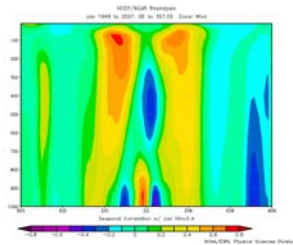


# NOAA/ESRL PSD Climate Data Tutorial

Finding and Analyzing Climate Data  
on the Web



<http://www.esrl.noaa.gov/psd/data/gridded/tutorial/>

## Finding Data

- Gridded Data (Dataset Doc Pages, Search and Plot)
- Non-Gridded
- Pregenerated Atmospheric/Ocean Timeseries
  - Monthly (PDO, ONI...)
  - Daily (PNA, AO)

<http://www.esrl.noaa.gov/psd/data/>

# Search and Plot and Dataset Doc

**Climate Datasets: By Category**

- All
- Sub-daily
- Daily
- Monthly
- Surface
- Multi-level
- Land
- Ocean
- Radiation
- Arctic
- Reanalysis
- Climate Indices

Search Datasets <\_>

**New Datasets**

20th Century Reanalysis

**Current PSD (WebData Status):** PSD has undergone major URL restructuring so that all URLs start with <http://www.esrl.noaa.gov/psd/> (More Info)

### Search for Gridded Climate Data at PSD

Select items to be searched for from either or both of the menus below (for data sets and/or variables). Multiple selections from each menu are allowed. If no selections are made from a menu, all of the items on that menu are included in the search.

**Data Sets:**

- CCC Derived NCEP Reanalysis Products Daily Sigma Level Data
- CCC Derived NCEP Reanalysis Products Other Gaussian Grid
- CCC Derived NCEP Reanalysis Products Pressure Level
- CCC Derived NCEP Reanalysis Products Sigma Level Data
- CCC Derived NCEP Reanalysis Products Surface Flux
- CCC Derived NCEP Reanalysis Products Surface Level
- CCC Derived NCEP Reanalysis Products Temperature Level
- CCC\_21a\_21b Daily 0.5 UNIFIED Precipitation

**Variables:**

- Accumulated Snow
- Air Temperature
- Air Temperature 0.1 Box
- Air Temperature 0.25 Box
- Air Temperature 0.5 Box
- Air Temperature Smoothing Error
- Air Temperature Station Error
- Air Temperature 1200km Smoothing Combined
- Air Temperature 1200km Smoothing Land Only
- Air Temperature 1200km Smoothing Land Only

Group results by Data Set. Group results by Variable.

Start the search or reset the form:

**Current PSD (WebData Status):** PSD has undergone major URL restructuring so that all URLs start with <http://www.esrl.noaa.gov/psd/> (More Info)

OPeNDAP Data access is now open without IP restrictions.

### PSD Gridded Climate Datasets: Surface

Descriptions | Summary Attributes

| Datasets   | Description  | OPeNDAP Catalog | RSS |
|--|--|-----------------|-----|
| CMAP Precipitation   | Monthly and pentad global gridded precipitation means. It includes a standard and enhanced version (with NCEP Reanalysis) from 1979 to near the present.             | Catalog         |     |
| CPC 2fa 35 Daily US Unified Precipitation                            | US high resolution gridded precipitation (from station data) for 1948 to 1998.   | Catalog         |     |
| CPC Soil Moisture  | Monthly Gridded CPC Soil Moisture from a model from 1948 to present.   | Catalog         |     |
| CRU Air Temperature and Combined Air Temperature/Marine Anomalies    | Global gridded (5°x5') monthly anomalies of combined observed air and marine temperature (HADCRUT2/HADCRUT2v) from the mid 1800's to the present.                    | Catalog         |     |
| CRU Air Temperature and Combined Air Temperature/Marine Anomalies V2 | Global gridded (5°x5') monthly anomalies of observed air temperature and combined observed air and marine temperature (HADCRUT2) from the mid 1800's to the present. | Catalog         |     |

[http://www.esrl.noaa.gov/psd/cgi-bin/db\\_search/SearchMenu.pl](http://www.esrl.noaa.gov/psd/cgi-bin/db_search/SearchMenu.pl)

<http://www.esrl.noaa.gov/psd/data/gridded/>

## Basic Plots: Search and Plot

- Files that are found can be plotted (or subset)
- Options for level, time average, region, plot... features generated automatically

Visualize NCEP Reanalysis Daily Averages Pressure Level Data (Specify dimension values)

XXX

Select the  for additional help. If you find that the plotting process only produces a blank page. Commonly, this problem is caused by requesting too large a subset. The process for making the subset has to work on one year's data at a time, and FTP protocol cannot send anything to the web browser as well as setting to display please the start page). The solution is to break the request into smaller chunks (it's usually easiest to do this along the time axis). If you need to concatenate the pieces back together—either end the top "button" on the NCEP web site or the FTP operations and help <http://www.esrl.noaa.gov/psd/>.

Selected file: /Climate/ncmp\_reanalysis\_dailyavg/pressure/level/1948.nc used: 1948.nc 2008/10

Variable: uwnd (m/s)

Variable units: m/s

Statistic: Mean

Axis Dimensions:

lon: Begin: 230 End: 300

lat: Begin: 20 End: 50

Other dimension value(s):

Select one value to show a slice at that value; select two values to identify a range to be averaged.

100.00 mbar: time: Range: 1948 Jan 1 (Daily)

100.00 mbar: lon: Begin: 230 End: 300

100.00 mbar: lat: Begin: 20 End: 50

100.00 mbar: level: 100.00 mbar: time: Range: 2009 Nov 28

100.00 mbar: lon: Begin: 230 End: 300

100.00 mbar: lat: Begin: 20 End: 50

Output options:

Create a plot  Create a subset without making a plot.

Plot output options:

Plot on a black background  Plot on a white background  GIP (PNG) default

Color Plot  Reverse Color Table  Fill Shaded

Polar Stereographic  Remove Zonal Mean  Smooth Data

Remove Contour Labels  Override Default Contour Interval

Contour range: to:

Scale plot:   Generate Postscript output

Create Plot or Subset of Data: 1/2 hour

lon: plotted from 230 to 300

lat: plotted from 20 to 50

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## Plotting Non-gridded data

- US Climate Division (monthly 1895-present)
- Plot means, anomalies, other statistics

US Climate Division Dataset Mapping Page

New! Subscribe to RSS feed for data update notification [RSS](#)

Variable? (Temperature)   
Type of plot? (Average Anomaly)   
Anomaly or Climatology. Choose base period. (1971-2000)   
Beginning month of season (Jan)  Ending month (Dec)   
Enter a DQYF (Year(s)). Valid range is January 1895 to Oct 2009. For seasons that span a year (e.g. DJF), please enter year. Default is current year.

2008

OR

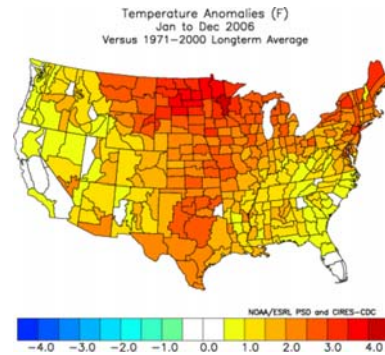
Enter a range of years

Optional: Contour Interval Low:  Hi:  Contour Interval:  (You must input all 3 options.)  
Optional: Scale Plot Size (1-200%): (Default 100%)   
White for central values for anomalies/percentiles? (Yes/No)  Yes  No

[Create Plot](#) [Reset Options](#) [Report Bugs](#)

Dataset is obtained from the National Climatic Data Center

It is provisional and may be subject to correction by NCDC at a later date!



<http://www.esrl.noaa.gov/psd/data/usclimdivs>

## Plotting/Extracting Timeseries

- Being able to extract a timeseries in ASCII from binned datasets is useful but often time consuming.
- Users can use the webpage to get timeseries at specified locations and plot them (some additional features are available) or save them.

# Extracting Monthly Timeseries

Create a monthly/seasonal mean time series from the NCEP Reanalysis Dataset

Create a timeseries of monthly/seasonal mean values (Directions). Output is organized by year for the rows and by month (January to December) across columns for monthly values. Simply save the browser page containing the timeseries output in order to use it in the [composites](#) with NCEP Reanalysis monthly mean web page. The program will calculate zonal latitudes and longitudes to those input. To use one grid, type in same segment latitude and longitude values.

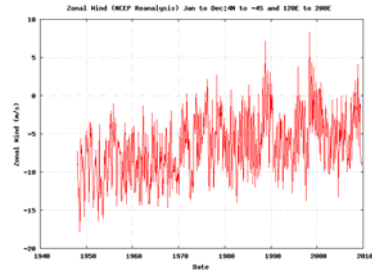
Variables? (Zonal Area)  Analysis level? (choose surface for non-level variables) (2000m)

Latitude? (N to S, e.g. 45-45)  Longitude? (W to E, e.g. 180 to 200 or -18 to 20)

Monthly  Seasonal average  First month of season (mm)   Second month (mm)

Area weight grid?  No  Yes

Output format:  Raw data values  Plot data



| Year | 1948  | 2008  |
|------|-------|-------|
| 1    | 14.00 | 10.00 |
| 2    | 14.00 | 10.00 |
| 3    | 14.00 | 10.00 |
| 4    | 14.00 | 10.00 |
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| 6    | 14.00 | 10.00 |
| 7    | 14.00 | 10.00 |
| 8    | 14.00 | 10.00 |
| 9    | 14.00 | 10.00 |
| 10   | 14.00 | 10.00 |
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| 100  | 14.00 | 10.00 |

<http://www.esrl.noaa.gov/psd/data/timeseries/>

# US Station Data

- There are many nice sites that plot US Station Data
- This one emphasizes different 'looks' at the data

<http://www.esrl.noaa.gov/psd/usstation/>



# More complicated plots: hovmollers; cross-sections

- Cross-sections: Plot latitude or longitude by height plots of means, anomalies
- Available on many composite pages

Monthly/Seasonal Climate Composites

For seasonal composites (composites of the mean or anomalies) (mean - total mean) of variables from the NCEP reanalysis and other sources, NCEP data is available from 1948 to Dec 2008.

Which variable? (Reanalysis)  Level? (Surface)

Beginning month of season (Jan)  Ending month (Dec)

Enter years for composites (from 1 to 195) (e.g. 1973) For seasons that span a year (e.g. DJF), please enter year of the LAST yr.

No. subtract one set of years from another. Use a minus sign (-) between the years that are to be subtracted.

On Error range of years:  Optional: minus

On List of years: None (None)

On Hours from values in Time Series: (None)

# CUSTOM Time Series:

Enter in composites:

Time of composites: (None)  (Season or month or year)

Log: Plot composites for:  months before or after date chosen

Axis? (None)  Missing: (None)

Plot type? (Mean)  Anomaly  (None)

Scale plot size (%): Plot contour interval? (No) (Yes)

Overide contour interval? Interval: Range: low: high:

Use pressure: (None) (hPa) (mb) (km)

# CUSTOM parameters:

Number of sets to plot: (1) Repeat of:

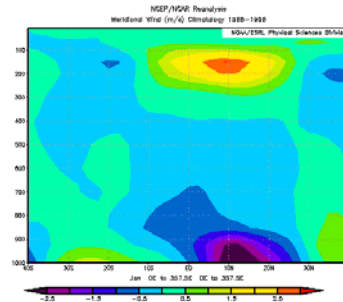
Vertical axis: latitude of a plot:  Eastern-most longitude:

UNIT: (None) (Reanalysis) (Reanalysis) (Reanalysis)

Choose height range & DIRECTION:

Lower level: (None)  Upper level: (None)

(None) (None) (None)



<http://www.esrl.noaa.gov/psd/data/composites>

# Hovmollers

Latitude/Time or Longitude by Time Plots  
Means and Anomalies  
Look at Feature Propagation

(Default plot is Time-Longitude along the Equator with no area averaging)

Which variable? (Air Temperature)  (Analysis Level?) (Surface)

Beginning month: (Mar)  Ending month: (Mar)

Beginning Day: (1)  Ending Day: (31)

Beginning year: (1973)  Ending year: (1974)

Operational data begins in 1979

Data type:  Operational  Reanalysis  Mean  Anomaly  Climatology

Plot type:  Time-Longitude  Time-Latitude  Postscript output?  Yes  No

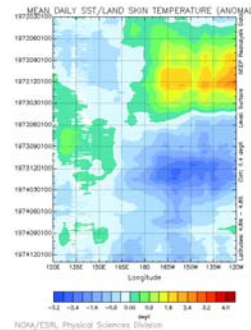
Longitude Range (e.g., Lon1: 0 Lon2: 360) Lon1: (0) Lon2: (360)

