



Online Training Course
On

Visualization of Marine Met Data (Using FERRET)

Organised by

International Training Centre for Operational Oceanography (ITCOO)
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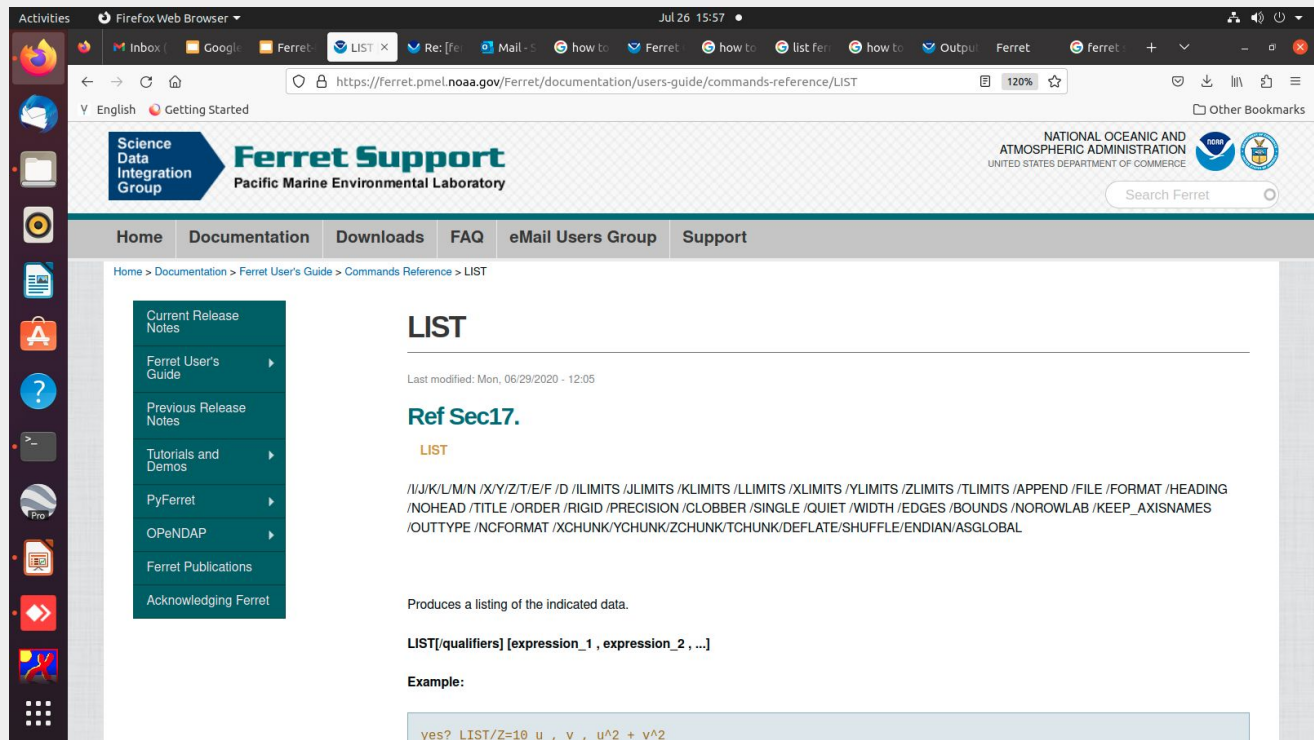
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List and Its Major Qualifiers

Precision, format, clobber, append, order etc

- **List/x/y/z/t**
- **List/i/j/k/l**
- **List/noheader**
- **List/file=**
- **List/clobber/file=**
- **List/append/file=**
- **List/precision=**
- **List/format=**
- **List Missing values**
- **List/order=xy or yx**
- **List/quiet=**



The screenshot shows a Firefox browser window displaying the Ferret documentation page for the LIST command. The page title is "LIST" and it is part of the "Commands Reference" section. The page content includes:

- LIST**
- Last modified: Mon, 06/29/2020 - 12:05
- Ref Sec17.**
- LIST**
- `/I/J/K/L/M/N /X/Y/Z/T/E/F /D /ILIMITS /JLIMITS /KLIMITS /LLIMITS /XLIMITS /YLIMITS /ZLIMITS /TLIMITS /APPEND /FILE /FORMAT /HEADING /NOHEAD /TITLE /ORDER /RIGID /PRECISION /CLOBBER /SINGLE /QUIET /WIDTH /EDGES /BOUNDS /NOROWLAB /KEEP_AXISNAMES /OUTTYPE /NCFORMAT /XCHUNK /YCHUNK /ZCHUNK /TCHUNK /DEFLATE /SHUFFLE /ENDIAN /ASGLOBAL`
- Produces a listing of the indicated data.
- `LIST[qualifiers] [expression_1 , expression_2 , ...]`
- Example:**
- `yes? LIST/Z=10 u , v , u^2 + v^2`

List and Its Major Qualifiers

Clobber and Append

`list/file=sample.txt/append/x=80:90/y=10:20/l=2 sst`
`list/file=sample.txt/append/x=80:90/y=10:20/l=4 sst`

VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
 FILENAME : coads_climatology.cdf
 FILEPATH : /usr/local/ferret/fer_dsets/data/
 SUBSET : 5 by 5 points (LONGITUDE-LATITUDE)
l=2
 TIME : 15-FEB 16:29
 81E 83E 85E 87E 89E
 31 32 33 34 35

19N / 55: 27.73 26.31 25.98 25.51
 17N / 54: 26.47 26.65 26.56 26.44 26.08
 15N / 53: 26.89 26.73 26.65 26.79 26.51
 13N / 52: 26.99 26.97 26.83 26.95 27.24
 11N / 51: 27.20 27.28 27.25 27.46 27.45

VARIABLE : SEA SURFACE TEMPERATURE (Deg

C)
 FILENAME : coads_climatology.cdf
 FILEPATH : /usr/local/ferret/fer_dsets/data/
 SUBSET : 5 by 5 points (LONGITUDE-LATITUDE)
l=4
 TIME : 15-FEB 16:29
 81E 83E 85E 87E 89E
 31 32 33 34 35

19N / 55: 27.73 26.31 25.98 25.51
 17N / 54: 26.47 26.65 26.56 26.44 26.08
 15N / 53: 26.89 26.73 26.65 26.79 26.51
 13N / 52: 26.99 26.97 26.83 26.95 27.24
 11N / 51: 27.20 27.28 27.25 27.46 27.45

sample.txt

`list/file=sample.txt/clobber/x=80:90/y=10:20/l=2 sst`
`list/file=sample.txt/clobber/x=80:90/y=10:20/l=4 sst`

l=2

VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
 FILENAME : coads_climatology.cdf
 FILEPATH : /usr/local/ferret/fer_dsets/data/
 SUBSET : 5 by 5 points (LONGITUDE-LATITUDE)
 TIME : 15-FEB 16:29
 81E 83E 85E 87E 89E
 31 32 33 34 35
 19N / 55: 27.73 26.31 25.98 25.51
 17N / 54: 26.47 26.65 26.56 26.44 26.08
 15N / 53: 26.89 26.73 26.65 26.79 26.51
 13N / 52: 26.99 26.97 26.83 26.95 27.24
 11N / 51: 27.20 27.28 27.25 27.46 27.45

sample.txt

l=4

VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
 FILENAME : coads_climatology.cdf
 FILEPATH : /usr/local/ferret/fer_dsets/data/
 SUBSET : 5 by 5 points (LONGITUDE-LATITUDE)
 TIME : 16-APR 13:27
 81E 83E 85E 87E 89E
 31 32 33 34 35
 19N / 55: 27.24 28.63 28.84 28.62
 17N / 54: 29.02 29.18 28.99 28.87 29.25
 15N / 53: 29.28 29.32 29.20 29.16 29.02
 13N / 52: 29.22 29.43 29.25 29.36 29.12
 11N / 51: 29.53 29.48 29.53 29.60 29.58

