to download data are available in Matlab, Python, NCL, and GrADS. These codes are available on Github (<https://github.com/kpegion/SubX>). The step-by-step instructions below show how to get the data using the Python sample codes.

a) Download the Python code from Github

The quickest way to download codes from GitHub for users who are not experienced with git is to navigate to the github page and then click the green "Clone or Download" button (Figure 11). Select the "Download ZIP" option. The file SubX-master.zip will be downloaded. You will need to place the file on the correct computer and in the location you want it. For example, I use scp to transfer the file to my local servers used for data processing.

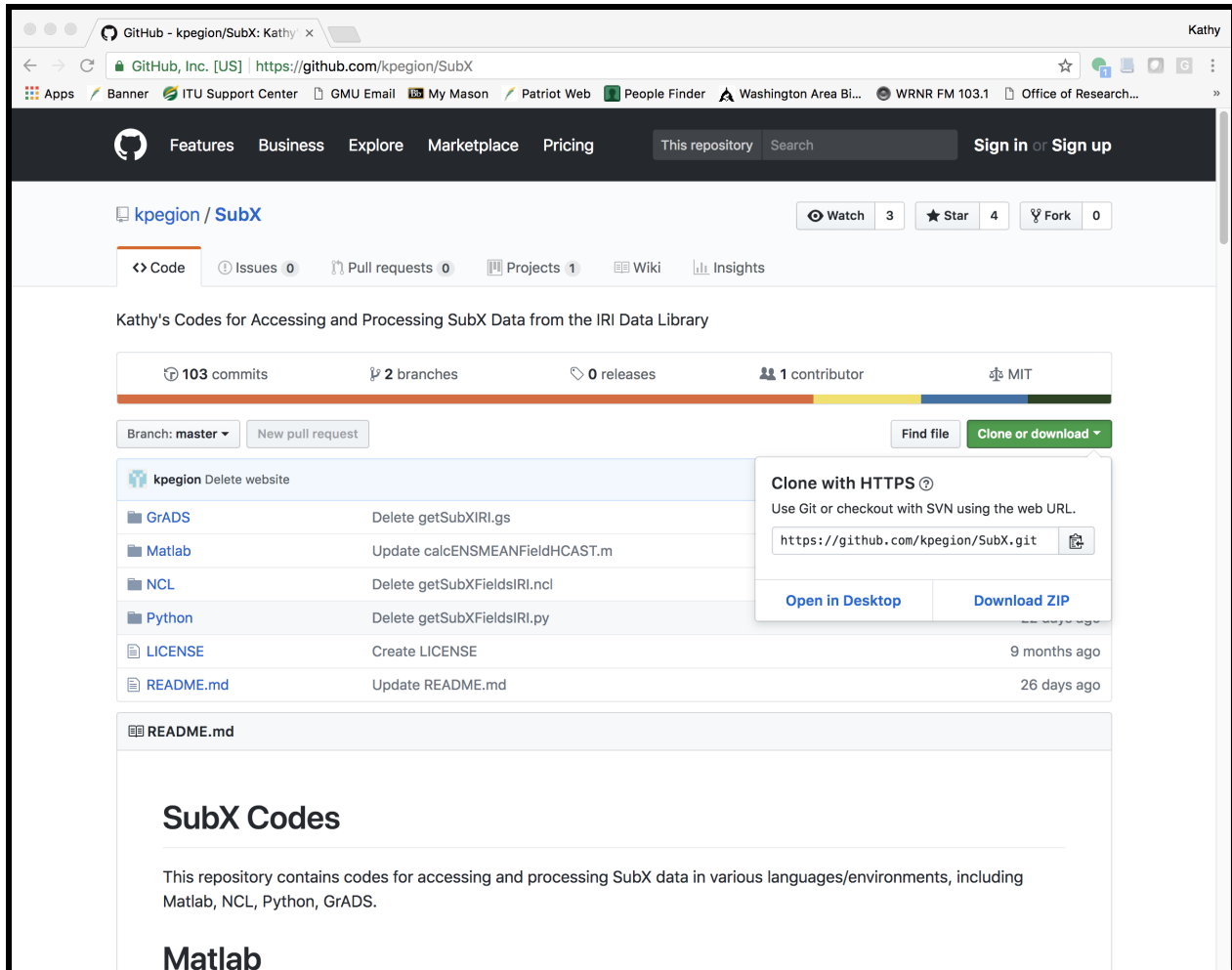


Figure 11

b) Once the file has been moved to the correct location, unzip the file. You will now have a directory called SubX-master that contains all of the SubX codes from GitHub.

c) cd to the Subx-Master directory where you will all of the GitHub SubX codes

```
[kpegion@atlas1 testSubX]$ cd SubX-master/
[kpegion@atlas1 SubX-master]$ ls
GrADS LICENSE Matlab NCL Python README.md
[kpegion@atlas1 SubX-master]$
```