Latitude Range (e.g., Lat1: 90 Lat2: 90) Lat1: (90) Lat2: (90)

Overide contour interval? Interval: Range Low: High:

Optional: Change size of plot (1-300%) (100%)

Enter Plot  Reset Options



[http://www.esrl.noaa.gov/psd/map/time\\_plot/](http://www.esrl.noaa.gov/psd/map/time_plot/)

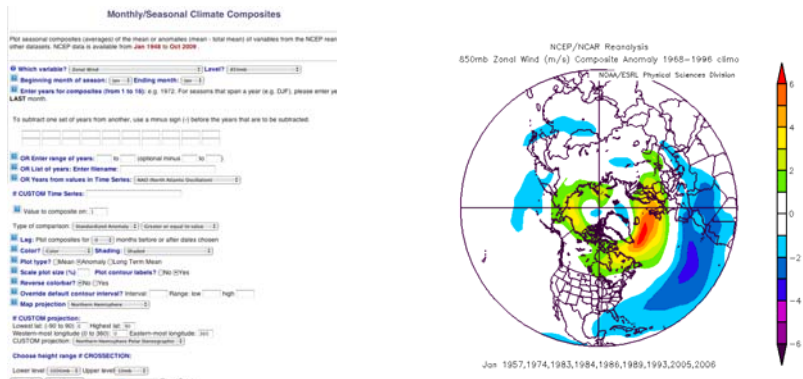
# Compositing Monthly Data

- Averaging different climate events can help 'smooth' out the noise and make processes more clear.
- Page can average dates, lead/lag, obtain dates to average, change variables...

<http://www.esrl.noaa.gov/psd/data/composites/>

# Obtaining Dates to Average for composites

Use provided timeseries (like PNA) and specify a criteria (such as  $>1.0$  sigma for January values)





# Monthly/Seasonal Correlations

- Correlations allow for quick looks and hypothesis testing
- Correlate provided timeseries or upload your own

**Linear Correlations in Atmospheric Seasonal/Monthly Averages**

Plot correlations of seasonally averaged variables from the NCEP reanalysis with specified teleconnection and ocean index time series. Correlations are generally available from Jan 1948 to Oct 2009.

[View options for custom time series.](#)

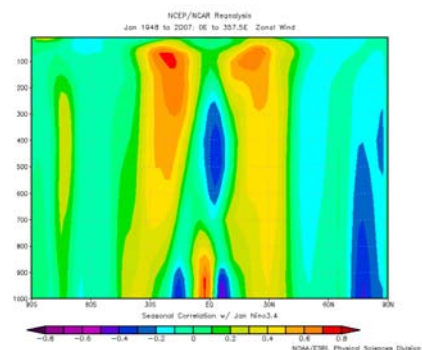
**Variable and Date Options:**  
 Correlation  Regression

Which variable? [Zonal Wind] [Analysis level?] [Latitude] [ ]  
Beginning month of season [Jan] [Ending month] [ ]  
Enter year range for correlations [ ] [ ] (Optional: Enter month(s) or season(s); index time series leads [ ] or lags [ ] correlating variable.)  
For seasons that span a year (e.g. DJF), please enter year of the LAST month of season. Default is 1948(9).  
Time Series? [New L4] [ ] [Custom] [ ]  
Optional custom title: [ ]

**Plot Options:**  
Color? [Color] [Shading Type] [Shaded] [ ]  
Override default contour interval? Interval: [ ] Range: low [ ] High [ ] Scale Plot Size? [ ]  
Plot Region? Type [Contour] [Contour with shading] [ ] [ ] (For your own select region, you must choose Custom or Crosssection.)

**IF CUSTOM or CROSSSECTION:**  
Enter level for L4 or L5? [ ] [Repeat] [ ] [ ]  
Enter season month longitude [ ] to [ ] [ ] Eastern most longitude [ ] [ ]  
Select approach for CUSTOM: [Contour] [ ] [ ]  
Choose height range for CROSSSECTION: [ ] to [ ] [ ] [ ]

[\(Custom Plot / About Options\)](#) [\(Report Bugs\)](#)



<http://www.esrl.noaa.gov/psd/data/correlation>

# Analyze Monthly Timeseries

- Users can correlate monthly timeseries changing the season/months
- Autocorrelation and Cross Correlation are available
- Upload your own timeseries

Correlate RAO, NAO: All months: .72  
January: .83 June: .68

[http://www.esrl.noaa.gov/psd/gcos\\_wgsp/Timeseries](http://www.esrl.noaa.gov/psd/gcos_wgsp/Timeseries)

# Obtain Daily Timeseries

- Extract ASCII timeseries of NCEP data, station data and pregenerated timeseries like the PNA
- Extract data that fits specified criteria (like >10C)
- Use these dates in the daily composite pages

Time series Selection

Choose a pregenerated time series?