sample.txt

Clobber

Append

List and Its Major Qualifiers

Precision and Format

Precision: a precise value after decimals up to n significant digits (25.**36589**)

```
VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
FILENAME : coads_climatology.cdf
SUBSET   : 12 points (TIME)
LONGITUDE: 85E
LATITUDE : 11N
          85E
          33
16-JAN   / 1: 27.053
15-FEB   / 2: 27.252
17-MAR   / 3: 28.395
16-APR   / 4: 29.533
16-MAY   / 5: 29.787
16-JUN   / 6: 29.182
16-JUL   / 7: 28.592
16-AUG   / 8: 28.513
15-SEP   / 9: 28.471
16-OCT   /10: 28.623
15-NOV   /11: 28.285
16-DEC   /12: 27.565
```

`list/precision=5/x=85/y=11 sst`

```
VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
FILENAME : coads_climatology.cdf
SUBSET   : 12 points (TIME)
LONGITUDE: 85E
LATITUDE : 11N
          85E
          33
16-JAN   / 1: 27.05341339
15-FEB   / 2: 27.25247765
17-MAR   / 3: 28.39465141
16-APR   / 4: 29.53341484
16-MAY   / 5: 29.78681755
16-JUN   / 6: 29.18249893
16-JUL   / 7: 28.59166527
16-AUG   / 8: 28.51285553
15-SEP   / 9: 28.47136307
16-OCT   /10: 28.62348747
15-NOV   /11: 28.28523827
16-DEC   /12: 27.56464958
```

`list/precision=10/x=85/y=11 sst`

List and Its Major Qualifiers

Precision and Format

Format: (F9.3) — **F** is floating number, **9** total length of the number, **0.3** no. of digits after decimal

```
VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
FILENAME : coads_climatology.cdf
FILEPATH : /usr/local/ferret/fer_dsets/data/
BAD FLAG : -1.E+34
SUBSET : 12 points (TIME)
LONGITUDE: 85E
TIME : 01-JAN 00:45 to 31-DEC 06:34
LATITUDE : 11N
```

```
27.053
27.252
28.395
29.533
29.787
29.182
28.592
28.513
28.471
28.623
28.285
27.565
```

list/format=(f9.3)/x=85/y=11 sst

```
VARIABLE : SEA SURFACE TEMPERATURE (Deg C)
FILENAME : coads_climatology.cdf
FILEPATH : /usr/local/ferret/fer_dsets/data/
BAD FLAG : -1.E+34
SUBSET : 12 points (TIME)
LONGITUDE: 85E
TIME : 01-JAN 00:45 to 31-DEC 06:34
LATITUDE : 11N
```

```
27.053
27.252
28.395
29.533
29.787
29.182
28.592
28.513
28.471
28.623
28.285
27.565
```

list/format=(f20.3)/x=85/y=11 sst

List and Its Major Qualifiers

Missing Values - Bad/undefined/filled values

***** → 9999.0000

- ❑ While listing filled/BAD/undefined values are shown as *****.
- ❑ To eliminate these, we can set the filled/BAD/undefined to any number we want as follows:
 - ❑ - **List/format=(F9.3) missing(sst[x=65,y=15],9999.000)**
- ❑ This will replace all the undefined valued to 9999.000. This can be used while creating NetCDF files too.
- ❑ The assigning value could be any random number but, it shouldn't be in the range of any variable present in dataset. **(e.g. 9999.000 shouldn't be 20.58, or -02.58 since these number come under range of variable SST in the dataset)**

List and Its Major Qualifiers

Missing Values - Bad/undefined/filled values

Example: Assigning a value(9999.000) to missing values (***) such as Bad/undefined/filled values**

```
VARIABLE : AIR TEMPERATURE (DEG C)
FILENAME : coads_climatology.cdf
FILEPATH : /usr/local/ferret/fer_dsets/data/
BAD FLAG : -1.E+34
SUBSET   : 3 by 3 points
(LONGITUDE-LATITUDE)
LONGITUDE: 80E to 85E
LATITUDE : 15N to 20N
TIME     : 16-APR 13:27
```