d) cd to the Python directory, where you will see a file called getSubXFieldsIRIRXYLMSP.py

```
[kpegion@atlas1 SubX-master]$ cd Python/
[kpegion@atlas1 Python]$ ls
getSubXFieldsIRIRXYLMSP.py
```

e) View the file getSubXFieldsIRIXYLMSP.py in your favorite text editor.

In the section labelled "Variables to be modified by user", modify the following:

outPath - change to the location you wish to download the data  
varnames - change to the variables you wish to download  
plevstrs - change to the variables/levels you wish to download (these must match with the varnames)  
groups - change to the modelling group for data you wish to download  
models - change to the models for data you wish to download (these must match with the group names)

As an example, to download the RSMAS, CCSM4, 2m temperature data, set the variables to the following:

```
varnames=['tas']  
plevstrs=['2m']  
groups=['RSMAS']  
models=['CCSM4']
```

f) Run the program.

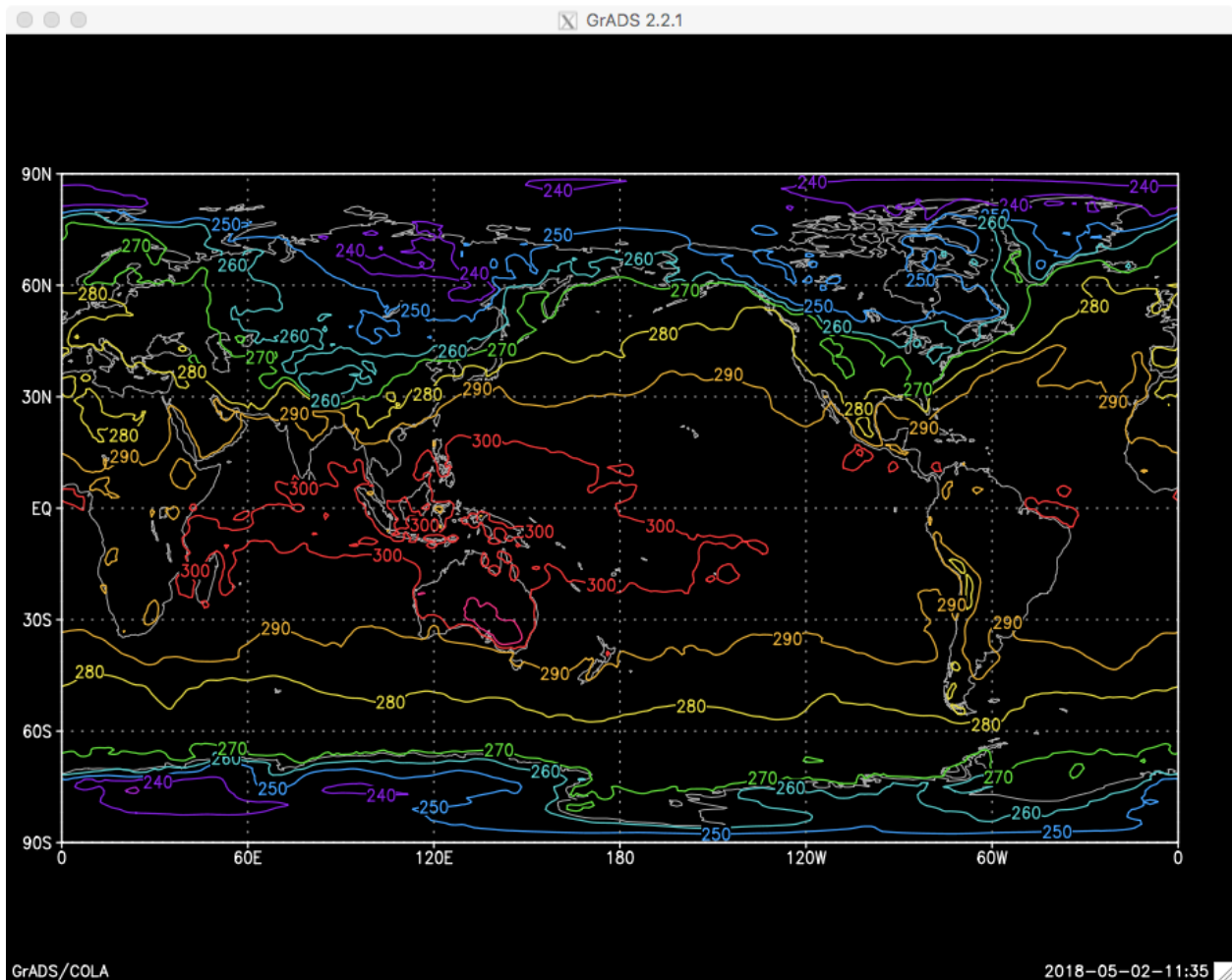
When you run the program, it may appear that nothing is happening. This is because the program is busy downloading the data. Since this is a large dataset, it will take a long time for the program to run.

