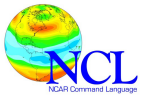
NCL



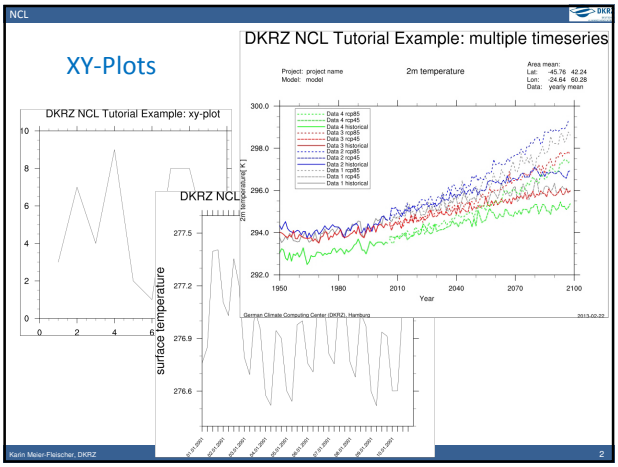
Part I

XY-Plots

Exercises and Tasks

NCL

XY-Plots



NCL

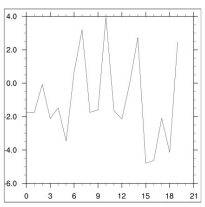
Since NCL version 6.2.0 not needed

Structure of a simple XY-plot script I

```
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/gsn_code.ncl"
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/gsn_csm.ncl"
begin
   y = random_uniform(-5,5,20)
   wks = gsn_open_wks("x11", "plot_part_I_simple_xy")
   plot = gsn_csm_y(wks, y, False)
end
```

Plot formats: X11, PNG, PDF, PS, EPS, EPSI, SVG, NCGM

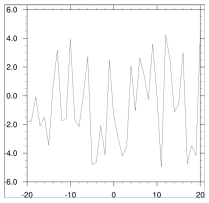
Window or plot file name



NCL

Structure of a simple XY-plot script II

```
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/gsn_code.ncl"
load "$NCARG_ROOT/lib/ncarg/nclscripts/csm/gsn_csm.ncl"

begin
   x = ispan(-20,20,1)
   y = random_uniform(-5,5,dimsizes(x))

   wks = gsn_open_wks("x11", "plot_part_I_simple_xy")

   plot = gsn_csm_xy(wks, x, y, False)
end
```



NCL

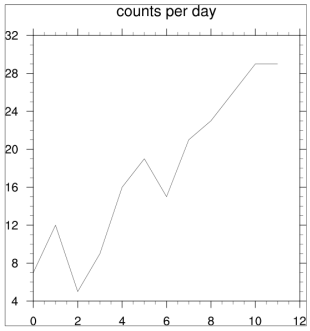
XY-plot script reading data from ASCII file

```
begin

   data = asciiread("$NCL_TUT/data/ASCII_data.asc", \
                    (/12,2/), "integer")
                       ; read ASCII data into 2D variable

   x = data(:,0)       ; get all data from column 1
   y = data(:,1)       ; get all data from column 2

   wks = gsn_open_wks("x11", "plot_part_I_read_ASCII_data_xy")

   res               =  True            ; create plot resource object
   res@tiMainString  = "counts per day" ; draw a title on top of plot

   plot = gsn_csm_xy(wks, x, y, res)

end
```

0	7
1	12
2	5
3	9
4	16
5	19
6	15
7	21
8	23
9	26
10	29
11	29
12	31

NCL

XY-plot script reading data from ASCII file



NCL

XY-plot script using geographical data

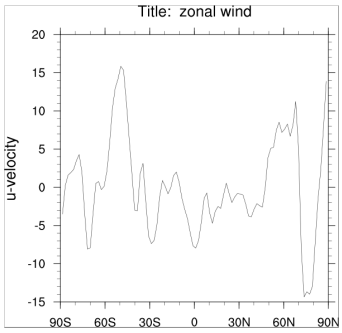
Dimensions: time, lat, lon

```
begin

   f = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
                                                  ; open data file
   x = f->lat                    ; latitude values
   y = f->u10(0,:,{45})          ; 1st time step, all lats,
                                 ; nearest to lon 45E deg.

   wks = gsn_open_wks("x11", "plot_part_I_read_data_xy")

   res               =  True          ; create plot resource object
   res@tiMainString = "Title: zonal wind"          ; draw a title

   plot = gsn_csm_xy(wks, x, y, res)       ; create and draw plot

end
```

Karin Meier-Fleischer, DKRZ 7

NCL

XY-plot script using geographical data



Karin Meier-Fleischer, DKRZ 8

NCL

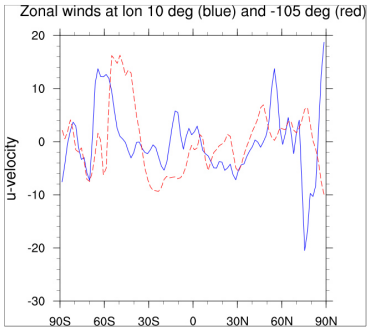
XY-plot multiple curves

```
begin

   f = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
   u = f->u10                          ; set variable u

  ;-- assign multidimensional array
   data      = new((/2,dimsizes(u&lat)/), float)
   data(0,:) = u(0,:,{10})             ; values at longitude 10 deg.
   data(1,:) = u(0,:,{-105})           ; values at longitude -105 deg.

   wks = gsn_open_wks("x11", "plot_part_I_multiple_curves_xy")

   res               =  True           ; create plot resource object
   res@xyLineColors = (/"blue", "red"/); line colors
   res@xyLineThicknesses = (/2.0,2.0/) ; set line thickness
   res@tiMainString = \
                "Zonal winds at lon 10 (blue) and -105 deg (red)"

   plot = gsn_csm_xy(wks, u&lat, data, res)    ; create the plot

end
```

Karin Meier-Fleischer, DKRZ 9

NCL

XY-plot multiple curves



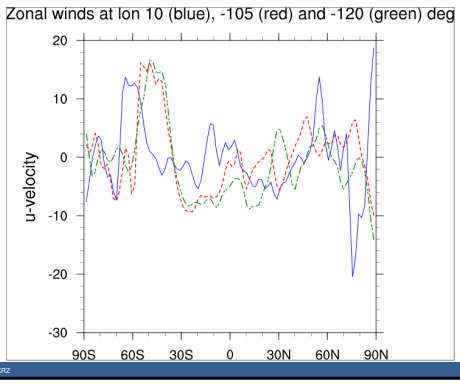
NCL

XY-plot change dash pattern

```
begin
   f = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
   u = f->u10                              ; set variable u

  ;-- assign multidimensional array
   data      = new((/3,dimsizes(u&lat)/), float)
   data(0,:) = u(0,:,{10})                 ; values at longitude 10 deg.
   data(1,:) = u(0,:,{-105})               ; values at longitude -105 deg.
   data(2,:) = u(0,:,{-120})               ; values at longitude -120 deg.

   wks = gsn_open_wks("png", "plot_part_I_dash_pattern_xy")

   res                   =  True           ; create plot resource object
   res@xyLineColors      = (/"blue", "red", "green4"/) ; line colors
   res@xyLineThicknesses = (/2.0, 3.0, 3.0/)   ; set line thickness
   res@xyDashPatterns    = (/0, 11, 4/)        ; 0=solid, 11=dashed,
                                               ; 4=line dotted
   res@tiMainString = \
          "Zonal winds at lon 10(blue), -105(red) and -120(green) deg"

   plot = gsn_csm_xy(wks, u&lat, data, res) ; create the plot
end
```


NCL

XY-plot change dash pattern



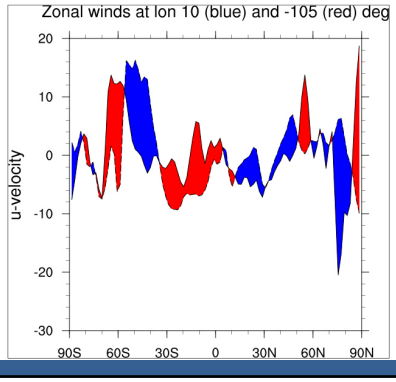
NCL

XY-plot fill between lines

```
begin
   f = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
   u = f->u10                          ;-- set variable u

  ;-- assign multidimensional array
   data      = new((/2,dimsizes(u&lat)/), float)
   data(0,:) = u(0,:,{10})             ;-- values at longitude 10 deg.
   data(1,:) = u(0,:,{-105})           ;-- values at longitude -105 deg.

   wks = gsn_open_wks("png", "plot_part_I_fill_between_lines_xy")

   res                     =  True  ;-- create plot resource object
   res@xyLineThicknessF    =  2.0   ;-- set line thickness

   res@gsnXYAboveFillColors = "red"
   res@gsnXYBelowFillColors = "blue"

   res@tiMainString = \
            "Zonal winds at lon 10 deg (blue) and -105 deg (red)"

   plot = gsn_csm_xy(wks, u&lat, data, res)   ;-- create the plot

end
```


NCL

XY-plot fill between lines

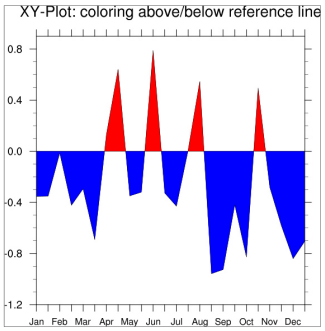


NCL

XY-plot with a reference line

```
begin
   x = fspan(1.,12.,24)                ; generate x values
   y = random_uniform(-1.,1.,24)       ; generate y values

   wks = gsn_open_wks("png","plot_part_I_reference_line_color_xy")

   res                      =  True     ; create plot resource object
   res@tmXBMode             = "Explicit" ; use explicit labels
   res@tmXBValues           =  x        ; set x-axis values
   res@tmXBLabelFontHeightF =  0.015    ; x-axis label font size
   res@tmXBLabels           = (/"Jan","","Feb","","Mar","","Apr","",\
                               "May","","Jun","","Jul","","Aug","",\
                               "Sep","","Oct","","Nov","","Dec",""/)
   res@gsnYRefLine           =  0.      ; reference line at 0.
   res@gsnAboveYRefLineColor = "red"    ; color red above ref. line
   res@gsnBelowYRefLineColor = "blue"   ; color blue below ref. line

   res@tiMainString = "XY-Plot: coloring above/below reference line"

   plot = gsn_csm_xy(wks,x,y,res)       ; create the plot

end
```