29.45919
29.32705
29.29093
29.10000
29.45452
29.54114

**Before assigning a value
to missing value (****)**

29.16333
29.10683

```
VARIABLE : MISSING(AIRT,9999.000)
FILENAME : coads_climatology.cdf
FILEPATH : /usr/local/ferret/fer_dsets/data/
BAD FLAG : -1.E+34
SUBSET   : 3 by 3 points
(LONGITUDE-LATITUDE)
LONGITUDE: 80E to 85E
LATITUDE : 15N to 20N
TIME     : 16-APR 13:27
```

29.45919
29.32705
29.29093
29.10000
29.45452
29.54114

**After assigning a value
(9999.000) to missing
value(*****)**

9999.00000

29.16333
29.10683

`list/format=(f10.5)/x=80:85/y=15:20/l=4 airt`

`list/format=(f10.5)/x=80:85/y=15:20/l=4 missing(airt,9999.000)`

List and Its Major Qualifiers

Order and quiet

`list/order=xy/x=80:90/y=10:20 sst`

`list/order=yx/x=80:90/y=10:20 sst`

`list/order=xyt/x=80:90/y=10:20/t=1:5 sst`

Quiet will prevent the message "LISTing to file XXXX.XXXX" from being displayed.

`list/file=sample.txt/clobber/x=80:90/y=10:20/l=1:5 sst` then "**LISTing to file sample.txt**" message comes

`list/file=sample.txt/quiet/clobber/x=80:90/y=10:20/l=1:5 sst` then, **above message doesn't come**

List and Save 1D Point Data

SST at x=90 E, y=5 N

Let us pick **SST data** at central Bay of Bengal (longitude = 90 E, latitude = 5 N) from coads_climatology and create a NetCDF file.

Here **X and Y are fixed**, since it is Sea Surface Temperature (SST), depth is also fixed to surface (or 3 meters say in moorings). Only time is varying from Jan – Dec. We need to build the jnl accordingly.

```
list/file=1Ddata.dat/x=90/y=5/noheader/clobber/format=(f9.5) missing(sst,9999.000)
```

```
27.98909
28.19978
28.80023
29.56818
29.21182
28.62704
28.33841
28.09795
28.04045
28.11159
28.26614
28.15705
```

```
1ddata.dat
```

List and Save 2D Point Data

SST of x=30E : 120E, y=-30S : 30N

Let us pick data corresponding to SST from coads_climatology for the month of Jan and create a NetCDF file.

Here **X and Y are varying** from **30 – 120 and -30 - 30**, since it is **SST depth is fixed to surface**. **Time is also fixed to be January**. We need to build the jnl accordingly.

use coads_climatology

set region/x=30:120/y=-30:30

list/format=(2f9.3,f9.3) x[gx=sst], y[gy=sst], sst[l=1]

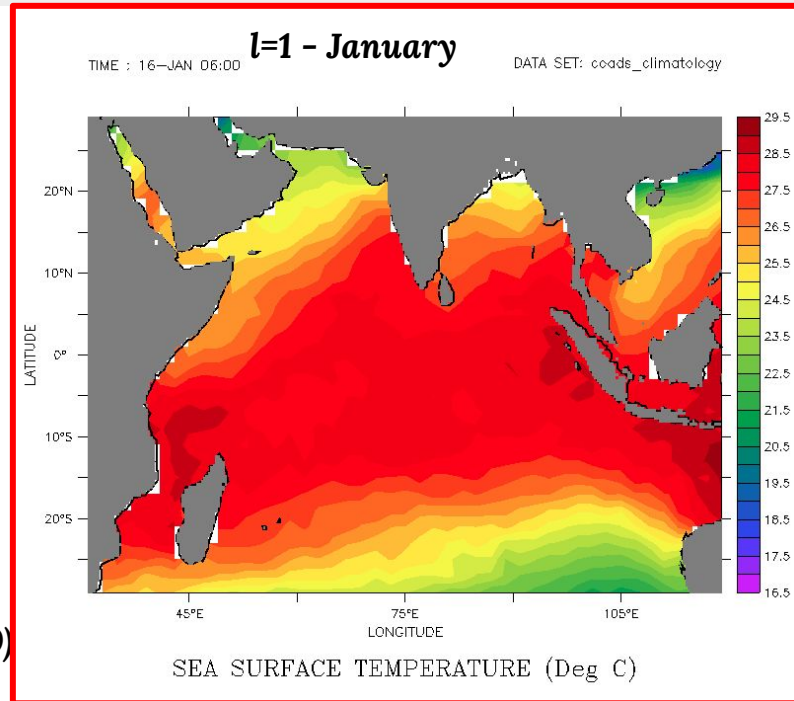
! without assigning any value to missing values

