Visualization of different Plots

Data Visualization of Marine Met data using FERRET

27 – 31 August, 2018

Getting Started

- To start the ferret s/w we give the following command
  - Ferret and press enter
  - yes? (Default prompt for ferret s/w)
- For every Ferret session, a log file stores the commands given. This is called the Ferret **journal file**. By default it is named **ferret.jnl**
  - If we don't want this log file then the command to be given is: "ferret –nojnl" and press enter
- To call the file for visualization we use the command
  - yes? Use filename.nc (or)
  - Yes? Set filename.nc
- To quit from the s/w we give say
  - yes? quit

Concepts

- In Ferret all **variables** are regarded as defined on **grids.** The grids tell Ferret how to locate the data in space and time.
- To access a variable Ferret must know its name, data set and the **region** of its grid that is desired.
  - Regions may be specified as **subscripts** (indices) or in **world coordinates.**
- Using the LET command new variables may be created "from thin air" as:
  - **abstract expressions** or created from combinations of known variables as arbitrary **expressions**.
- If component variables in an expression are on different grids, then **regridding** may be applied simply by naming the desired grid

Concepts continued …

- The user need to explicitly tell Ferret to read data. From start to finish, the sequence of operations needed to obtain results from Ferret is simply:
  - specify the data set
  - specify the region
  - define the desired variable or expression (optional)
  - request the output

Grids in loaded files

- All Ferret grids are 6-dimensional (Prior to Ferret v6.8, grids were 4-dimensional)
- Files when loaded into ferret displays the grids corresponding to the variables
  - **Subscripts** are specified by I=,J=,K=,L=, M=, N= for axes 1 through 6, respectively.
  - **World coordinates** are specified by X=,Y=,Z=,T=, E=, F=.
- In most cases the axes have the obvious interpretation of 3 space coordinates and time.
- Two more to allow for e.g. an Ensemble dimension and Forecast-time dimension but sometimes the axes are abstract.

To plot the data and visualize

- As the data set have different dimensions, to plot the data one need to freeze the dimensions that are not to be varied. That is we have longitude, latitude, depth and time varying we need to fix any of these dimensions as per our requirement.
  - Eg: If we want to plot and see the temperature at a place then we fix (x,y,t) that is fix its position (x,y) and the time of occurrence.
  - If we want to see the variability along all latitudes we fix longitude, depth and time.
  - If all dimensions are fixed we get a value listed and no plot is displayed.

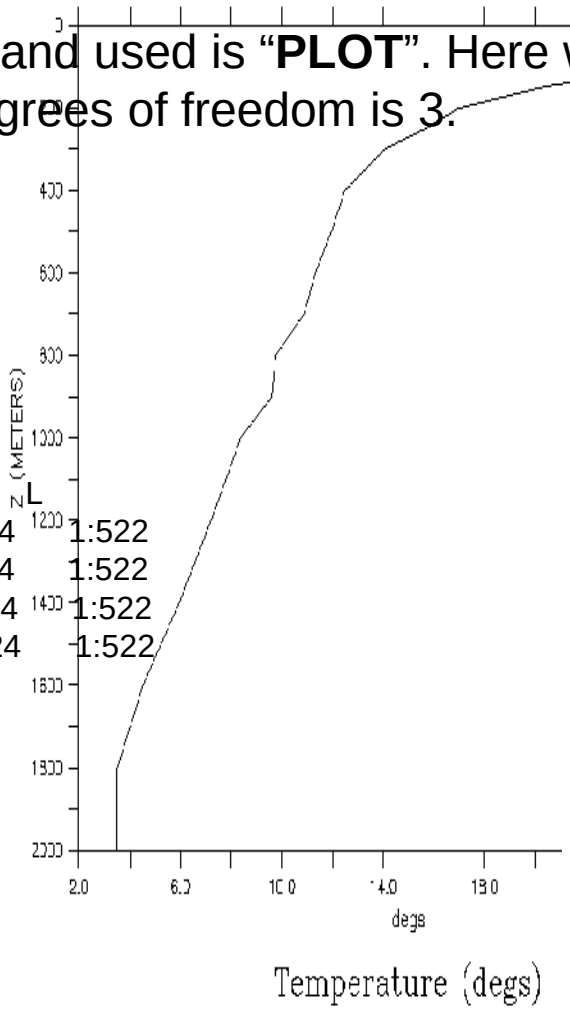
Plot command and annotations

- /I/J/K/L/M/N /X/Y/Z/T/E/F /ALONG /OVERLAY/ SET_UP /FRAME /D/ TRANPOSE/ VS/ SYMBOL/ NOLABEL /LINE /COLOR /THICKNES /SIZE /HLIMITS /VLIMITS /TITLE /STEP /NOAXES /DASH /HGRATICULE /VGRATICULE /HLIMITS /VLIMITS /HLOG /VLOG /GRATICULE /NOKEY /NOYADJUST /KEY /RIBBON /LEVELS /PALETTE /FAST /MISSING /GAPLOC /SKIPSYM /DEGMINSEC /HALFSPACE /HIGHLIGHT.
  - Eg: plot temp[x=65,y=15,t=15-aug-2017]
  - Plot/line/color=red temp[x=65,y=15,t=15-aug-2017]

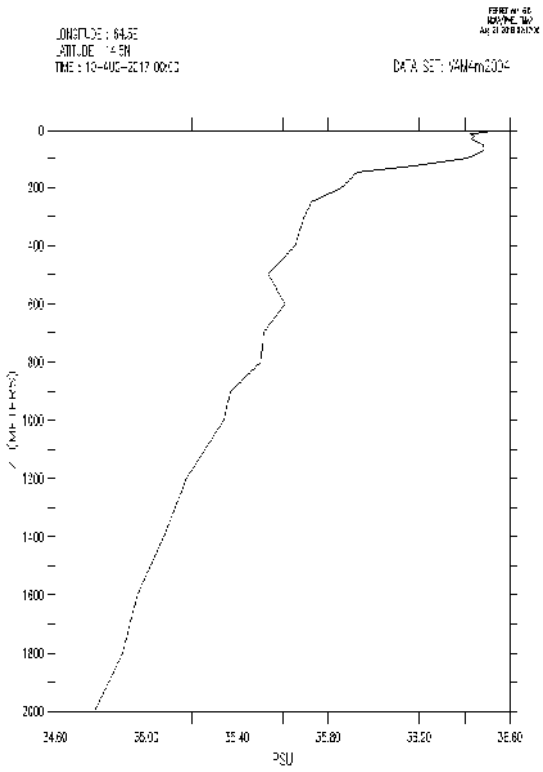
To plot any line plots the command used is “**PLOT**”. Here we need to fix at least 3 out of 4 dimensions. That is degrees of freedom is 3.

```
yes? use VAM4m2004.nc
yes? show data
     currently SET data sets:
    1> ./VAM4m2004.nc  (default)
 name     title                  I        J        K        L
 TEMP     Temperature            1:90     1:60     1:24     1:522
 TERR     Temp relative Error    1:90     1:60     1:24     1:522
 SAL      Salinity               1:90     1:60     1:24     1:522
 SERR     Sal relative Error     1:90     1:60     1:24     1:522

yes? plot temp[x=65,y=15,t=15-aug-2017]
!
! To plot the salinity profile
!
yes? plot temp[x=65,y=15,t=15-aug-2017]
```



Temperature (degs)

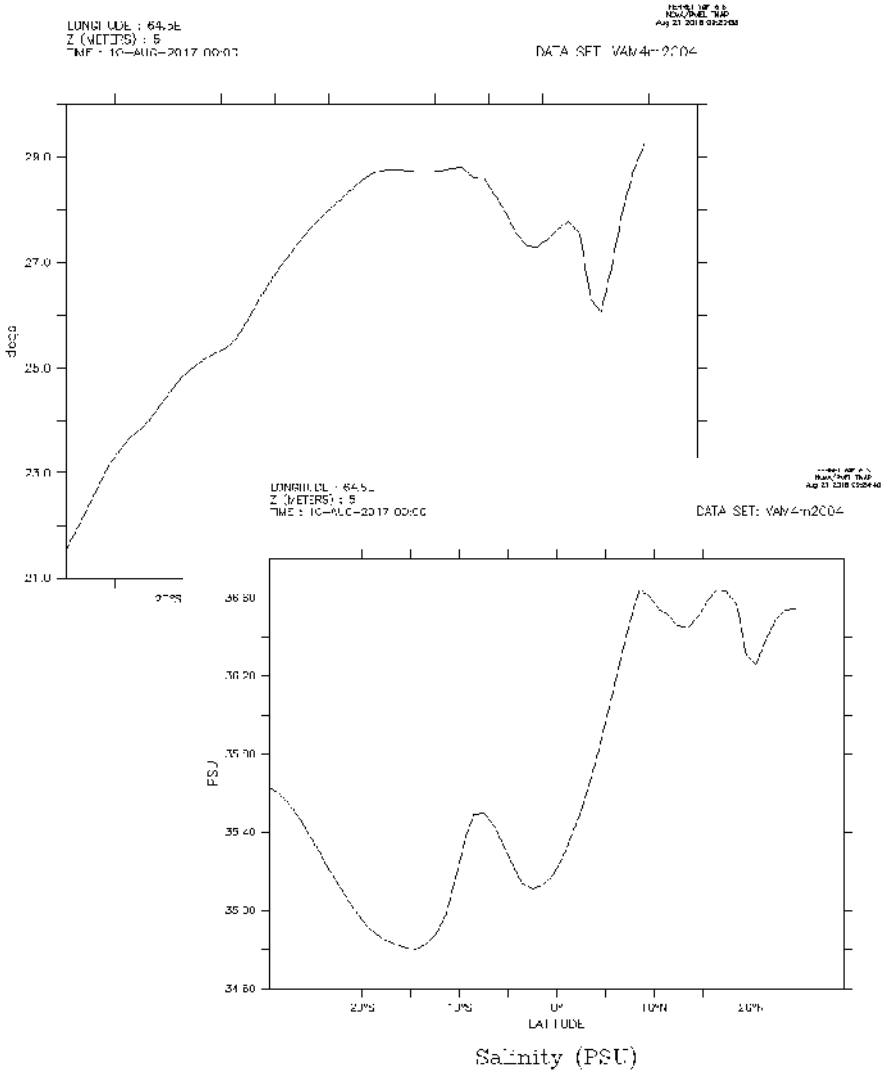


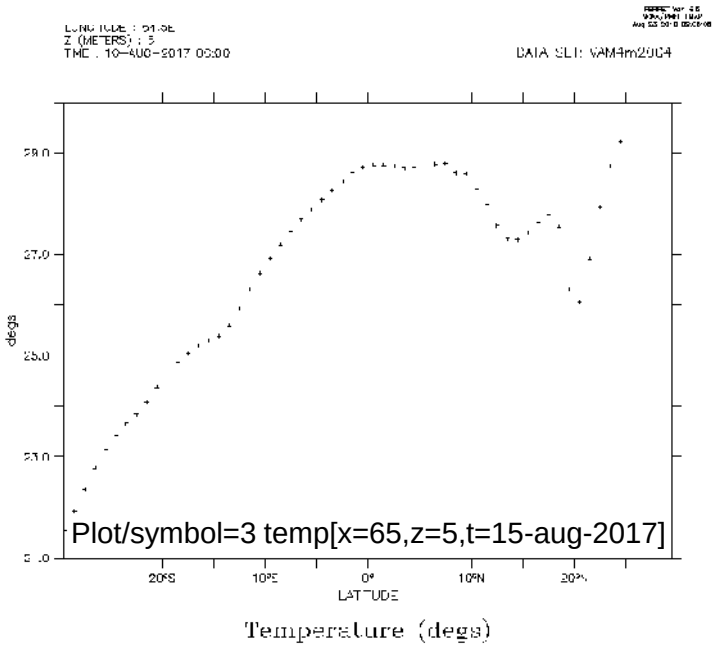
Salinity (PSU)

To plot and see the latitudinal and longitudinal variabilities the following commands are used.

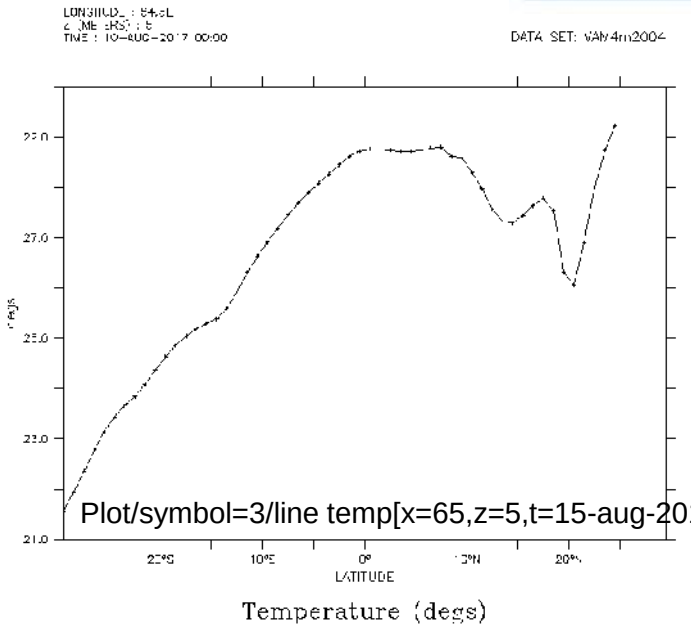
```
yes? use VAM4m2004.nc
yes? sh da
     currently SET data sets:
    1> ./VAM4m2004.nc  (default)
 name     title                I        J        K        L
 TEMP     Temperature          1:90     1:60     1:24     1:522
 TERR     Temp relative Error  1:90     1:60     1:24     1:522
 SAL      Salinity             1:90     1:60     1:24     1:522
 SERR     Sal relative Error   1:90     1:60     1:24     1:522

!
! To plot the latitudinal variability of temperature
!
yes? plot temp[x=65,z=5,t=15-aug-2017]
yes? Plot/symbol temp[x=65,z=5,t=15-aug-2017]
!
! To plot the latitudinal variability of salinity
!
yes? Plot sal[x=65,z=5,t=15-aug-2017]
```

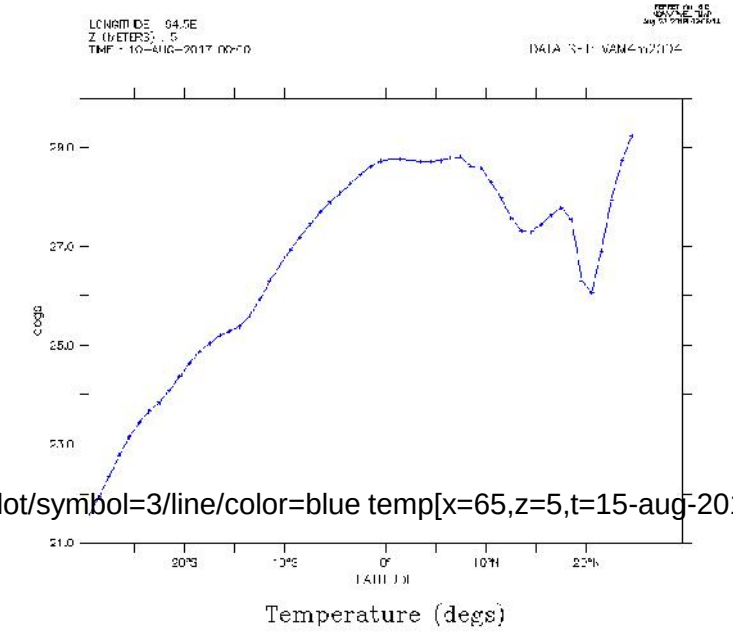




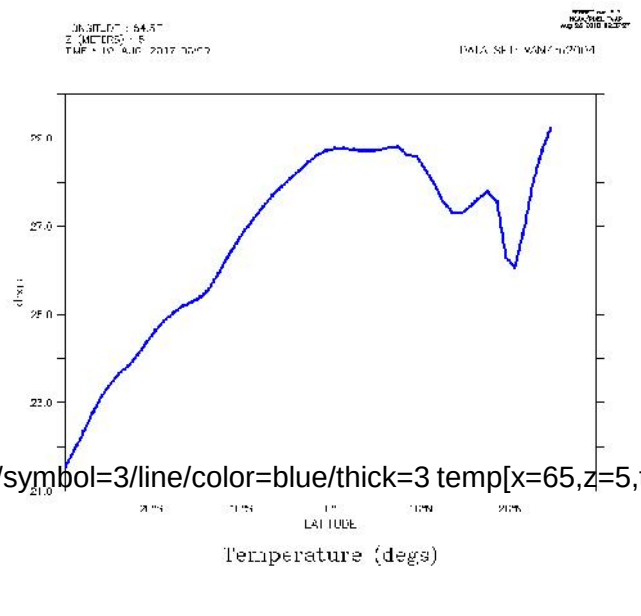
Plot/symbol=3 temp[x=65,z=5,t=15-aug-2017]



Plot/symbol=3/line temp[x=65,z=5,t=15-aug-2017]



Plot/symbol=3/line/color=blue temp[x=65,z=5,t=15-aug-2017]