g) Check to see that the data is being downloaded correctly. The data will be located in:

<outPath>/tas2m/daily/full/RSMAS-CCSM4/

```
[kpegion@atlas1 RSMAS-CCSM4]$ ls -la  
total 31580  
drwxr-xr-x 2 kpegion users 12 May 2 11:27 .  
drwxr-xr-x 4 kpegion users 4 May 2 11:26 ..  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:26 tas_2m_RSMAS-CCSM4_19990107.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:26 tas_2m_RSMAS-CCSM4_19990108.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:26 tas_2m_RSMAS-CCSM4_19990109.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:26 tas_2m_RSMAS-CCSM4_19990110.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:26 tas_2m_RSMAS-CCSM4_19990111.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:26 tas_2m_RSMAS-CCSM4_19990112.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:27 tas_2m_RSMAS-CCSM4_19990113.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:27 tas_2m_RSMAS-CCSM4_19990114.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:27 tas_2m_RSMAS-CCSM4_19990115.e1.daily.nc  
-rw-r--r-- 1 kpegion users 11743938 May 2 11:27 tas_2m_RSMAS-CCSM4_19990116.e1.daily.nc
```

h) Since the data are in netcdf, they are easy to view using your favorite method for plotting data. For example, viewing the data in `tas_2m_RSMAS-CCSM4_19990107.e1.daily.nc` using GrADS for the first lead time, produces the map below. I can confirm that these data are correct by comparing it with a map of the data in the IRIDL data viewer (see section 2).



#### i) Additional information

Data files will be downloaded for all start dates, this includes start dates for which there is all missing data. This means that some files will contain all missing data. As an example, the figure below shows the map for RSMAS-CCSM4, 2m Temperature for the file `tas_2m_RSMAS-CCSM4_19990108.e1.daily.nc`. As explained in section 2, RSMAS-CCSM4 does not have data for start dates on Jan 8, 1999. Therefore, a map of this data in GrADS looks like:

