

Introduction to Climate Information Service of APCC (ADSS & CLIPs)

Hyunrok Lee

Information Service Team
Climate Prediction Department



Climate Information Service of APCC



LOGIN | CONTACT US | SITE MAP | 한국어 Q

Research | Climate Information Services | International Cooperation | Media | Notices | About us



CLIMATE INFORMATION SERVICES

Seasonal Forecast

BSISO Forecast

Climate Monitoring

CLIK

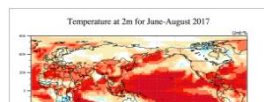
Data Service

CLIPS

FORECASTS +

NOTICE +

P.R. +

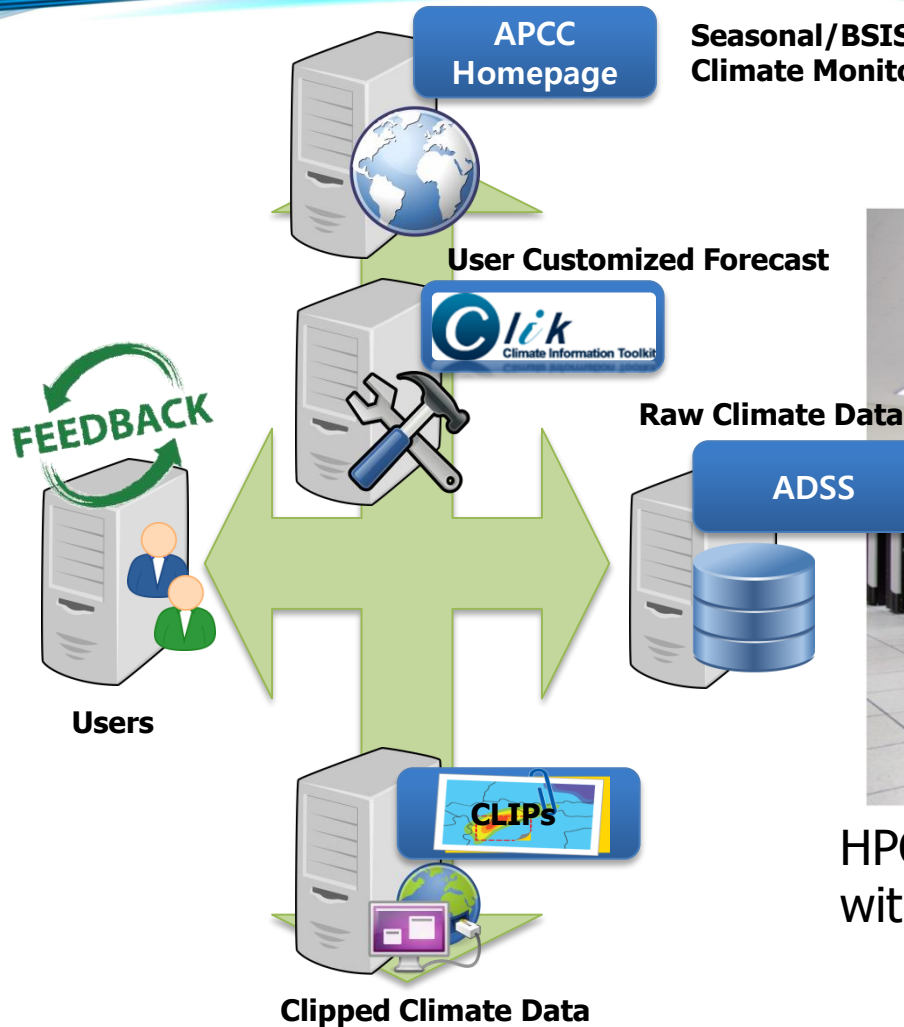


APCC News	Employment	APCC Seminars
Notice	The APEC Climate Center Launched ...	05.22
Notice	APEC Climate Center held the Works...	05.08



<http://www.apcc21.org>

Climate Information Service Architecture



HPC (High Performance Computing)
with Mass Climate Data Storage @ APCC

*3.47GHz * 1,260 Cores
3 Peta Bytes (3,000 Tera Bytes) Storage*

- **ADSS (APCC Data Service System)**
 - Developed for real-time **climate monitoring and provision of digital data service** to APEC member economies
 - A climate data provision service using **FTP** and **OPeNDAP** protocol
 - Climate information comes from a variety of sources
 - Including forecast models, in situ observation platforms, satellites, and climate re-analyses, which are a blend of observational and model data

- **ADSS (APCC Data Service System)**

ADSS APCC Data Service System

LOGIN | REGISTER | CONTACT US



The APEC Climate Center Data Service System was developed for real-time climate monitoring and provision of digital data service to APEC member economies. This system underscores the role of APCC in playing an important role as a hub of climate data and services in the region. The main objective of the ADSS is to provide a comprehensive set of models and observational climate data to various researchers and users to establish a scientific basis for climate prediction. ADSS also aims to monitor climate information using near real-time in-situ observation and prediction data in a standardized and accessible format for various users.

NOTICE

When you use MME and individual model data, Please acknowledge us by include following text, "The authors acknowledge that the APCC Multi Model Ensemble(MME) Producing Centers for making their data available for analysis and the APEC Climate Center for collecting and archiving them and for organizing APCC MME prediction."

MME Data : Register user only
CLIQ, ADSS share user ID via SSO
Other Data : Open to everyone

NOTICE

When you use MME and individual model data, Please acknowledge us by include following text, "The authors acknowledge that the APCC Multi Model Ensemble(MME) Producing Centers for making their data available for analysis and the APEC Climate Center for collecting and archiving them and for organizing APCC MME prediction."

DataSet	Areal Coverage	Grid Size	Time Step	Access	Source	Requirements
APCC-MME(6-MON)	Global	2.5×2.5(degree)	Monthly		APCC	Login
APCC-MME(3-MON)	Global	2.5×2.5(degree)	Monthly		APCC	Login
INDIVIDUAL-MODEL(6-MON)	Global	2.5×2.5(degree)	Monthly		APCC	Login
INDIVIDUAL-MODEL(3-MON)	Global	2.5×2.5(degree)	Monthly		APCC	Login
CORDEX-SEA25	Regional	25km	Daily		APCC	
CORDEX-SEA50	Regional	50km	Daily		APCC	
Clipped CMIP5	National level (22 Countries)	Depending on GCMs	Daily		ESGF	
IRI_DATA_LIBRARY	Global	2.5×2.5(degree)	Various		IRI	

<http://adss.apcc21.org>

- How to access the data files from ADSS
 - Conventional FTP

```
1 adss.apcc21.org:21
Kshell:\> ftp adss.apcc21.org

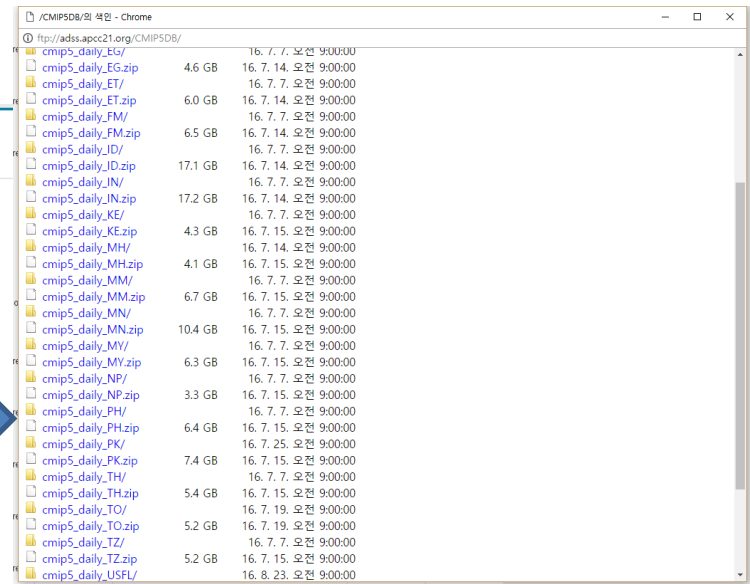
Looking up host 'adss.apcc21.org'...
Host 'adss.apcc21.org' resolved to 210.98.49.149.
Connecting to 210.98.49.149:21...
Connection established.
Escape character is '^@]'.
220 Welcome
Name (adss.apcc21.org:~): anonymous
331 Please specify the password.
Password:
230 Login successful.
ftp:> ls -al
227 Entering Passive Mode (210,98,49,149,20,201).
150 Here comes the directory listing.
drwxr-xr-x  12 928      100          4096 Jul 25  2016 .
drwxr-xr-x  12 928      100          4096 Jul 25  2016 ..
drwxr-xr-x  26 928      100         16384 Apr 10  07:44 CMIP5DB
drwxr-xr-x   4 928      100          4096 Jun 01 12:52 CORDEX-SEA
drwxr-xr-x   3 928      100          4096 Sep 04  2014 GHCN
drwxr-xr-x   3 928      100          4096 Sep 04  2014 GPCP
drwxr-xr-x   4 928      100          4096 Aug 17  2016 NCEP
drwxr-xr-x   4 928      100          4096 Nov 10  2015 NCEP_SFC
drwxr-xr-x   4 928      100          4096 Nov 10  2015 NOAA_OLR
drwxr-xr-x   4 928      100          4096 Nov 10  2015 QuikScat
drwxr-xr-x   4 928      100          4096 Nov 10  2015 TMI
drwxr-xr-x   3 928      100          4096 Sep 04  2014 WIMT
226 Directory send OK.
ftp:>
```

ADSS

[4/14]

- How to access the data files from ADSS
 - Web FTP

DataSet	Areal Coverage	Grid Size	Time Step	Access
APCC-MME(6-MON)	Global	2.5×2.5(degree)	Monthly	  
APCC-MME(3-MON)	Global	2.5×2.5(degree)	Monthly	  
INDIVIDUAL-MODEL(6-MON)	Global	2.5×2.5(degree)	Monthly	  
INDIVIDUAL-MODEL(3-MON)	Global	2.5×2.5(degree)	Monthly	  
CORDEX-SEA25	Regional	25km	Daily	  
CORDEX-SEA50	Regional	50km	Daily	  
Clipped CMIP5	National level (22 Countries)	Depending on GCMs	Daily	  



Click FTP icon & Download the data

- **How to access the data files from ADSS**
 - OPeNDAP (Open-source Project for a Network Data Access Protocol)
 - OPeNDAP is a framework that simplifies all aspects of scientific data networking.
 - Just open a specific OPeNDAP URL, then use the data.
 - Advantage
 - It makes local data accessible to remote locations regardless of local storage format.
 - Familiar data analysis and visualization packages like Fortran, NCL, R, GrADS, Matlab, etc. are supporting OPeNDAP.
 - It is possible to access only the point of data interest – extracting geographical area, time series, etc. -

- **How to access the data files from ADSS**
 - 1. Download & Install OPeNDAP software from <https://www.opendap.org/support/OPeNDAP-clients>



- [Home](#)
- [About Us](#)
- [Software](#)
- [Support](#)
- [User Documentation](#)
- [Design Documentation](#)
- [Project Documentation](#)
- [Available Client Software](#)
- [Available Server Software](#)
- [Data Handlers](#)
- [OPeNDAP Mailing Lists](#)
- [OPeNDAP Wiki](#)
- [Software Wish List](#)
- [FAQ](#)

Search

[Home](#) > [Support](#)

Available OPeNDAP Client Software

OPeNDAP Clients:

NCL - Scientific data analysis and visualization software

NCL is a scientific data analysis and visualization software package freely available from [NCAR](#).

For more information and **to download**, go to www.ncl.ucar.edu.

CDAT (Climate Data Analysis Tools)























CDAT (developed at [PCMDI](#)) is a software infrastructure that forms an integrated environment for solving model diagnosis problems. CDAT uses Python to seamlessly link together separate software subsystems and packages. CDAT version 3.3 is not distributed as a OPeNDAP client but can be re-linked to the OPeNDAP client libraries. CDAT version 4.0 will be distributed with that step integrated in the CDAT build.

To Download and for more information on CDAT, go to cdat.sf.net.

ADSS

[7/14]

- How to access the data files from ADSS
 - 2. Browse the collection of data at ADSS
 - 3. Copy the URL of the data file to your client software

DataSet	Areal Coverage	Grid Size	Time Step	Access	Source	Requirements																																		
APCC-MME(6-MON)	Global	2.5×2.5(degree)	Monthly	  																																				
APCC-MME(3-MON)	Global	2.5×2.5(degree)	Monthly	  	Contents of /MME/6-MON/FORECAST/GAUS/APR/2017																																			
INDIVIDUAL-MODEL(6-MON)	Global	2.5×2.5(degree)	Monthly	  	<table border="1"><thead><tr><th>Name</th><th>Last Modified</th><th>Size</th><th>DMP Response Links</th><th>Dataset Viewers</th></tr></thead><tbody><tr><td>prec.nc</td><td>2017-04-20T09:53:25</td><td>1011560</td><td>dds das info html rdf</td><td>viewers</td></tr><tr><td>slp.nc</td><td>2017-04-20T09:53:24</td><td>1011560</td><td>dds das info html rdf</td><td>viewers</td></tr><tr><td>sst.nc</td><td>2017-04-20T09:53:25</td><td>1011568</td><td>dds das info html rdf</td><td>viewers</td></tr><tr><td>t2m.nc</td><td>2017-04-20T09:53:25</td><td>1011564</td><td>dds das info html rdf</td><td>viewers</td></tr><tr><td>t850.nc</td><td>2017-04-20T09:53:25</td><td>1011572</td><td>dds das info html rdf</td><td>viewers</td></tr><tr><td>z500.nc</td><td>2017-04-20T09:53:25</td><td>1011572</td><td>dds das info html rdf</td><td>viewers</td></tr></tbody></table>	Name	Last Modified	Size	DMP Response Links	Dataset Viewers	prec.nc	2017-04-20T09:53:25	1011560	dds das info html rdf	viewers	slp.nc	2017-04-20T09:53:24	1011560	dds das info html rdf	viewers	sst.nc	2017-04-20T09:53:25	1011568	dds das info html rdf	viewers	t2m.nc	2017-04-20T09:53:25	1011564	dds das info html rdf	viewers	t850.nc	2017-04-20T09:53:25	1011572	dds das info html rdf	viewers	z500.nc	2017-04-20T09:53:25	1011572	dds das info html rdf	viewers
Name	Last Modified	Size	DMP Response Links	Dataset Viewers																																				
prec.nc	2017-04-20T09:53:25	1011560	dds das info html rdf	viewers																																				
slp.nc	2017-04-20T09:53:24	1011560	dds das info html rdf	viewers																																				
sst.nc	2017-04-20T09:53:25	1011568	dds das info html rdf	viewers																																				
t2m.nc	2017-04-20T09:53:25	1011564	dds das info html rdf	viewers																																				
t850.nc	2017-04-20T09:53:25	1011572	dds das info html rdf	viewers																																				
z500.nc	2017-04-20T09:53:25	1011572	dds das info html rdf	viewers																																				
INDIVIDUAL-MODEL(3-MON)	Global	2.5×2.5(degree)	Monthly	  	<small>THREDDS Catalog 325</small>	<small>Hyrax development sponsored by NASA, and NOAA</small>																																		
CORDEX-SEA25	Regional	25km	Daily	  	OpeNDAP Hyrax (1.13.0)	Documentation																																		
CORDEX-SEA50	Regional	50km	Daily	  																																				
Clipped CMIP5	National level (22 Countries)	Depending on GCMs	Daily	  																																				

- **How to access the data files from ADSS**

- Example 1. NCL code https://www.ncl.ucar.edu/Download/install_dap.shtml

```
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/gsn_code.ncl"
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/gsn_csm.ncl"
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/contributed.ncl"
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/diagnostics_cam.ncl"
begin
  date = "20170415"
  varName = "t2m"
  inFile = "http://adss.apcc21.org/opendap/MME/3-
  MON/FORECAST/GAUS/APR/2017/t2m.nc"
  outFile = "./test_t2m_"+date

  ;;-----;;
  readF = addfile(inFile,"r")
  t2m = readF->$varName$

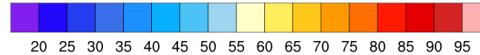
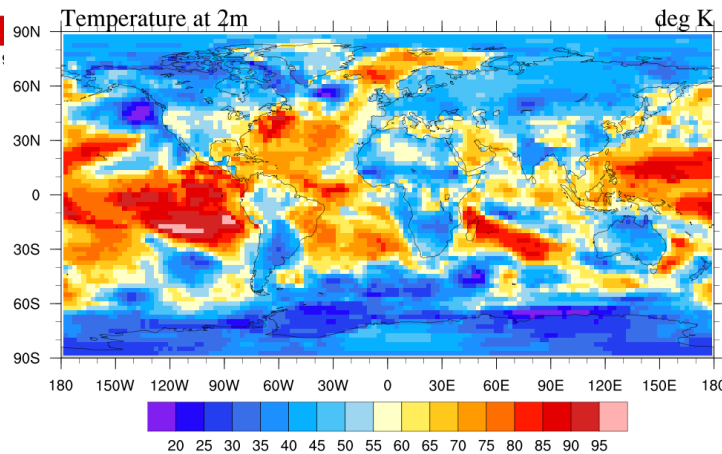
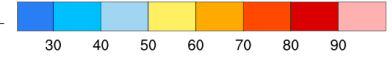
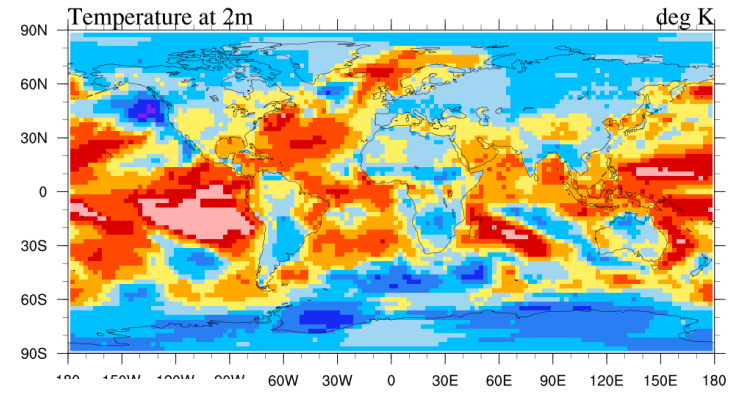
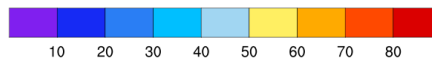
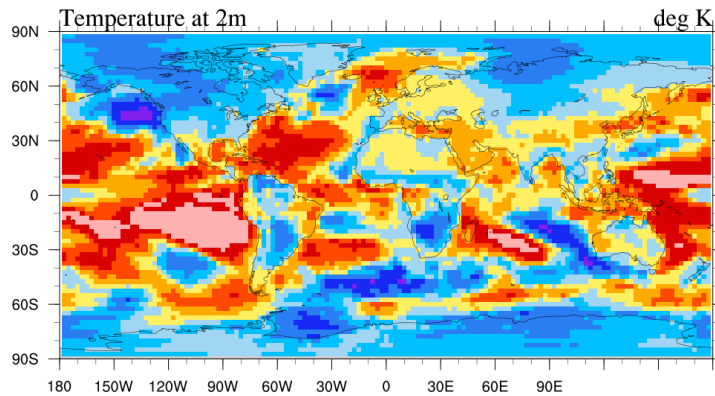
  type = "x11"
  type@wkWidth=1000
  type@wkHeight=1000
  wks = gsn_open_wks(type,outFile)
  gsn_define_colormap(wks,"ncl_default")
  ;;-----;;
```

```
plot = new((/3/),"graphic")

do itime=0,2
  res = True
  res@gsnDraw = True
  res@gsnFrame = True
  res@gsnPaperOrientation = "landscape"
  res@gsnAddCyclic = True
  res@gsnStringFont = "times-roman"
  res@gsnLeftStringOrthogonalPosF = 0.001
  res@gsnRightStringOrthogonalPosF = 0.001
  res@gsnStringFontHeightF = 0.02
  res@cnFillOn = True
  res@cnFillMode = "CellFill"
  res@cnLinesOn = False
  res@cnLineLabelsOn = False

  plot(itime) =
  gsn_csm_contour_map(wks,t2m(itime,0,:),res)
end do
end
```

- How to access the data files from ADSS
 - Example 1. NCL result



• How to access the data files from ADSS

– Example 2. R Code

NetCDF(ncdf4) library is needed for .nc file access

<https://cran.rstudio.com/web/packages/ncdf4/index.html>

Use raster, rworldmap for plotting

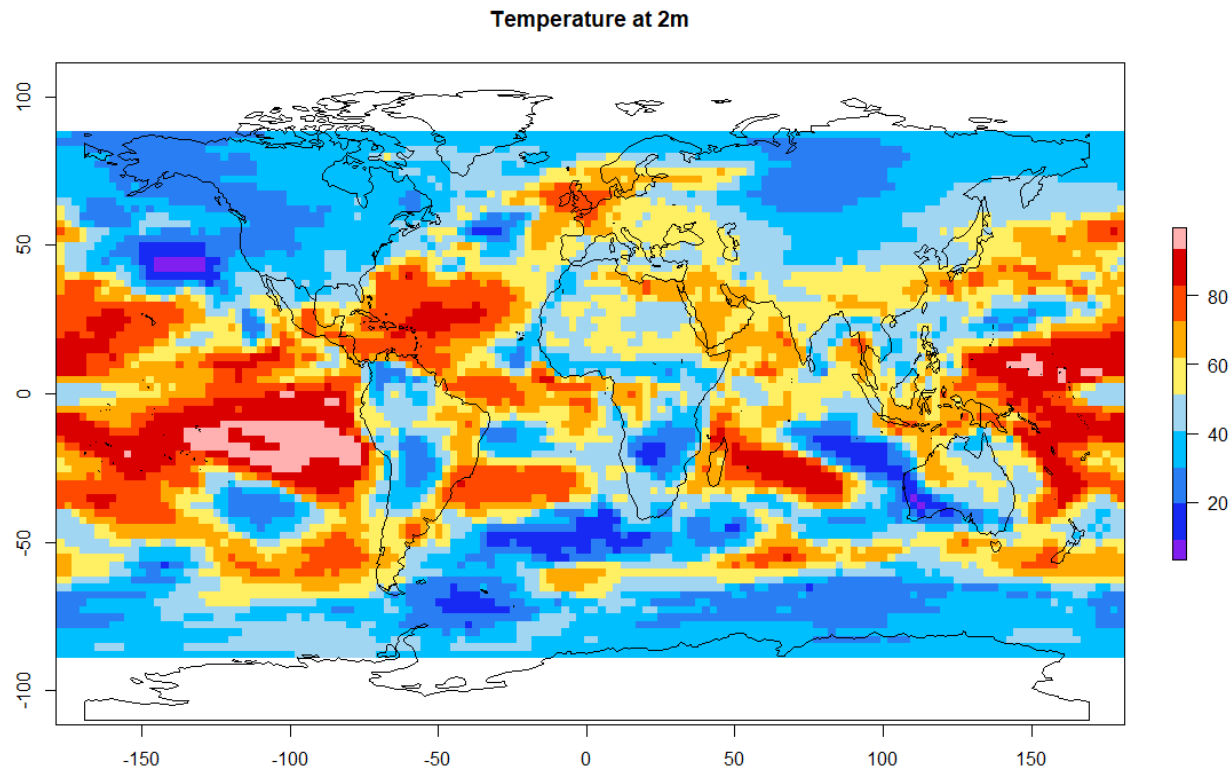
```
# Download from ADSS
url_t2m <- "http://adss.apcc21.org/opendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.nc4"
download.file(url_t2m, "t2m.nc.nc4", method = "auto", quiet = FALSE, mode="wb", cacheOK = TRUE)

# After manual downloading files from the internet, open with ncdf4
t2m.nc <- nc_open("t2m.nc.nc4")
map_data <- getData("worldclim", var="alt", res=10)

# convert longitude and latitude from 0~360 to -180~180
r <- raster("t2m.nc.nc4")
x <- rotate(r)

# making continental map from rworldmap
sMap <- getMap()
sMap <- clgeo_Clean(sMap)
sCont <- sapply(levels(sMap$continent),
               FUN = function(i) {
                 poly <- gUnionCascaded(subset(sMap, continent==i))
                 poly <- spChFIDs(poly, i)
                 SpatialPolygonsDataFrame(poly, data.frame(continent=i, row.names=i))
               }, USE.NAMES=TRUE)
sCont <- Reduce(spRbind, sCont)
# plot twice, Temperature 2 meters and continental contour
plot(x, main=title("Temperature at 2m"), col=colorRampPalette(
c("#801FEF", "#162AF4", "#2A7EF4", "#00BFFF", "#A1D6F2", "#FFEF62", "#FFAA00", "#FF4900", "#DA0000", "#FFB1B1"))(10))
plot(sCont, add=T)
```

- How to access the data files from ADSS
 - Example 2. R result



- **How to access the data files from ADSS**
 - Example 3. FORTRAN code

Netcdf-C(for DAP supporting), Netcdf-Fortran Library are needed
<https://www.unidata.ucar.edu/downloads/netcdf/index.jsp>

'nf-config --has-dap' , 'nf-config --has-f90(or --has-f03)' should be 'yes' in command line

<pre>program t2m_rd use netcdf implicit none character (len = *), parameter :: FILE_NAME = "http://adss.apcc21.org/opendap/MME/3- MON/FORECAST/GAUS/APR/2017/t2m.nc" integer :: ncid integer, parameter :: NDIMS = 4, NTIMES = 3 integer, parameter :: NLVLS = 4, NLATS = 73, NLONS = 144 character (len = *), parameter :: TIME_NAME = "time" integer :: start(NDIMS), count(NDIMS) double precision :: times(NTIMES) integer :: t_varid</pre>	<pre>character (len = *), parameter :: TEMP_NAME="t2m" integer :: temp_varid real :: temp_in(NLONS, NLATS, NLVLS) real :: rmin, rmax integer :: lvl, lat, lon, rec, i call check(nf90_open(FILE_NAME, nf90_nowrite, ncid)) call check(nf90_inq_varid(ncid, TIME_NAME, t_varid)) call check(nf90_inq_varid(ncid, TEMP_NAME, temp_varid)) call check(nf90_get_var(ncid, t_varid, times)) count = (/ NLONS, NLATS, NLVLS, 1/) start = (/ 1, 1, 1, 1 /)</pre>
---	--

- **How to access the data files from ADSS**
 - Example 3. FORTRAN code (cont.)

```
do rec = 1, NTIMES
  start(4) = rec
  print *, "time - ", times(rec)
  print *

  call check( nf90_get_var(ncid, temp_varid, temp_in, start,
count) )

  rmin = 99999999.0
  rmax = -99999999.0
  do lvl = 1, NLVLS
    print *, "level -", lvl
    do lat = 1, NLATS
      do lon = 1, NLONS
        if(temp_in(lon, lat, lvl) /= 1.e+20) then
          if (temp_in(lon, lat, lvl) < rmin) then
            rmin = temp_in(lon,lat,lvl)
          end if
          if (temp_in(lon, lat, lvl) > rmax) then
            rmax = temp_in(lon,lat,lvl)
          end if
        end if
      end if
    end do
  end do
end do
```

```
print *, "min : ", rmin, " max : ", rmax
end do
print *
end do

call check( nf90_close(ncid) )

print *, "*** SUCCESS reading example file ", FILE_NAME, "!"

contains
  subroutine check(status)
    integer, intent ( in ) :: status

    if(status /= nf90_noerr) then
      print *, trim(nf90_strerror(status))
      stop "Stopped"
    end if
  end subroutine check

end program t2m_rd
```

- How to access the data files from ADSS
 - Example 3. FORTRAN result

time - 42838.000000000000

level - 1
min : 3.39759827 max : 99.5172653
level - 2
min : 0.468056530 max : 99.5172653
level - 3
min : 1.93715049E-03 max : 99.5172653
level - 4
min : -72.3682022 max : 199.517273

time - 42868.000000000000

level - 1
min : 9.05132008 max : 97.8657227
level - 2
min : 2.00587893 max : 97.8657227
level - 3
min : 4.12500370E-03 max : 97.8657227
level - 4
min : -63.0695305 max : 197.865723

time - 42899.000000000000

level - 1
min : 16.8491440 max : 97.0544434
level - 2
min : 2.59870005 max : 97.0544434
level - 3
min : 6.96195336E-03 max : 97.0544434
level - 4
min : -59.3354645 max : 197.054443

*** SUCCESS reading example file <http://adss.apcc21.org/opendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc>!

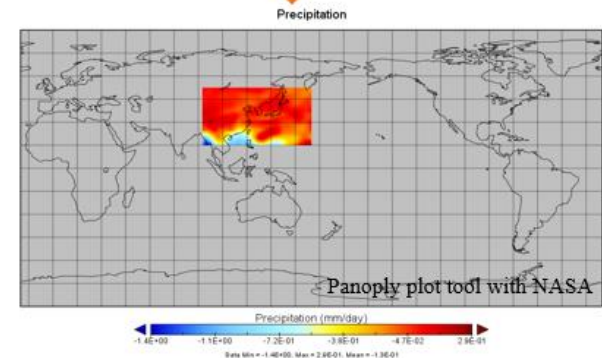
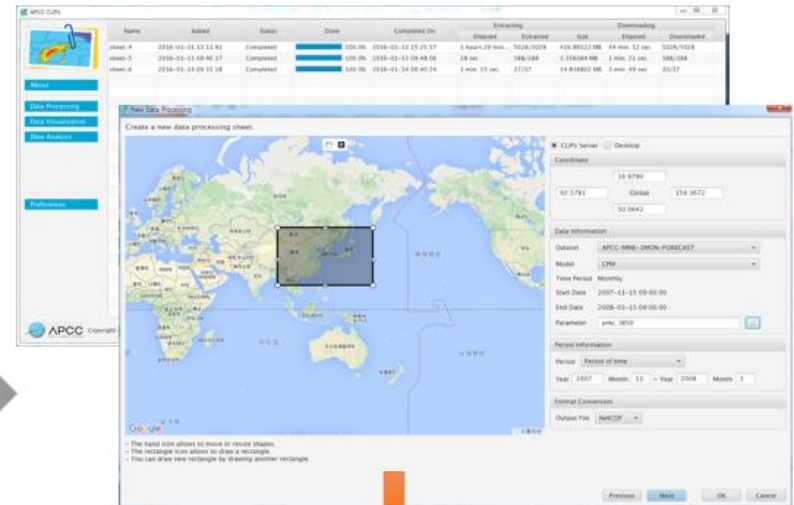
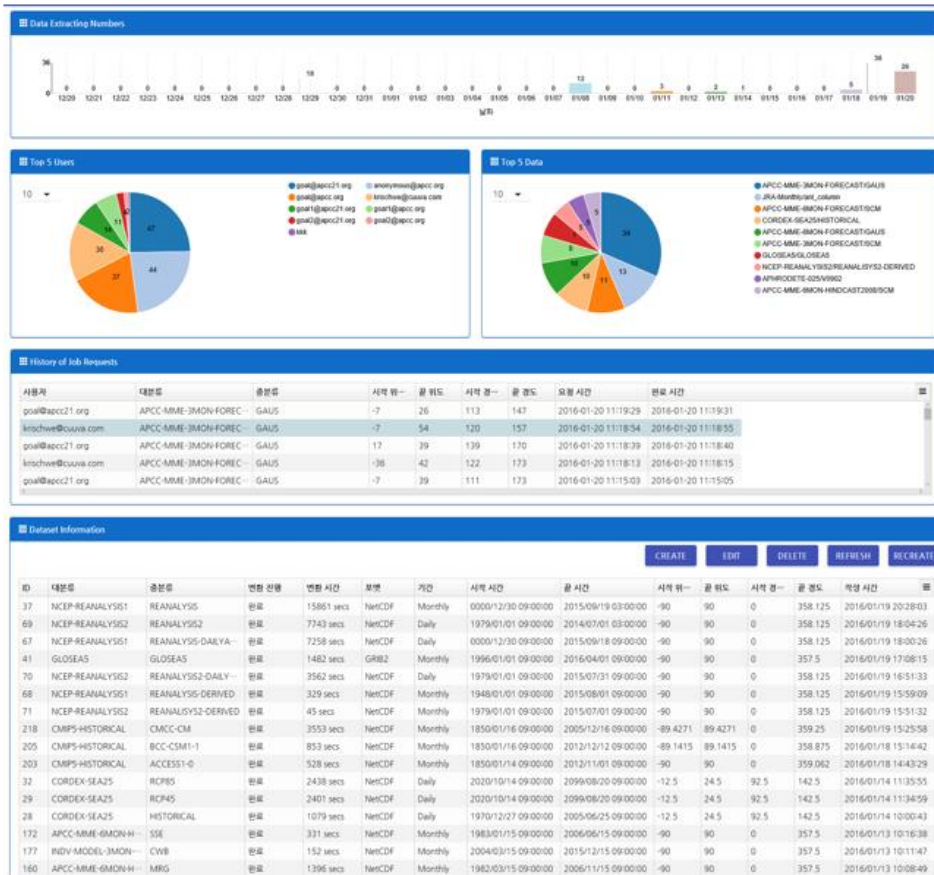
- **CLIPs (CLimate Information Processing system)**
 - Climate and climate application data
 - numerous file formats,
 - enormous time and resources to process
 - User tends to have difficulty dealing with climate data because a single climate data set
 - Enables the user to conveniently extract the specific data necessary for their research



CLIPs

[2/14]

• CLIPs Architecture



- **CLIPs Advantage**

- Researchers that are unfamiliar with processing mass data, to effortlessly extract necessary data for specific regions including climate index and time-scale information.
- Helps researchers reduce time spent on data processing and renders it unnecessary to budget for high-end hardware and software.
- Expected to be widely used developing countries that lack appropriate IT infrastructures.

CLIPs

[4/14]

Current climate data provided in CLIPs

DataSet	Model	Time Step	Latitude	Longitude	Period	Source
APCC-MME-6MON(Forecast)	GAUS, MRG, SCM, SPM, SSE	Monthly	-90 ~ 90	0.00 ~ 357.5	2008~updating	APCC
APCC-MME-6MON(Hindcast)	GAUS, MRG, SCM, SPM, SSE	Monthly	-90 ~ 90	0.00 ~ 357.5	1981~2006	APCC
APCC-MME-3MON(Forecast)	CPM, GAUS, MRG, SCM, SPM, SSE	Monthly	-90 ~ 90	0.00 ~ 357.5	2006~updating	APCC
APCC-MME-3MON(Hindcast)	CPM, GAUS, MRG, SCM, SPM, SSE	Monthly	-90 ~ 90	0.00 ~ 357.5	1981~2004	APCC
Individual-Model-6MON	APCC, CMCC, GLOSEA5, MSC_CANM3, MSC_CAMCM4, NASA, NCEP, POAMA	Monthly	-90 ~ 90	0.00 ~ 357.5	2008~updating	APCC
Individual-Model-3MON	APCC, BCC, CMCC, COLA, CWB, GL OSEA5, HMC, IRI, IRIF, MGO, MSC_CANCM3, MSC_CANCM4, NASA, NCEP, POAMA	Monthly	-90 ~ 90	0.00 ~ 357.5	2004~updating	APCC
CORDEX-SEA25	Historical, RCP45, RCP85	Daily	-12.50 ~ 24.5	92.5 ~ 142.5	1970~2099	APCC
CORDEX-SEA44	Historical, RCP45, RCP85	Daily	-13 ~ 23	83 ~ 156	1970~2099	APCC
APHRODETE-25	V1204R1, V1101R2, V1101, V1003R V0902	Monthly	-15 ~ 83.875	15.125 ~ 194	1951~2007	APHRODETE
APHRODETE-50	V1204R1, V1101R2, V1101, V1003R V0902	Monthly	-15 ~ 83.875	15.125 ~ 194	1951~2007	APHRODETE
JRA	fest_phy3m, fcs_p125, fcst_mdl, fcst_land, fcst_column, anl_suf, anl_mdl, anl_land, anl_isentrop, anl_column	Monthly	-90 ~ 90	0 ~ 159	1958~2014	JRA/JMA
NCEP	Reanalysis1, reanalysis2	Daily, Monthly	-90 ~ 90	0 ~ 358.125	1948~2015	NCEP/NCAR
PERSIANN	CDR	Daily, Monthly	-59.87 ~ 59.88	0.125 ~ 359.875	1983~2014	CDR/NOAA
CMIP5	Historical, RCP2.6, RCP4.5, RCP6.0, RCP8.5	Daily, Monthly	-90 ~ 90	0 ~ 365	1950~2300	CMIP5/WCRP
National Summary	Land based Climatological Data National summary	Monthly	-90 ~ 90	0 ~ 365	1950~1980	CDNS/NOAA

- **How to Install CLIPs (version 2.0)**

- <http://clips.apcc21.org> , click download CLIPs
- Save & extract zip file
- Double click “start.bat” file

The screenshot shows the CLIPs website interface. The top navigation bar includes 'Home', 'Data Description', 'Information Service', 'Download', and 'About us & Contact'. The main content area is divided into 'Objectives' and 'Material' sections. The 'Objectives' section describes the challenges of handling diverse climate data formats and the goal of providing a standardized system. The 'Material' section lists the types of data collected and the tools used for standardization. A 'Download CLIPs' button is visible at the bottom of the content area.



📁 jre	2017-06-01 오후...	파일 폴더	
📁 lib	2017-06-01 오후...	파일 폴더	
📁 logs	2017-06-01 오후...	파일 폴더	
📁 org	2017-06-01 오후...	파일 폴더	
📁 win32-x86-64	2017-06-01 오후...	파일 폴더	
📄 derby.log	2017-06-01 오후...	텍스트 문서	1KB
📄 log4j.xml	2016-01-25 오후...	XML 문서	2KB
🖼️ logo.gif	2015-10-20 오전...	GIF 파일	7KB
📄 preferences.production.properties	2017-06-01 오후...	PROPERTIES 파일	1KB
📄 preferences.production.properties.bak	2017-02-03 오전...	BAK 파일	1KB
📄 start.bat	2016-01-06 오전...	Windows 배치 파일	1KB

- How to use CLIPs step by step
 - 1. Setting your e-mail and Download directory

The screenshot displays the APCC CLIPs application window. On the left, a sidebar contains navigation buttons: About, Data Processing, Data Visualization, Data Analysis, and Preferences (highlighted with a red box). A blue arrow points from the Preferences button to a 'Preferences' dialog box. The dialog box contains the following text and fields:

Preferences
Configure CLIPs preferences.
Your E-Mail address and the directory to store files are must be specified.

User E-Mail:

Download Directory: ...

OK

The background shows a progress table with the following data:

Name	Added	Status	Done	Completed On	Extracting		Downloading		
					Elapsed	Extracted	Size	Elapsed	Downloaded
sheet-2	2017-06-04 18:31:59	Completed	<input type="checkbox"/> 100.0%	2017-06-04 18:32:07	3 sec.	22/22	378.132 KB	4 sec.	22/22

At the bottom of the window, the APCC logo and 'Copyright APCC 2016, all rights reserved.' are visible on the left, and 'Connected.' along with 'New', 'Delete', and 'Reprocessing' buttons are on the right.

CLIPs

[7/14]

- How to use CLIPs step by step
 - 2. Select “Data Processing”
 - 3. Choose “New”, then new window pop up with map

2

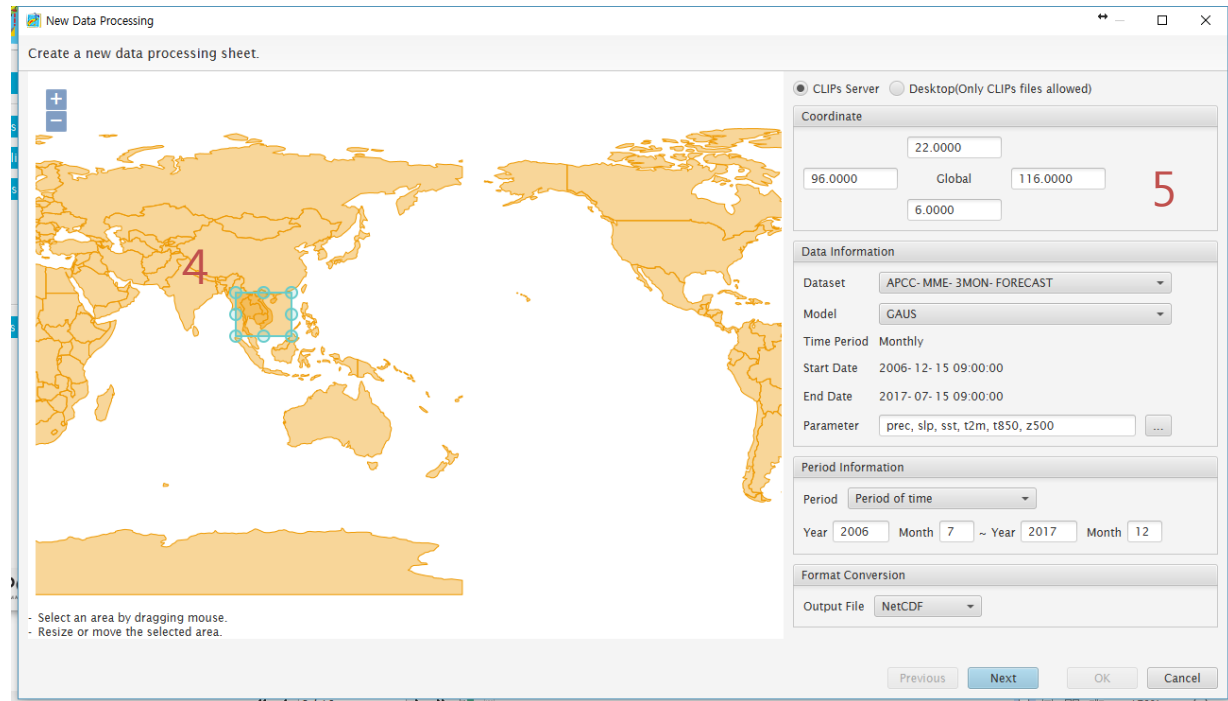
The screenshot displays the APCC CLIPs software interface. On the left, a sidebar contains a menu with options: 'About', 'Data Processing' (highlighted with a red box and a blue arrow), 'Data Visualization', 'Data Analysis', and 'Preferences'. The main window shows a table with columns: Name, Added, Status, Done, and Completed On. A row is visible with 'sheet-2', '2017-06-04 18:31:59', 'Completed', a progress bar at 100.0%, and '2017-06-04 18:32:07'. A large blue arrow points from the 'Data Processing' menu item to the 'New Data Processing' dialog box. The dialog box is titled 'New Data Processing' and contains a world map. To the right of the map are several configuration panels: 'Coordinate' (with input fields for 90.0000, 0, Global, 360.0000, and -90.0000), 'Data Information' (with dropdowns for Dataset: APCC- MME- 3MON- FORECAST, Model: GAUSS, Time Period: Monthly, Start Date: 2006-12-15 09:00:00, End Date: 2017-07-15 09:00:00, and Parameter: prec, slp, sst, t2m, t850, z500), 'Period Information' (with dropdown for Period: Period of time, Year: 2006, Month: 7, Year: 2017, Month: 12), and 'Format Conversion' (with dropdown for Output File: NetCDF). At the bottom of the dialog are 'Previous', 'Next', 'OK', and 'Cancel' buttons. A small red '3' logo is visible at the bottom center of the main window.

Name	Added	Status	Done	Completed On
sheet-2	2017-06-04 18:31:59	Completed	100.0%	2017-06-04 18:32:07

CLIPs

[8/14]

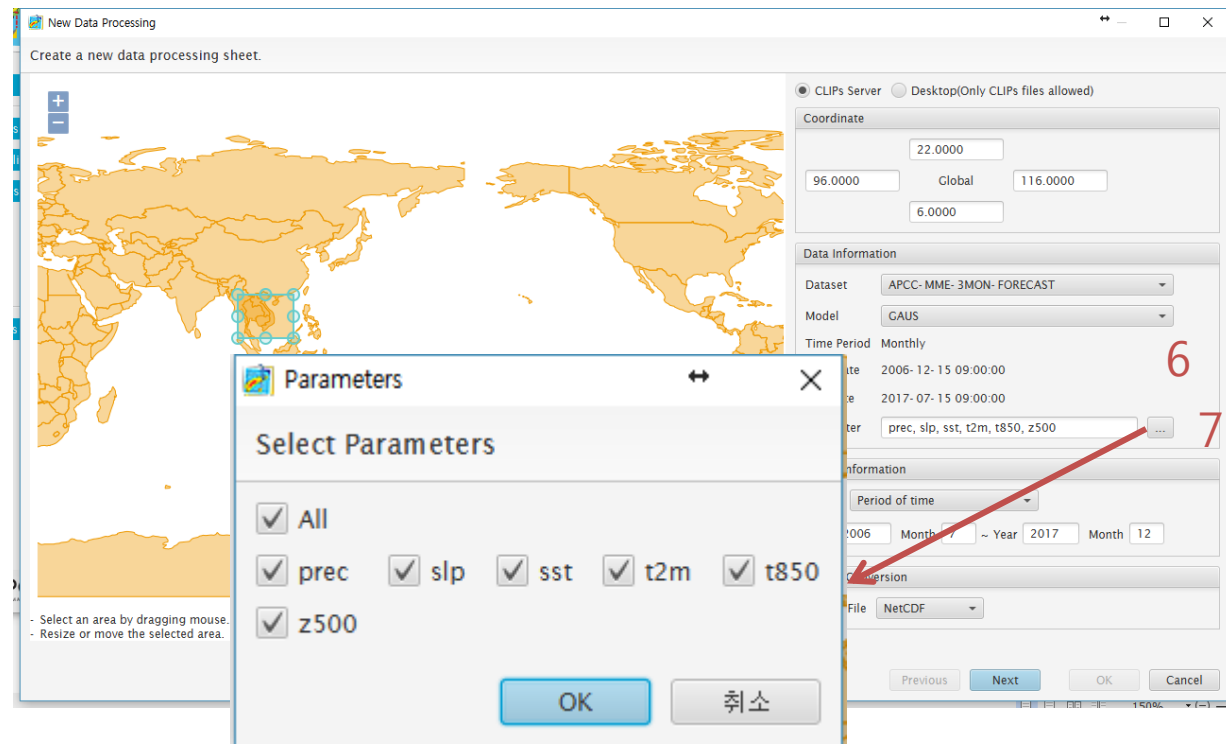
- How to use CLIPs step by step
 - 4. Target region can be selected by mouse drag.
 - 5. Verify the coordinates



CLIPs

[9/14]