OR: Choose a Station?  Choose a Variable?  Station List

OR: Choose a variable from the NCEP/NCAR reanalysis?

Variable?  Choose a Level?

Latitude?  Longitude?

Time Series Action Choices

Get timeseries of full subset of dates

High/Low values  Days from seasons selected (start 2002)

All values to composite  Type of comparison:

Season/Year Refinement

Beginning month of season:  Ending month:

Enter range of years

Start:  to

OR: Enter Years to use (from 1 to 201 e.g. 1972. For seasons that span a year (e.g. DJF), please enter year of the LAST month.

Get Data/Timeseries/Reanalysis

2008:01:17: 267.3500  
 2007:01:15: 267.9700  
 2004:01:06: 268.1800  
 2007:01:16: 269.0000  
 2008:01:02: 269.1300  
 2009:01:27: 269.1300  
 2004:01:05: 270.1000  
 2005:01:05: 270.6200  
 2007:01:14: 271.0500  
 2008:01:22: 271.2200  
 2008:01:01: 271.2800  
 2007:01:13: 271.6800  
 2007:01:12: 272.1800  
 2002:01:31: 272.4700  
 2007:01:19: 272.5200  
 2002:01:02: 272.5500  
 2008:01:19: 272.6500  
 2001:01:17: 273.3900  
 2007:01:17: 273.5300  
 2009:01:26: 273.5800

<http://www.esrl.noaa.gov/psd/data/timeseries/daily>

# Google Earth Format Data

- Users can plot monthly data and get a kmz file output
- File can be downloaded for use in Google Earth Desktop Ap
- Those with Google web ap can view in their browser
- Below is 1000mb Air T anom for El Nino years from 20thC Reanalysis

20th Century Reanalysis Monthly/Seasonal Compos

Plot seasonal composites (averages) of the mean or anomalies (mean - total mean) of variables from the 1 KML/KMZ file and a link to the Google Earth Browser Interface. 20th century reanalysis data is available in

Which variable?  Level?

Beginning month of season:  Ending month:

Enter years for composite (start - to - end, e.g. 1972. For seasons that span a year (e.g. DJF), please enter

To subtract one set of years from another, use a minus sign (-) before the years that are to be subtracted.

OR: Enter range of years:  to  (optional minus sign)

OR: List of years: Enter (comma)

OR: Enter from values in Time Series:

or: ODT/OT Time Series:

Value to composite on:

Type of comparison:

Lag: Plot composites for  months before or after dates (please)

Color?  Shading?

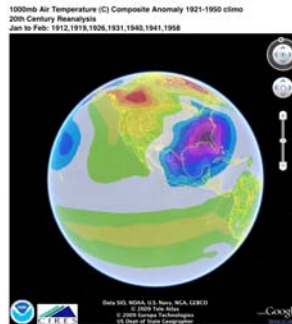
Plot type?  Mean of Anomaly / Long Term Mean

Scale plot axis (X):  Plot contour labels?

Reverse contour?

Override default contour interval? Interval:  Range: low  high

Contour  Shading  Plot Area



<http://www.esrl.noaa.gov/psd/cgi-bin/data/composites/plot20thc.kml.new.pl>

## openDAP

- OpenDAP: Users can access any of PSD's gridded files via a protocol called openDAP.
- OpenDAP makes files appear to be local when accessing them from any openDAP enabled app (GrADS, IDL, NCO, CDO) and from Fortran.
- Directions are on the PSD webpage for our files
- A catalog of all the files and metadata is available via THREDDS

## Other Data Sources and Future Possibilities

- PSD has all of its internal data and web apps available from <http://www.esrl.noaa.gov/psd/data/> and /products/
- Other Sources of non-PSD data are linked
- In the future, we would like to consolidate apps
- We would like to use openDAP in apps to access for data outside ESRL
- We would like to do more with datasets comparisons
- We would like to be incorporated into the NOAA climate portal