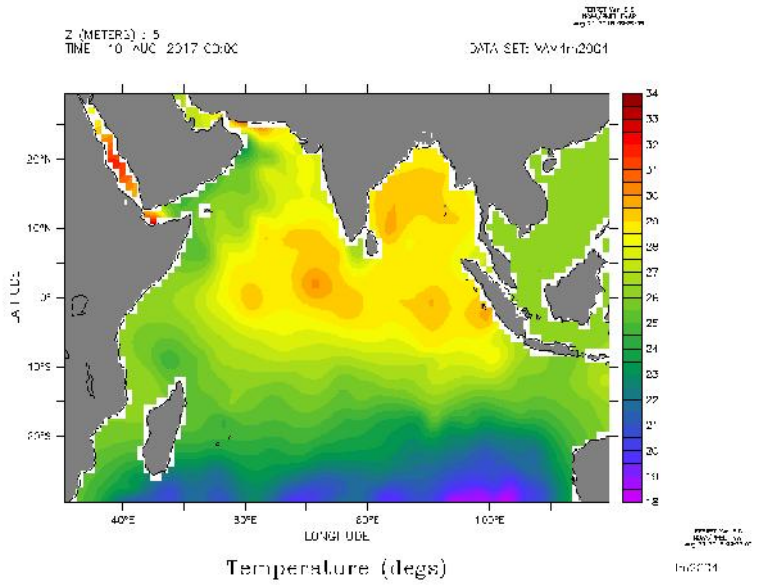


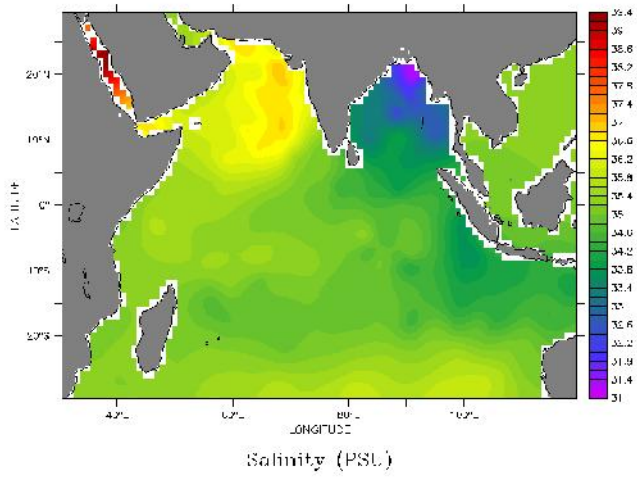
Plot/symbol=3/line/color=blue/thick=3 temp[x=65,z=5,t=15-aug-2017]

To plot any filled plots the command used is "**FILL/SHADE**". Here we need to fix at least 2 out of 4 dimensions. That is degrees of freedom is 2.

```
yes? use VAM4m2004.nc
yes? sh da
     currently SET data sets:
    1> ./VAM4m2004.nc  (default)
 name     title                 I         J        K        L
 TEMP     Temperature           1:90      1:60     1:24     1:522
 TERR     Temp relative Error   1:90      1:60     1:24     1:522
 SAL      Salinity              1:90      1:60     1:24     1:522
 SERR     Sal relative Error    1:90      1:60     1:24     1:522

yes? fill temp[z=5,t=15-aug-2017]
yes? go fland
yes? go land
!
! To display the surface salinity
!
yes? Fill sal[z=5,t=15-aug-2017]; go fland; go land
```





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```
yes? use VAM4m2004.nc
yes? sh da
     currently SET data sets:
    1> ./VAM4m2004.nc  (default)
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 TERR     Temp relative Error   1:90      1:60     1:24     1:522
 SAL      Salinity              1:90      1:60     1:24     1:522
 SERR     Sal relative Error    1:90      1:60     1:24     1:522

yes? shade temp[z=5,t=15-aug-2017]
yes? go fland
yes? go land
!
! To display the surface salinity
!
yes? Fill sal[z=5,t=15-aug-2017]; go fland; go land
```
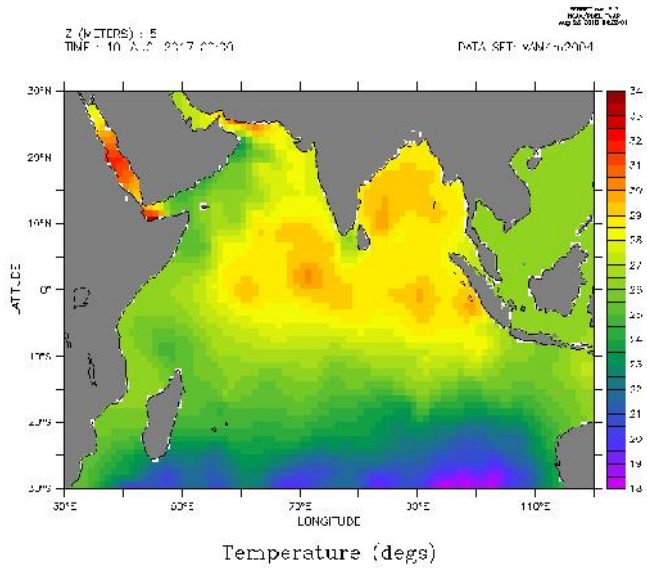
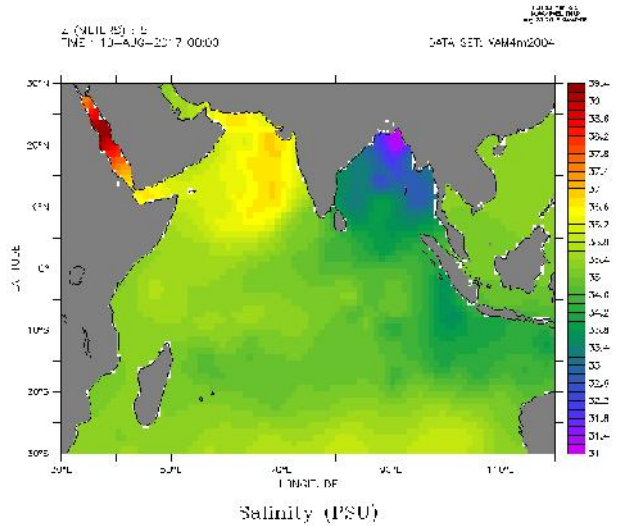
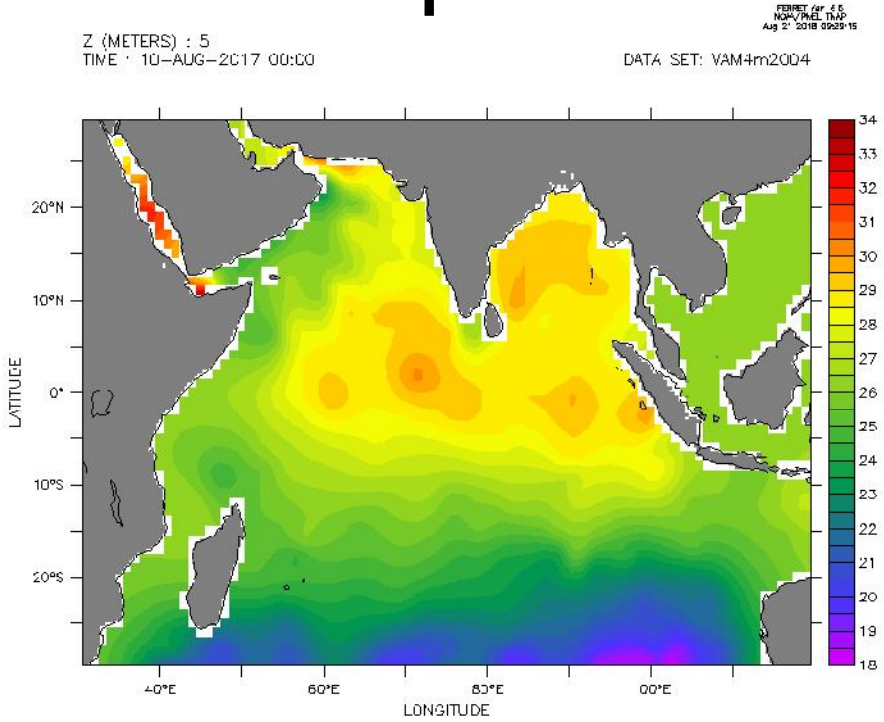
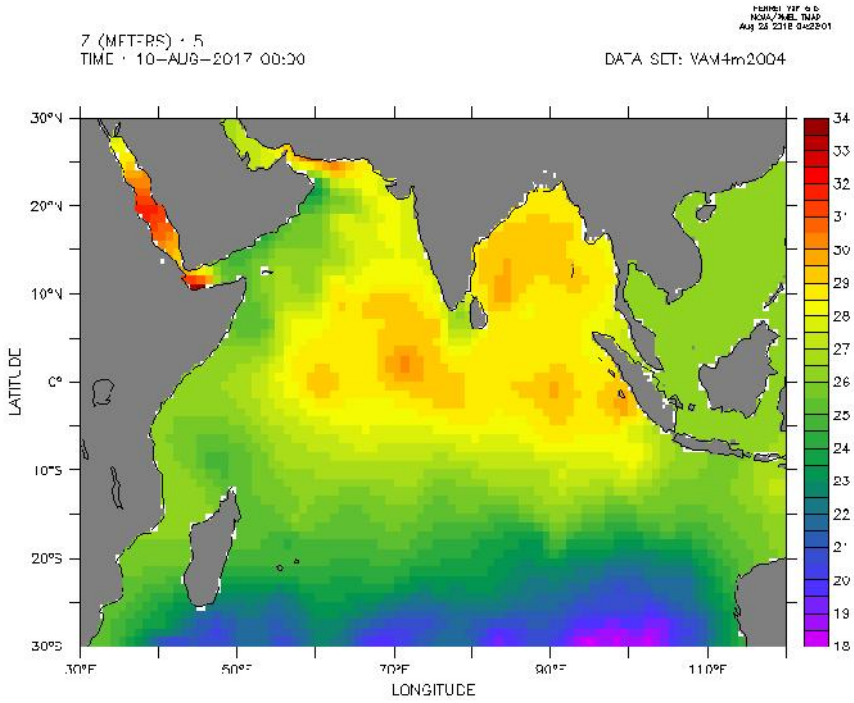





Comparison of Fill Vs Shade

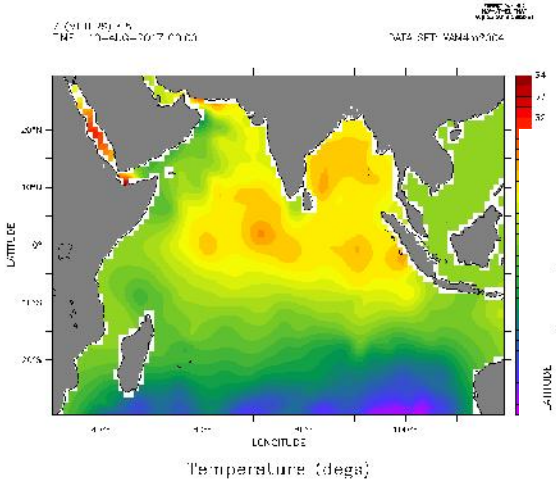


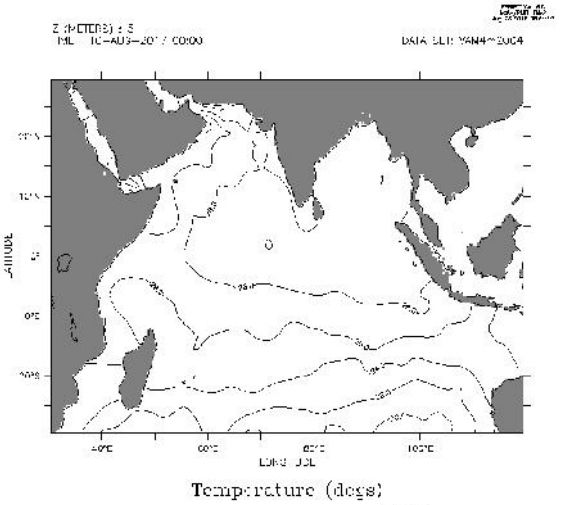
Temperature (degs)



Temperature (degs)

“Contour” command is used along with Fill/Shade to display line contours along With the filled contours