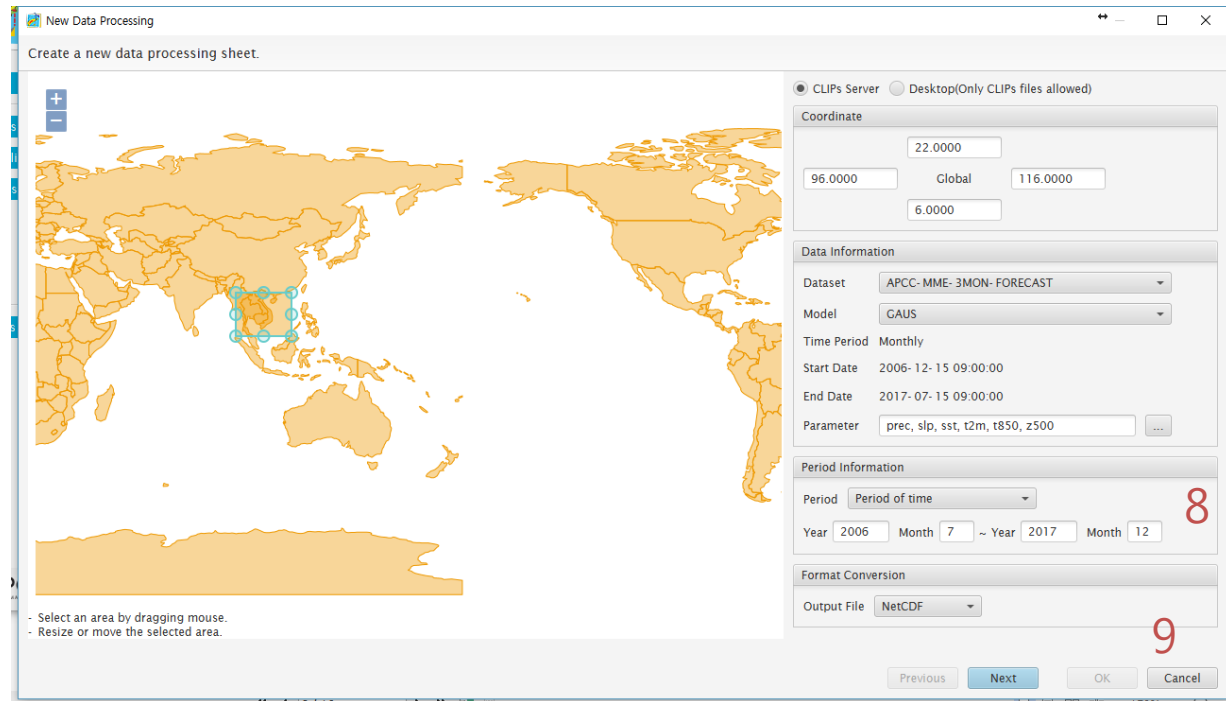
- How to use CLIPs step by step
 - 6. Choose the dataset, model
 - 7. Check parameters



CLIPs

[10/14]

- How to use CLIPs step by step
 - 8. Set time period
 - 9. Select the format of climate data



CLIPs

[12/14]

- How to use CLIPs step by step
 - 11. Click “OK” button
 - 12. Extracting climate data by user request

The screenshot displays the APCC CLIPs software interface. On the left, there is a sidebar with navigation buttons: "About", "Data Processing", "Data Visualization", "Data Analysis", and "Preferences". The main window features a table with columns for Name, Added, Status, Done, Completed On, and sub-columns for Extracting and Downloading progress. A red number "12" is overlaid on the table. Below the table, there are buttons for "New", "Delete", and "Reprocessing". To the right, a separate window shows a list of files with columns for File Name, Collected Time, and Latitude. A red number "11" is overlaid on this list. At the bottom, a dialog box shows "1 Items" and buttons for "Previous", "Next", "OK", and "Cancel".

Name	Added	Status	Done	Completed On	Extracting			Downloading	
					Elapsed	Extracted	Size	Elapsed	Downloaded
sheet-2	2017-06-04 18:31:59	Completed	100.0%	2017-06-04 18:32:07	3 sec	22/22	378.132 KB	4 sec	22/22
	2017-06-04 22:49:30	Extracting	46.5%		2 sec	28/30	0 Byte	0 sec	0/30

File Name	Collected Time	Latitude
/sect02/CLIPs_D...	2016-11-15 09:00:00 ~ 2017-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-11-15 09:00:00 ~ 2017-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-11-15 09:00:00 ~ 2017-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-11-15 09:00:00 ~ 2017-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-11-15 09:00:00 ~ 2016-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-11-15 09:00:00 ~ 2016-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-11-15 09:00:00 ~ 2016-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-11-15 09:00:00 ~ 2016-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-11-15 09:00:00 ~ 2016-01-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-12-15 09:00:00 ~ 2017-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-12-15 09:00:00 ~ 2017-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-12-15 09:00:00 ~ 2017-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-12-15 09:00:00 ~ 2017-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-12-15 09:00:00 ~ 2017-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-12-15 09:00:00 ~ 2016-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-12-15 09:00:00 ~ 2016-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-12-15 09:00:00 ~ 2016-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-12-15 09:00:00 ~ 2016-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2015-12-15 09:00:00 ~ 2016-02-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-10-15 09:00:00 ~ 2016-12-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-10-15 09:00:00 ~ 2016-12-15 09:00:00	-90.0 ~ 90.0
/sect02/CLIPs_D...	2016-10-15 09:00:00 ~ 2016-12-15 09:00:00	-90.0 ~ 90.0

CLIPs

[13/14]

- How to use CLIPs step by step

- 13. Mouse right click on the task → Open directory
- 14. Check the data files

The screenshot displays the APCC CLIPs software interface on the left and a Windows File Explorer window on the right. The software interface shows a table of tasks with columns for Name, Added, Status, Done, Completed On, and Elapsed. A right-click context menu is open over the 'sheet-3' task, with the 'Open containing directory' option highlighted. A red number '13' is overlaid on the table. The File Explorer window shows the directory path 'D:\data\CLIPs\2017-06-04_608' and a list of data files. A red number '14' is overlaid on the file list.

Name	Added	Status	Done	Completed On	Elapsed
sheet-2	2017-06-04 18:31:59	Completed	100.0%	2017-06-04 18:32:07	3 sec.
sheet-3	2017-06-04 22:49:30	Completed	100.0%	2017-06-04 22:49:35	3 sec.

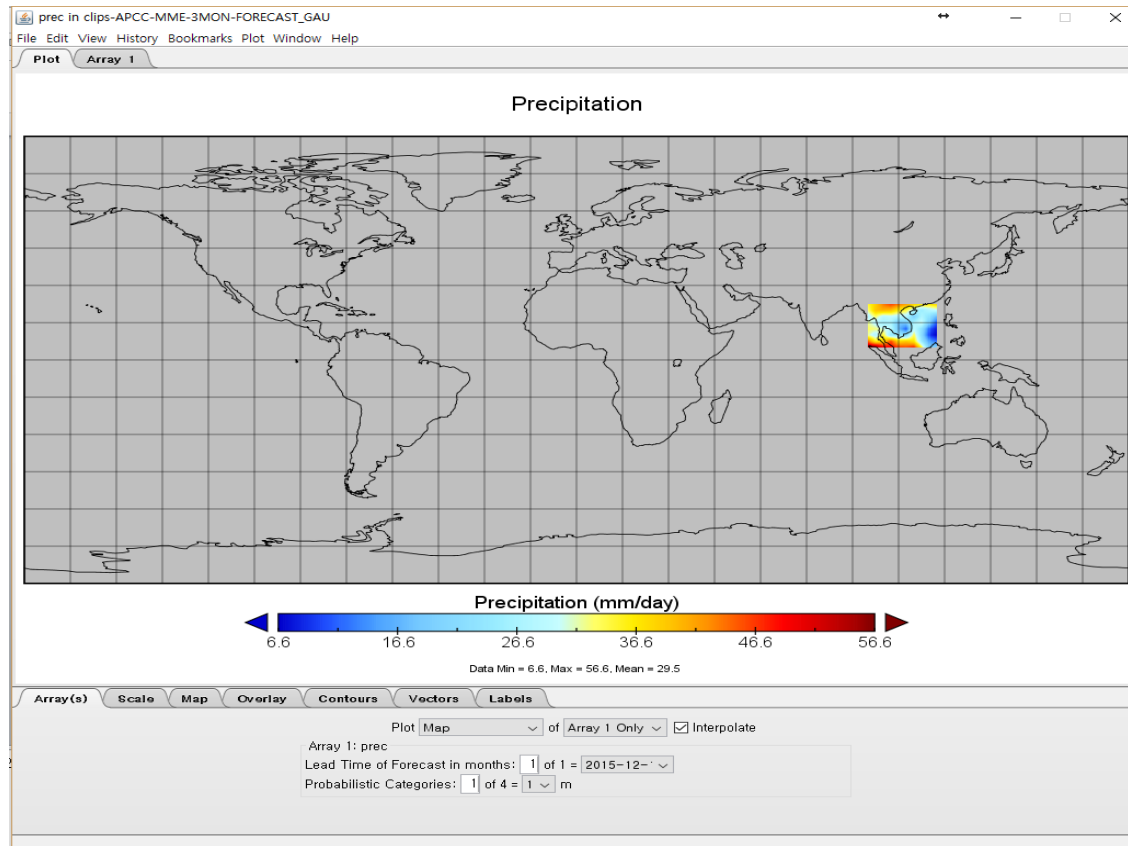
File Explorer Path: D:\data\CLIPs\2017-06-04_608