list/format=(2f9.3,f9.3) x[gx=sst], y[gy=sst], missing(sst[l=1],9999.000)

! with assigning '9999.000' to missing values

list/format(2f9.3,f9.3)/file=2Ddata.dat x[gx=sst], y[gy=sst], missing(sst[l=1],9999.000)

! saving the data in file with name of 2Ddata.dat for sst at l=1



Net CDF File Generation using Ferret

Rules - X, Y, Z and T axes

- ❑ **NetCDF (network Common Data Form)** is a file format for storing **multidimensional scientific data** (variables) such as temperature, humidity, pressure, wind speed, and direction.
- ❑ NetCDF files can be **generated from ASCII or Binary files.**
- ❑ One need to know the detailed information of
 - ★ **X (longitude range: Xint and Xfin and increment)**
 - ★ **Y (latitude range: Yint and Yfin and increment)**
 - ★ **Z (Depth range: Zint and Zfin and increment)**
 - ★ **T (Time range: Tint and Tfin and increment)**
- ❑ The **fundamental rule** is that these **ranges are to be in monotonic increasing range.**
- ❑ FERRET gives an **error** while creating the NetCDF file, If **range is not in monotonic increasing range**

Net CDF File Generation using Ferret

Rules - Ini & final ranges, increments, units, no. of points

- ❑ The **axes are to be defined** with
 - ★ Initial and final ranges
 - ★ Increments
 - ★ Number of points
 - ★ Units etc.
- ❑ After axes are defined, **grid need to be defined based on axes.**
- ❑ The data in the file need to be mapped to the grid definition. **If the count (lat x lon x depth x time) is not matching, then FERRT will throw error.**
- ❑ **Titles, BAD or undefined (fill values)** need to be specified properly. **Total count = X*Y*Z*T**

Net CDF File Generation using Ferret

Define the X - Axis - Longitude

Yes ? *define axis/x= Xint : Xfin: Δx /npoints=number/units=degrees_e name*

Example

define axis/x=65:65:1/npoints=1/units=degrees_e xlon. ----Low resolution
***d**efine axis/x=60:65:1/npoints=5/units=degrees_e xlon*
define axis/x=60:65:0.5/npoints=11/units=degrees_e xlon --High resolution

Net CDF File Generation using Ferret

Define the Y - Axis - Latitude

Yes ? *define axis/y= Yint : Yfin:Δy/npoints=number/units=degrees_n name*

Example:

```
define axis/y=15:15:1/npoints=1/units=degrees_n ylat.
define axis/x=10:15:1/npoints=5/units=degrees_n ylat
define axis/x=10:15:0.5/npoints=11/units=degrees_n ylat
```

$$\frac{\text{Final value} - \text{initial value}}{\text{increment}} + 1$$

Net CDF File Generation using Ferret

Define the Z - Axis - Depth

Yes ? *define axis/z= Zint : Zfin: Δz /npoints=number/units=meters name*

Example:

define axis/z=0:15:1/npoints=15/units=meters zdep.

Z values can be discrete and need not be continuous, but they should be monotonically increasing.

Net CDF File Generation using Ferret

Define the T - Axis - Time

Yes ? *define axis/t= Tint : Tfin: Δ t/npoints=number/units=days name*

Example:

define axis/t=1:5:1/npoints=5/units=days taxis.

define axis/t="15-jan-2020":"30-jan- 2020":1/npoints=15/units=days taxis

define axis/t="15-jan":"15-jan":1/npoints=1/units=days taxis (generally for climatology)

Net CDF File Generation using Ferret

Define - Grid

Define grid/x=xname/y=yname/z=zname/t=tname/order=xyzt/var="var1, var2, ..." filename grid_name

Example:

```
define grid/x=xaxis/y=yaxis/z=zaxis/t=taxis/order=xyz t sample_grid
```

Net CDF File Generation using Ferret

1D_data.nc file creation

yes? define axis/x=89:89:1/npoints=1/units=degrees_e xlon ----- **X axis**

yes? define axis/y=05:05:1/npoints=1/units=degrees_n ylat ----- **Y axis**

yes? define axis/z=0:0:1/npoints=1/units=meters zdep ----- **Z axis**

yes? define axis/t="15-jan":"15-dec":1/npoints=12/units=days taxis ---- **T axis**

yes? define grid/x=xlon/y=ylat/z=zdep/t=taxis oneDgrid ----- **Grid**

yes? file/var="nsst"/order=xyzt/grid=oneDgrid 1D_data.dat ----- **variables**

yes? set variable/BAD=9999.000 nsst ----- **Set BAD Value**

yes? save/clobber/file=1D_data.nc nsst ----- **Save as .nc file**

LISTing to file 1D_data.nc

Net CDF File Generation using Ferret

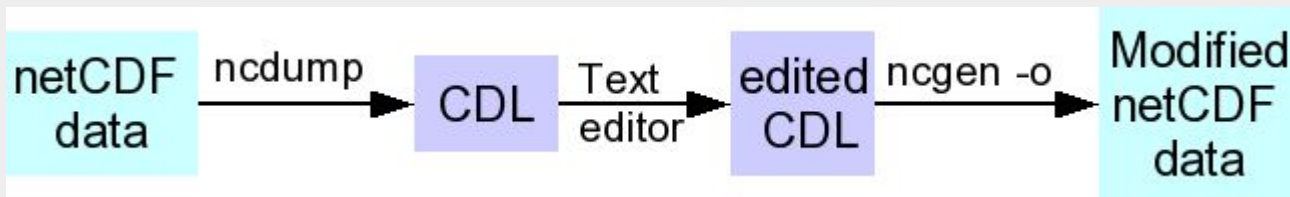
2D_data.nc file creation

```
yes? set region/x=30:120/y=-30:30
yes? define axis/x=31:119:2/npoints=45/units=degrees_e xlon
yes? define axis/y=-29:29:2/npoints=30/units=degrees_n ylat
yes? define axis/z=0:0:1/npoints=1/units=meters zdep
yes? define axis/t="15-Jan-2023":"15-Jan-2023":1/npoints=1/units=days taxis
yes? define grid/x=xlon/y=ylat/z=zdep/t=taxis twoDgrid
yes? file/var="lon,lat,nsst"/order=xyzt/grid=twoDgrid 2D_data.dat
yes? set variable/BAD=9999.000 nsst
save/clobber/file=2D_data.nc nsst
LISTing to file 2D_data.nc
```

NetCDF Utilities

Ncdump and Ncgen

The **ncdump** command-line utility converts netCDF data to human-readable form.



- Use **ncdump** to convert netCDF file to CDL
- Use a text editor to make desired change to CDL
- Use **ncgen** to turn modified CDL back into modified netCDF file
- This is not very practical for large netCDF files.



Thank You for your kind patience

For more details, you can approach me through

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Quora: <https://www.quora.com/profile/Sivaiah-Borra>

YouTube: <https://www.youtube.com/@guidemycareer-meteorologya8816/featured>