```
yes? use VAM4m2004.nc
yes? sh da
     currently SET data sets:
    1> ./VAM4m2004.nc  (default)
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 SERR     Sal relative Error   1:90     1:60     1:24     1:522

yes? fill temp[z=5,t=15-aug-2017]
!
! To display the line contours
!
yes? contour/overlay temp[z=5,t=15-aug-2017]
yes? go fland
yes? go land
```
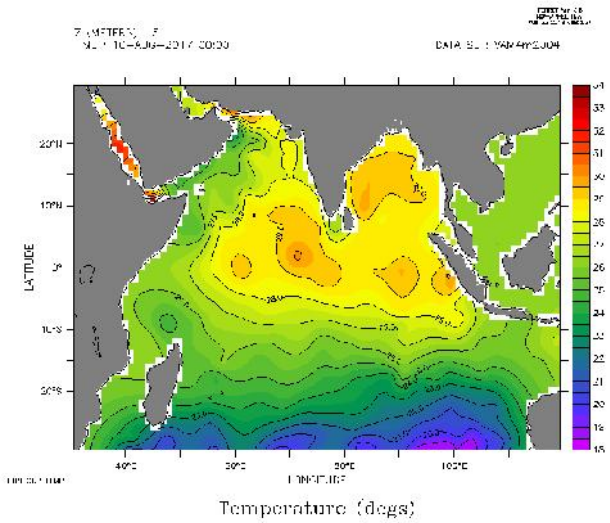
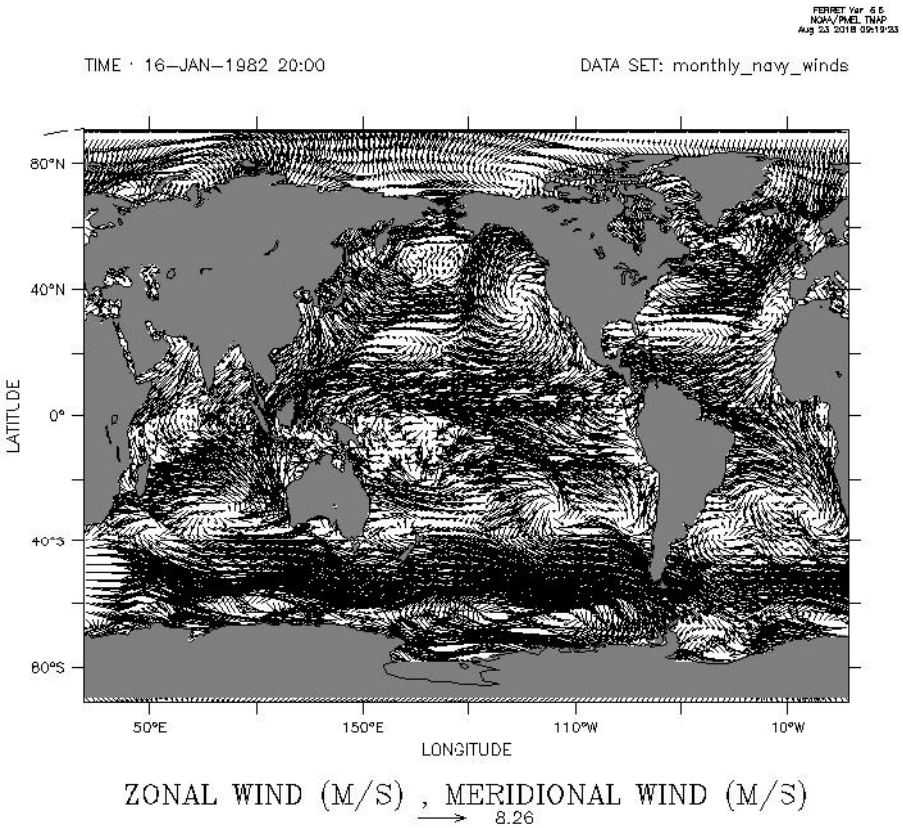



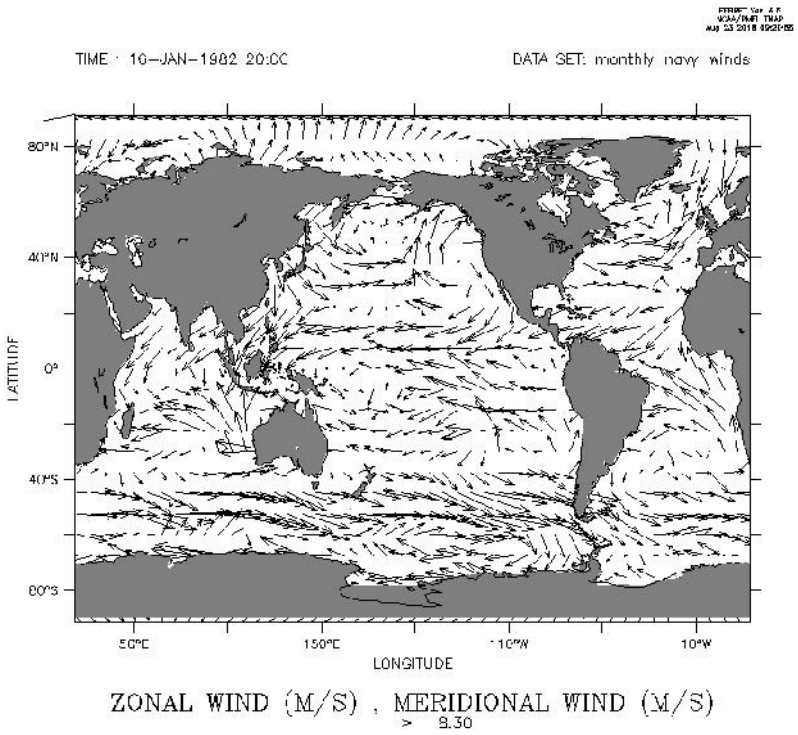
Plotting Wind data

- If we want to plot vector plots of stick plots from wind
  - Yes? Vector ucmp,vcmp (Ucmp is zonal component and vcmp is meridional component of the wind)
  - Plotuv is used for plotting the stick plots. This is to called using ppl commands.
- If we want to restrict the number of vector then we use the xskip and yskip commands to restrict them.
  - Eg:- yes? Use monthly_navy_winds