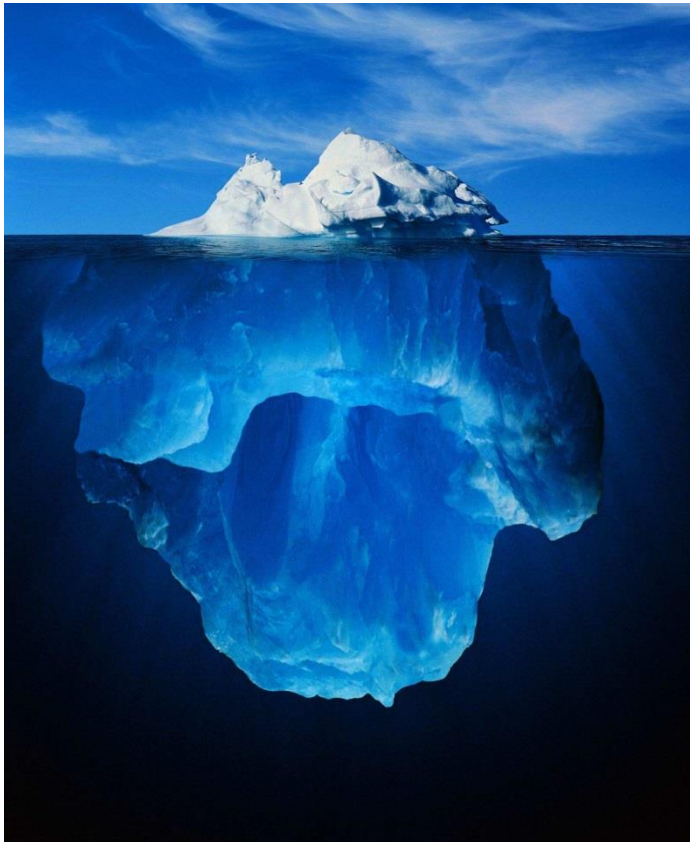
이름	수정된 날짜	유형	크기
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2015_prec.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2015_slp.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2015_t2m.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2015_t850.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2015_t500.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2016_prec.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2016_slp.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2016_t2m.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2016_t850.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_DEC_2016_t500.nc.nc	2017-06-04 오후...	NC 파일	4KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2015_prec.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2015_slp.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2015_t2m.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2015_t850.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2015_t500.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2016_prec.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2016_slp.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2016_t2m.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2016_t850.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_NOV_2016_t500.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_OCT_2015_prec.nc.nc	2017-06-04 오후...	NC 파일	5KB
clips-APCC-MME-3MON-FORECAST_GAUS_OCT_2015_slp.nc.nc	2017-06-04 오후...	NC 파일	5KB

CLIPs

[14/14]

- How to use CLIPs step by step
 - 15. Check the data by visualization tool



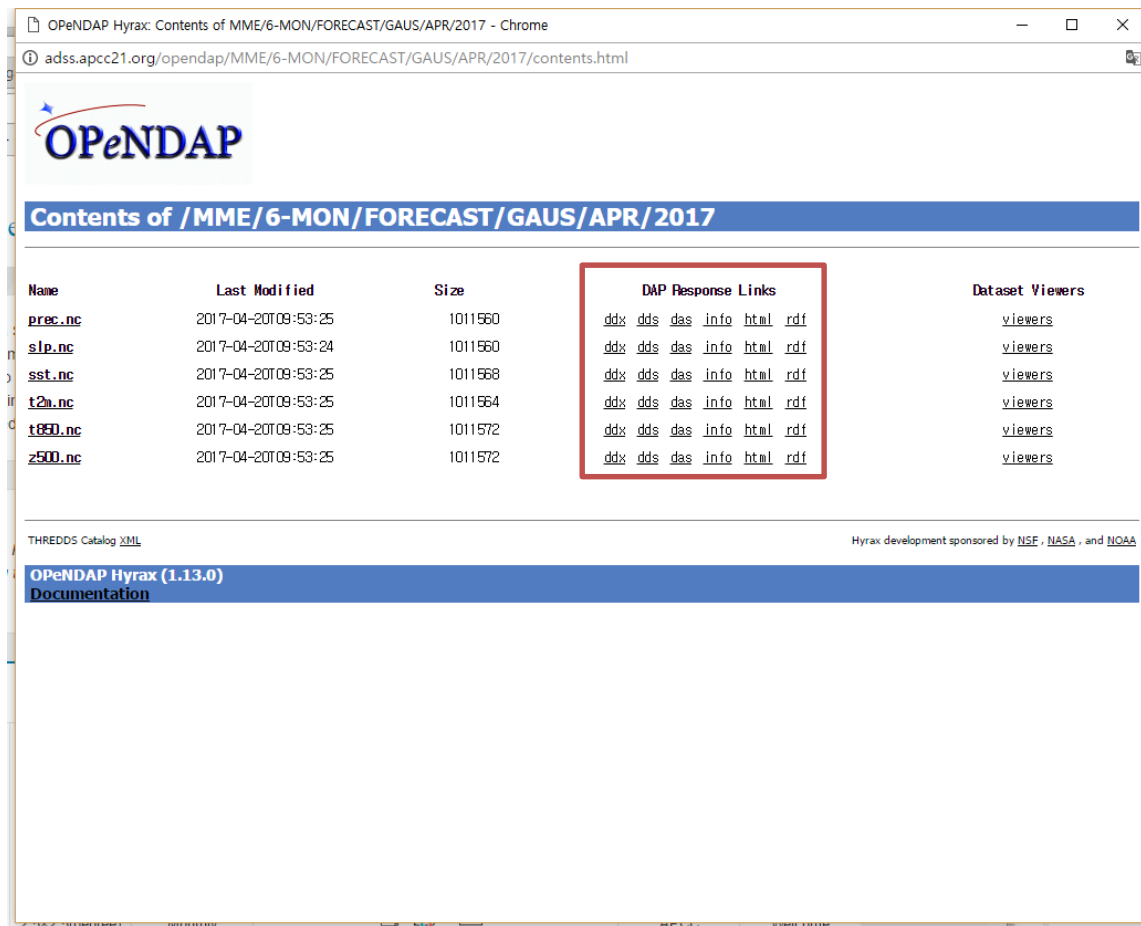


THANK
YOU

Q&A

APPENDIX. I

- OPeNDAP (Details about DAP Response Links)



The screenshot shows a web browser window displaying the OPeNDAP Hyrax interface. The page title is "OPeNDAP Hyrax: Contents of MME/6-MON/FORECAST/GAUS/APR/2017 - Chrome". The URL is "adss.apcc21.org/opendap/MME/6-MON/FORECAST/GAUS/APR/2017/contents.html". The page features the OPeNDAP logo and a blue header bar with the text "Contents of /MME/6-MON/FORECAST/GAUS/APR/2017". Below this is a table listing dataset files with columns for Name, Last Modified, Size, DAP Response Links, and Dataset Viewers. The DAP Response Links column is highlighted with a red box, showing links for ddx, dds, das, info, html, and rdf. The Dataset Viewers column shows a link for viewers. At the bottom, there is a link for "THREDDS Catalog XML" and a note that "Hyrax development sponsored by NSF, NASA, and NOAA". A blue bar at the bottom of the page contains the text "OPeNDAP Hyrax (1.13.0) Documentation".

Name	Last Modified	Size	DAP Response Links	Dataset Viewers
prec.nc	2017-04-20T09:53:25	1011560	ddx dds das info html rdf	viewers
slp.nc	2017-04-20T09:53:24	1011560	ddx dds das info html rdf	viewers
sst.nc	2017-04-20T09:53:25	1011568	ddx dds das info html rdf	viewers
t2m.nc	2017-04-20T09:53:25	1011564	ddx dds das info html rdf	viewers
t850.nc	2017-04-20T09:53:25	1011572	ddx dds das info html rdf	viewers
z500.nc	2017-04-20T09:53:25	1011572	ddx dds das info html rdf	viewers

THREDDS Catalog [XML](#) Hyrax development sponsored by [NSF](#), [NASA](#), and [NOAA](#)

[OPeNDAP Hyrax \(1.13.0\) Documentation](#)

DDS



- **Dataset Description Structure**
- **contains knowledge about the dataset variables and the interrelations of those variable**
- **describe the structure of a particular dataset.**

DDS

<http://adss.apcc21.org/opensdap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.dds>

```
Dataset {  
  Float64 time[time = 3];  
  Int32 level[level = 4];  
  Float32 lat[lat = 73];  
  Float32 lon[lon = 144];  
  Grid {  
    Array:  
      Float32 t2m[time = 3][level = 4][lat = 73][lon = 144];  
    Maps:  
      Float64 time[time = 3];  
      Int32 level[level = 4];  
      Float32 lat[lat = 73];  
      Float32 lon[lon = 144];  
  } t2m;  
} t2m.nc;
```

DAS



- **Dataset Attribute Structure**
- **store attributes for variables in the dataset**