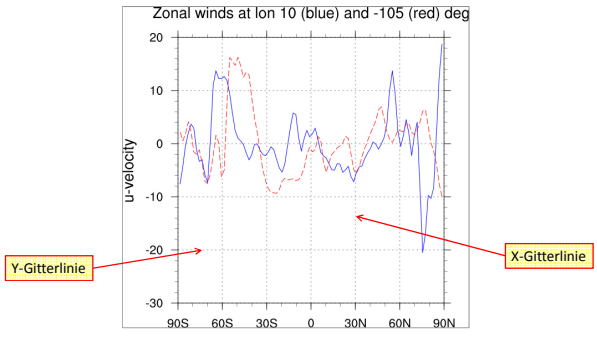
XY-plot with a reference line



XY-plot auxiliary grid lines

```
begin
   f = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
   u = f->u10                              ; set variable u

   data      = new((/2,dimsizes(u&lat)/), float)
   data(0,:) = u(0,:,{10})                 ; values at longitude 10 deg.
   data(1,:) = u(0,:,{-105})               ; values at longitude -105 deg.

   wks = gsn_open_wks("png", "plot_part_I_auxiliary_grid_lines_xy")

   res                    =  True       ; create plot resource object
   res@xyLineColors       =  ("blue", "red") ; set line colors
   res@xyLineThicknessF   =  2.0        ; set line thickness
   res@tiMainString = "Zonal winds at lon 10(blue) and -105 deg (red)"

   res@tmXMajorGrid               =  True   ; turn on x-grid
   res@tmXMajorGridThicknessF     =  1.0    ; thinner the lines
   res@tmXMajorGridLineDashPattern =  2     ; use dashed lines
   res@tmYMajorGrid               =  True   ; turn on y-grid
   res@tmYMajorGridThicknessF     =  1.0    ; thinner the lines
   res@tmYMajorGridLineDashPattern =  2     ; use dashed lines

   plot = gsn_csm_xy(wks, u&lat, data, res)  ; create the plot

end
```


XY-plot auxiliary grid lines



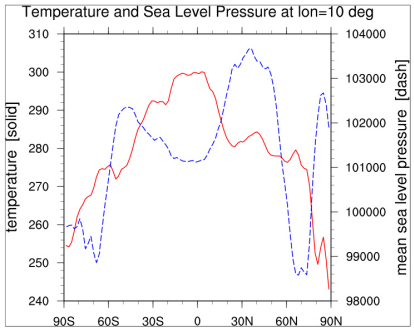
NCL

XY-plot two different y-axis

```
begin
   f    = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
   t    = f->tsurf(0,:,{10})          ; set variable t;    left y-axis
   slp  = f->slp(0,:,{10})            ; set variable slp;  right y-axis
   x    = f->lat                      ; x-axis values

   wks = gsn_open_wks("png", "plot_part_I_two_different_y_axis_xy")

   resT                  =  True      ; create plot resource object
   resT@xyLineColor      = "red"      ; set line colors
   resT@xyLineThicknessF =  3.0       ; set line thickness
   resT@xyDashPatterns   =  0         ; solid line
   resT@tiYAxisString    = t@long_name +"  "+"[solid]"; axis string

   resSLP                  =  True
   resSLP@xyLineColor      = "blue"   ; set line colors
   resSLP@xyLineThicknessF =  3.0     ; set line thickness
   resSLP@xyDashPatterns   =  1       ; dashed line
   resSLP@tiYAxisString    = slp@long_name +"  "+"[dash]"; axis string
   resSLP@tiMainString     = \
                  "Temperature and Sea Level Pressure at lon=10 deg"

   plot = gsn_csm_xy2(wks, x, t, slp, resT, resSLP) ; create plot
end
```


NCL

XY-plot two different y-axis

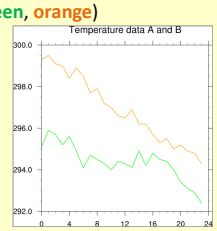


NCL

Task: XY-plot script reading data from ASCII file

- Use the script `part_I_XY_read_ASCII_data.ncl`
- Modify:
  - Read data file **ASCII_data_II.asc** column **1** and **2**
  - Define x-axis as **time** with **24** integer values
  - Plot data with different line colors (**green**, **orange**)
  - Make the **lines thicker** (=**3**)

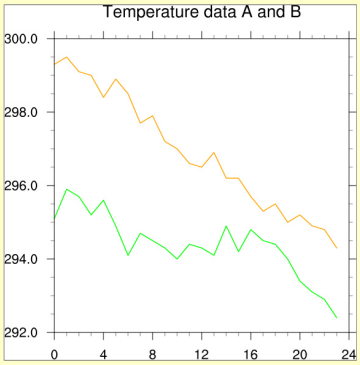
Hints:
- use ispan to create time x-axis
- xyMonoDashPattern
- xyLineThicknessF
- xyLineColors