```
yes? vector uwnd[l=1],vwnd[l=1];go fland;go land
yes? Vector/xskip=1/yskip=1 uwnd[l=1],vwnd[l=1];go fland;go land
yes? Vector/xskip=3/yskip=3 uwnd[l=1],vwnd[l=1];go fland;go land
```

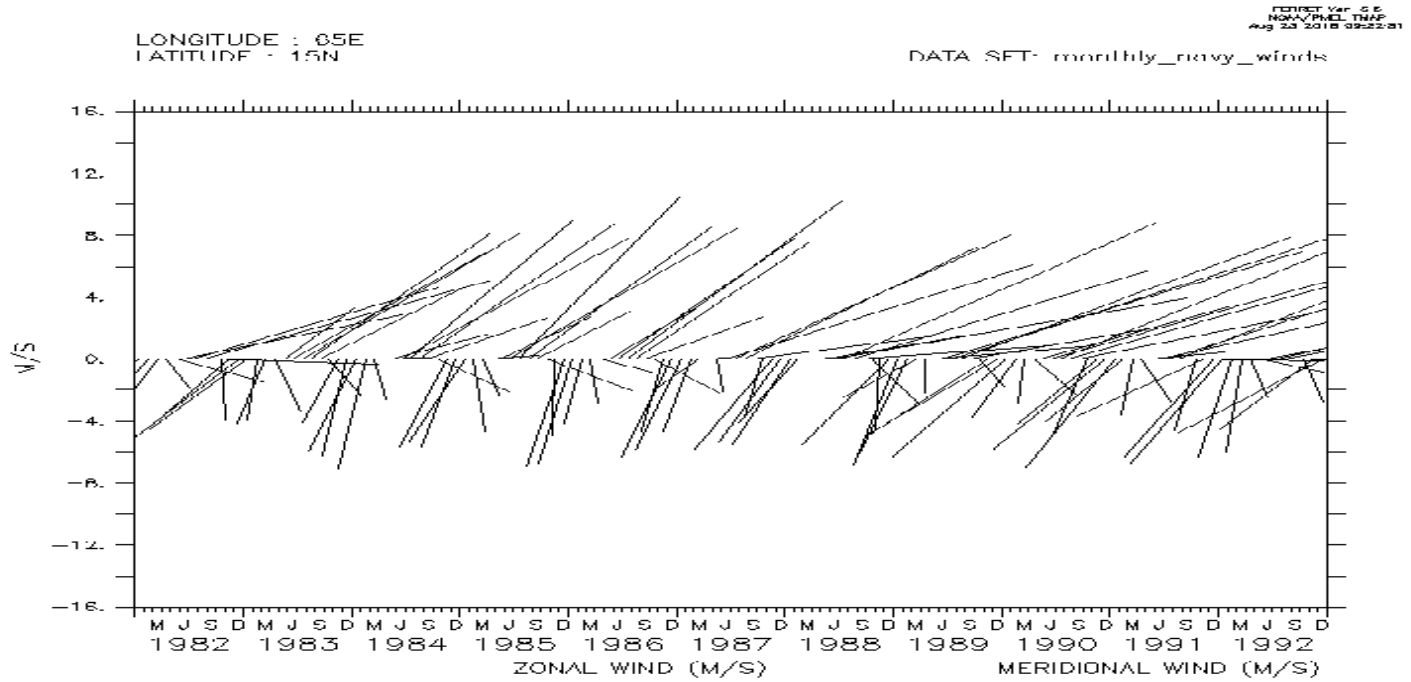


Vector/xskip=1/yskip=1
uwnd[l=1],vwnd[l=1];go fland;go land



Vector/xskip=3/yskip=3
uwnd[l=1],vwnd[l=1];go fland;go land

yes? use monthly_navy_winds
yes? PLOT/SET/X=65/Y=15 uwnd, vwnd
yes? ppl plotuv



Plotting for comparison

- If we want to compare plots there are options like:
  - Create multiple windows
  - Use viewports
- Multiple windows can be created using
  - Set window # (the number)
- Viewports divide the space in the window into multiple canvases
  - Set viewport “name”
  - One can use the build in viewport options or create his/her own.
  - Eg:- yes? Set viewport upper

```
yes? Fill temp[z=5,t=10-aug-2017];go fland; go land
yes? Set viewport lower
yes? Fill sal[z=5,t=10-aug-2017];go fland; go land
```

Multiple windows

yes? use VAM4m2004.nc

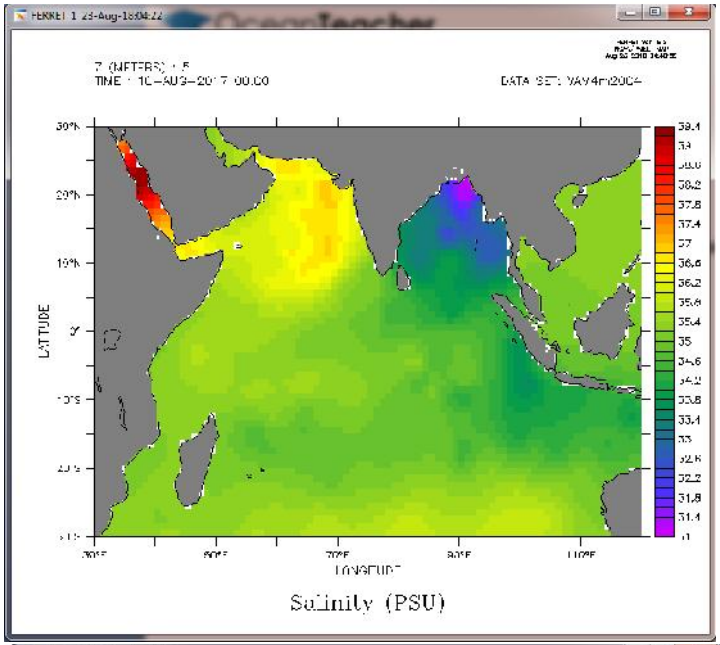
yes? shade temp[z=5,t=15-aug-2017]; go fland; go land

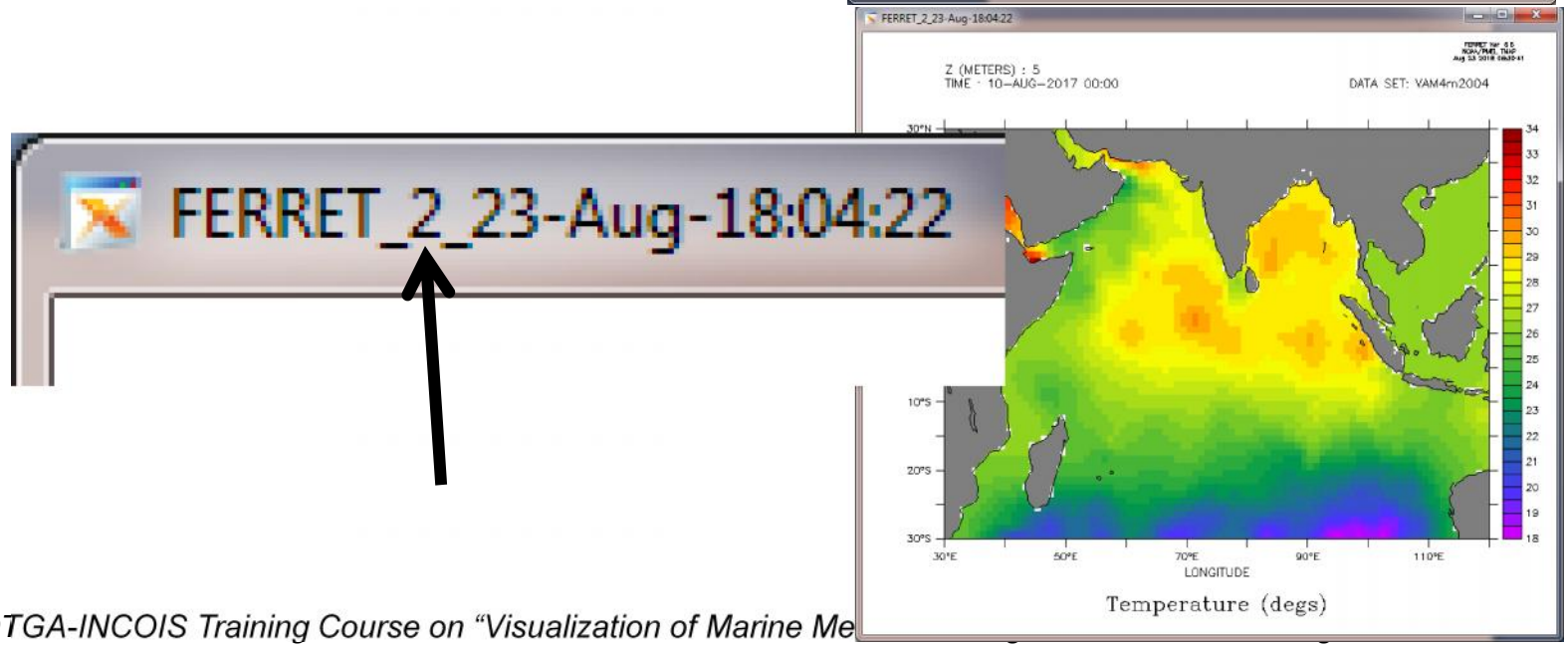
! The above command displays the plot in default window-1

! Now to create a new windows we give as below

yes? set window 2

yes? shade sal[z=5,t=15-aug-2017];go fland;go land





Using viewports

- There are two build in viewports which one can use directly by taking their name
- For simultaneously plotting two images the command is yes? Set viewport upper and

  yes? Set viewport lower
- For simultaneously plotting four images the command is yes? Set viewport ll (meaning lower left)

  yes? Set viewport lr (meaning lower right)

  yes? Set viewport ul (meaning upper left)

  yes? Set viewport ur (meaning upper right)
- If need one can define their own set of viewports

Using built in viewports (for 2)

yes? use VAM4m2004.nc

yes? Set viewport upper

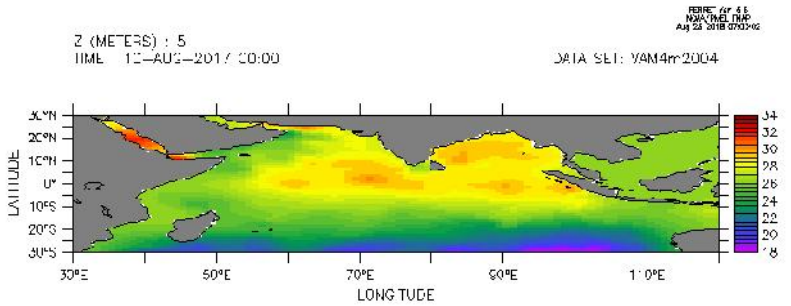
yes? shade temp[z=5,t=15-aug-2017]; go fland; go land

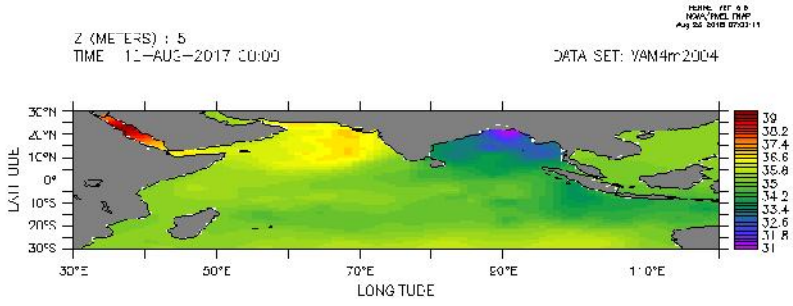
! The above command displays the plot in upper portion of the window

yes? set viewport lower

! The above command displays the plot in lower portion of the window

yes? shade sal[z=5,t=15-aug-2017];go fland;go land





Using built in viewports (for 4)

yes? use VAM4m2004.nc

yes? Set viewport ul

! The above command displays the plot in upper left portion of the window

yes? fill temp[z=5,t=15-apr-2017]; go fland; go land

yes? set viewport ur

! The above command displays the plot in upper right portion of the window

yes? Fill temp[z=5,t=15-jul-2017];go fland; go land

Yes? Set viewport ll

! The above command displays the plot in lower left portion of the window

yes? fill temp[z=5,t=15-oct-2017]; go fland; go land

Yes? Set viewport lr

! The above command displays the plot in lower right portion of the window

Yes? fill temp[z=5,t=15-dec-2017]; go fland; go land