DAS

<http://adss.apcc21.org/opensdap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.das>

```
Attributes {
  time {
    Float64 _FillValue -9999.000000000000;
    String original_name "Lead Time of Forecast in
months";
    String units "days since 1900-01-01";
  }
  level {
    String original_units "Dimensionless";
    String units "m";
    String categories "above_normal near_normal
below_normal combined";
    String original_name "Probabilistic Categories";
  }
  lat {
    String units "degrees_north";
    String long_name "latitude";
    Int32 nlat 73;
  }
  lon {
    String units "degrees_east";
    String long_name "longitude";
    Int32 nlon 144;
  }
}
```

```
t2m {
  Float32 missing_value 1.00000002e+20;
  String long_name "Temperature at 2m";
  String units "deg K";
  String original_units "%";
  String original_long_name "Probability of Occurrence";
  Float32 _FillValue 1.00000002e+20;
}
NC_GLOBAL {
  String model "GAUS";
  String ProbDistFunc "Gaussian";
  String ForecastInfo "3-MON forecast for 4 2017";
  String MME_Models "CWB IRI_CA JMA APCC CMCC
MSC NASA NCEP PNU POAMA";
  Int32 hindcast_end_year 2005;
  Int32 hindcast_start_year 1983;
  String source "APCC Seasonal Forecast based on
GAUS method";
  String creation_date "Wed Mar 15 13:53:16 KST 2017";
  String Conventions "None";
  String title "Written using AFS function write_TLLL";
}
DODS_EXTRA {
  String Unlimited_Dimension "time";
}
}
```

DDX



- **an XML version of the Data Attribute and Data Description replies**
- **combine the information in the both the DDS and DAS**

DDX

<http://adss.apcc21.org/opendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.ddx>

```
<Dataset xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:grddl="http://www.w3.org/2003/g/data-view#" xmlns="http://xml.opendap.org/ns/DAP/3.2#"
xmlns:dap="http://xml.opendap.org/ns/DAP/3.2#" name="t2m.nc" xsi:schemaLocation="http://xml.opendap.org/ns/DAP/3.2# http://
grddl:transformation="http://xml.opendap.org/transforms/ddxToRdfTriples.xsl" dapVersion="3.2" xml:base="http://adss.apcc21.org/opendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc">
  <Attribute name="NC_GLOBAL" type="Container">
    <Attribute name="model" type="String">
      <value>GAUS</value>
    </Attribute>
    <Attribute name="PrbDistFunc" type="String">
      <value>Gaussian</value>
    </Attribute>
    <Attribute name="ForecastInfo" type="String">
      <value>3-MON forecast for 4 2017</value>
    </Attribute>
    <Attribute name="MME_Models" type="String">
      <value>CWB IRI_CA JMA APCC CMCC MSC NASA NCEP PNU POAMA</value>
    </Attribute>
    <Attribute name="hindcast_end_year" type="Int32">
      <value>2005</value>
    </Attribute>
    <Attribute name="hindcast_start_year" type="Int32">
      <value>1983</value>
    </Attribute>
    <Attribute name="source" type="String">
      <value>APCC Seasonal Forecast based on GAUS method</value>
    </Attribute>
    <Attribute name="creation_date" type="String">
      <value>Wed Mar 15 13:53:16 KST 2017</value>
    </Attribute>
    <Attribute name="Conventions" type="String">
      <value>None</value>
    </Attribute>
    <Attribute name="title" type="String">
      <value>Written using AFS function write_TLLL</value>
    </Attribute>
    <Attribute name="DODS_EXTRA" type="Container">...</Attribute>
  </Attribute>
  <Array name="time">
    <Attribute name="_FillValue" type="Float64">
      <value>-9999.000000000000</value>
    </Attribute>
    <Attribute name="original_name" type="String">
      <value>Lead Time of Forecast in months</value>
    </Attribute>
  </Array>
  <Grid name="t2m">
    <Array name="t2m">
      <Attribute name="missing_value" type="Float32">
        <value>1.00000002e+20</value>
      </Attribute>
      <Attribute name="long_name" type="String">
        <value>Temperature at 2m</value>
      </Attribute>
      <Attribute name="units" type="String">
        <value>deg K</value>
      </Attribute>
      <Attribute name="original_units" type="String">
        <value>K</value>
      </Attribute>
      <Attribute name="original_long_name" type="String">
        <value>Probability of Occurrence</value>
      </Attribute>
      <Attribute name="_FillValue" type="Float32">
        <value>1.00000002e+20</value>
      </Attribute>
      <Float32/>
      <dimension name="time" size="3"/>
      <dimension name="level" size="4"/>
      <dimension name="lat" size="73"/>
      <dimension name="lon" size="144"/>
    </Array>
    <Map name="time">
      <Attribute name="_FillValue" type="Float64">
        <value>-9999.000000000000</value>
      </Attribute>
      <Attribute name="original_name" type="String">
        <value>Lead Time of Forecast in months</value>
      </Attribute>
      <Attribute name="units" type="String">
        <value>days since 1900-01-01</value>
      </Attribute>
      <Float64/>
      <dimension name="time" size="3"/>
    </Map>
    <Map name="level">
      <Attribute name="original_units" type="String">
        <value>Dimensionless</value>
      </Attribute>
      <Attribute name="units" type="String">
        <value>m</value>
      </Attribute>
      <Attribute name="categories" type="String">
        <value>above_normal near_normal below_normal combined</value>
      </Attribute>
    </Map>
  </Grid>

```

Info

- formatted page containing information from the Data Attributes and Data Description

Dataset Information

model:GAUS
ProbDistFunc:Gaussian
ForecastInfo:3-MON forecast for 4 2017
MME_Models:CWB IRI_CA JMA APCC CMCC MSC NASA NCEP PNU POAMA
hindcast_end_year:2005
hindcast_start_year:1983
source:APCC Seasonal Forecast based on GAUS method
creation_date:Wed Mar 15 13:53:16 KST 2017
Conventions:None
title:Written using AFS function write_TLLL
Unlimited_Dimension:time

Variables in this Dataset

time:Array of 64 bit Reals [time = 0..2]
_FillValue: -9999.000000000000
original_name: Lead Time of Forecast in months
units: days since 1900-01-01
level:Array of 32 bit Integers [level = 0..3]
original_units: Dimensionless
units: m
categories: above_normal near_normal below_normal combined
original_name: Probabilistic Categories
lat:Array of 32 bit Reals [lat = 0..72]
units: degrees_north
long_name: latitude
nlat: 73
lon:Array of 32 bit Reals [lon = 0..143]
units: degrees_east
long_name: longitude
nlon: 144
t2m:Grid
missing_value: 1.00000002e+20
long_name: Temperature at 2m
units: deg K
original_units: %

<http://adss.apcc21.org/opensdap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.info>

HTML

- provides the information from the info and a JavaScript form to help you build a request for data

OPeNDAP Server Dataset Access Form

Action:

Data URL:

Global Attributes:

```
NC_GLOBAL.model: GAUS
NC_GLOBAL.ProbDistFunc: Gaussian
NC_GLOBAL.ForecastInfo: 3-MON forecast for 4 2017
NC_GLOBAL.MME_Models: CWB IRI_CA JMA APCC CMCC MSC NASA NCEP PNU POAMA
NC_GLOBAL.hindcast_end_year: 2005
```

Variables:

time: Array of 64 bit Reals [time = 0..2]

time:
_FillValue: -9999.000000000000
original_name: Lead Time of Forecast in months
units: days since 1900-01-01

level: Array of 32 bit Integers [level = 0..3]

level:
original_units: Dimensionless
units: m
categories: above_normal near_normal below_normal combined
original_name: Probabilistic Categories

lat: Array of 32 bit Reals [lat = 0..72]

lat:
units: degrees north

<http://adss.apcc21.org/opendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.html>

RDF

- Resource Description Framework (<https://www.w3.org/RDF/>)
 - a standard model for data interchange on the Web

<http://adss.apcc21.org/pendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.rdf>

```
▼ <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
  ▼ <rdf:Description rdf:about="">
    ▼ <Dataset xmlns="http://xml.opendap.org/ns/DAP/3.2#">
      ▼ <rdf:Description xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns" rdf:about="" xml:base="http://adss.apcc21.org:80/pendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc">
        <name xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">t2m.nc</name>
        ▼ <schemaLocation xmlns="http://www.w3.org/2001/XMLSchema-instance#">
          http://xml.opendap.org/ns/DAP/3.2# http://xml.opendap.org/dap/dap3.2.xsd
        </schemaLocation>
        ▼ <transformation xmlns="http://www.w3.org/2003/g/data-view#">
          http://xml.opendap.org/transforms/ddxToRdfTriples.xsl
        </transformation>
        <dapVersion xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">3.2</dapVersion>
        <dataset_id xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc</dataset_id>
        ▼ <Attribute>
          ▼ <rdf:Description>
            <name xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">NC_GLOBAL</name>
            <type xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">Container</type>
          ▼ <Attribute>
            ▼ <rdf:Description>
              <name xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">model</name>
              <type xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">String</type>
              <value>GAUS</value>
            </rdf:Description>
          </Attribute>
          ▼ <Attribute>
            ▼ <rdf:Description>
              <name xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">ProbDistFunc</name>
              <type xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">String</type>
              <value>Gaussian</value>
            </rdf:Description>
          </Attribute>
          ▼ <Attribute>
            ▼ <rdf:Description>
              <name xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">Forecast Info</name>
              <type xmlns="http://iridl.ldeo.columbia.edu/ontologies/xsd2owl/nonamespace#">String</type>
              <value>3-MON forecast for 4 2017</value>
            </rdf:Description>
          </Attribute>
        </Attribute>
      </Dataset>
    </rdf:Description>
  </rdf:Description>
</rdf:RDF>
```


DODS



- Transmit data to a client in response to a request URL (data url + “.dods”)
- DAP2 binary response
- <http://adss.apcc21.org/opendap/MME/3-MON/FORECAST/GAUS/APR/2017/t2m.nc.dods>