Exercices/Part_I

NCL

Task: XY-plot script reading data from ASCII file



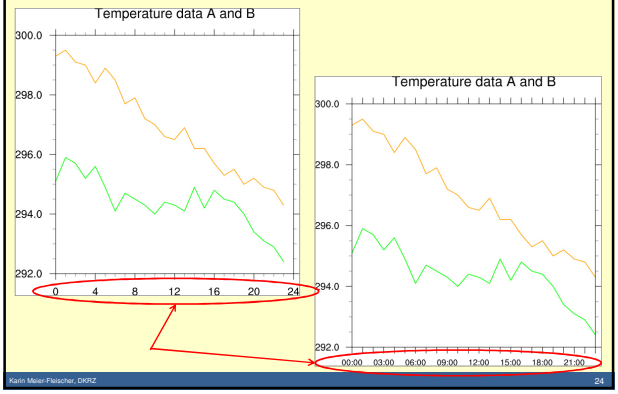
NCL

Task: XY-plot script reading data from ASCII file

```
begin
   data_col = asciiread("ASCII_data_II.asc", (/24,3/), "float")

   date    = ispan(0,23,1)         ; generate time array of 24 values

   mod_a   = data_col(:,1)         ; get all data from column 2
   mod_b   = data_col(:,2)         ; get all data from column 3

   wks = gsn_open_wks("png", "task_I_read_ASCII_data_2_xy")

   res                     =  True       ; create plot resource object
   res@tiMainString        = "Temperature data A and B" ; title string

   res@xyMonoDashPattern =  True     ; use solid lines pattern for all
   res@xyLineThicknessF  =  3                  ; set line thickness
   res@xyLineColors      =  (/"green","orange"/)       ; line colors

   plot = gsn_csm_xy(wks, date, (/mod_a,mod_b/), res)  ; create plot

end
```


NCL

Task: XY-plot script reading data from ASCII file



Task: XY-plot script reading data from ASCII file (1/2)

```
begin
   data_col2 = asciiread("ASCII_data_II.asc", -1, "string")

   delim  = " "                  ; set the delimiter used in the data file

   date   = str_get_field(data_col2,1,delim)                 ; 1st column
   mod_a2 = stringtofloat(str_get_field(data_col2,2,delim))  ; 2nd column
   mod_b2 = stringtofloat(str_get_field(data_col2, 3, delim)) ; 3rd column

   year   = str_get_cols(date,  0,  3)         ; char 0-3 of date string
   month  = str_get_cols(date,  4,  5)         ; next 2 char of date string
   day    = str_get_cols(date,  6,  7)         ; next 2 char of date string
   hour   = str_get_cols(date,  8,  9)         ; next 2 char of date string
   minute = str_get_cols(date, 10, 11)         ; next 2 char of date string

   tt     = hour + ":" + minute            ; format time string tt to hh:mm
   time   = stringtointeger(hour)          ; convert string to integer
```


Task: XY-plot script reading data from ASCII file (2/2)

```
   wks = gsn_open_wks("png", "task_I_read_ASCII_data_2_xy")

   res2                   =  True                 ; create resource object
   res2@tiMainString      = "Temperature data A and B"       ; title

   res2@xyMonoDashPattern =  True                 ; use one dash pattern
   res2@xyLineThicknessF  =  3                    ; set line thickness
   res2@xyLineColors      =  (/"green","orange"/) ; line colors

   res2@tmXBMode          = "Explicit"     ; set x-axis labels explicitly
   res2@tmXBLabels        =  tt            ; set the x-axis labels
   res2@tmXBValues        =  time          ; where to set x-axis labels
   res2@tmXBLabelFontHeightF = 0.015       ; decrease x-axis label size
   res2@tmLabelAutoStride =  True          ; don't overlap labels

   res2@trXMinF           =  min(time)       ; start value of x-axis
   res2@trXMaxF           =  max(time)       ; end value of x-axis

   plot = gsn_csm_xy(wks, time,(/mod_a2,mod_b2/),res2)    ; create plot

end
```