NCL   DKRZ

Part VIII

Animation

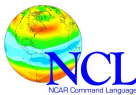Exercises and Tasks

Karin Meier-Fleischer, DKRZ

NCL   DKRZ

Time animation of a contour plot (1/4)

```
undef ("getDate")
function getDate(time)
local utc_date, year, mon, day, hours, mins, str_date
begin
  utc_date  = cd_calendar(time, 0)              ; convert date to UT-referenced date
  year      = sprinti("%0.4i",tointeger(utc_date(:,0)))   ; year as integer
  mon       = sprinti("%0.2i",tointeger(utc_date(:,1)))   ; month as int
  day       = sprinti("%0.2i",tointeger(utc_date(:,2)))   ; day as integer
  hours     = sprinti("%0.2i",tointeger(utc_date(:,3)))   ; hour as integer
  mins      = sprinti("%0.2i",tointeger(utc_date(:,4)))   ; minute as integer
  str_date  = year+"/"+mon+"/"+day+" "+hours+":"+mins     ; yyyy/mm/dd HH:MM
  return(str_date)
end

;-----------------------------------------------------
;-- main script
;-----------------------------------------------------
begin
```

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NCL   DKRZ

Time animation of a contour plot (2/4)

```
f     = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
temp  = f->tsurf                        ; temperature data 1st time step
time  = f->time                         ; time values

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

res                     = True
res@gsnMaximize         = True          ; maximize plot output
res@gsnRightString      = ""            ; don't draw right string
res@gsnLeftString       = ""            ; don't draw left string

res@cnFillPalette        = "MPL_jet"    ; choose color map
res@cnLevelSelectionMode = "ManualLevels"  ; use manual cont. line levels
res@cnMinLevelValF       = 250.0        ; contour min. value
res@cnMaxLevelValF       = 300.0        ; contour max. value
res@cnLevelSpacingF      = 1.0          ; contour interval
res@cnFillOn             = True         ; enable color fill
res@cnLinesOn            = False        ; disable contour lines
```

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NCL   DKRZ

Time animation of a contour plot (3/4)

```
res@cnFillMode          = "RasterFill"         ; set fill mode
res@cnRasterSmoothingOn = True                 ; smooth contouring

res@lbBoxLinesOn        = False                ; no lines around labelbar boxes

res@mpDataBaseVersion   = "MediumRes"          ; set map data base
res@mpMinLonF           = -10.6                ; lon min. value
res@mpMaxLonF           = 34.6                 ; lon max. value
res@mpMinLatF           = 36.8                 ; lat min. value
res@mpMaxLatF           = 69.8                 ; lat max. value

res@tiMainFontHeightF   = 0.02                 ; main title font size
res@tiMainOffsetYF      = 0.06                 ; move title upward

;-- create plots, loop along time
ntimes = dimsizes(time)
do i=0,ntimes-1
   res@tiMainString = "Surface Temperature~F29~~Z70~          " + \
                       getDate(time(i)) + "~N~"      ; draw title
   plot = gsn_csm_contour_map(wks,temp(i,:,:),res)   ; create the plots
end do
```

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NCL   DKRZ

Time animation of a contour plot (4/4)

```
;-- convert the plot output from PNG to Animated GIF
system("convert -delay 50 part_VIII_animation_contour_map*.png " + \
                      "part_VIII_animation_contour_map.gif")
                            ; -delay n: fps = 100/n -> n=50 fps=2
system("rm -rf part_VIII_animation_contour_map*.png")  ; delete single files

end
```

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Time animation of a contour plot

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Time animation – vectors on contour (1/5)

```
undef ("getDate")
function getDate(time)
local utc_date, year, mon, day, hours, mins, str_date
begin
   utc_date  = cd_calendar(time, 0)          ; convert date to UT-referenced date
   year      = sprinti("%0.4i",tointeger(utc_date(:,0)))  ; get year as integer
   mon       = sprinti("%0.2i",tointeger(utc_date(:,1)))  ; get month as int
   day       = sprinti("%0.2i",tointeger(utc_date(:,2)))  ; get day as integer
   hours     = sprinti("%0.2i",tointeger(utc_date(:,3)))  ; get day as integer
   mins      = sprinti("%0.2i",tointeger(utc_date(:,4)))  ; get day as integer
   str_date  = year+"/"+mon+"/"+day+" "+hours+":"+mins    ; yyyy/mm/dd HH:MM
   return(str_date)
end

;---------------------------------------------------
;-- main script
;---------------------------------------------------
begin
```

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Time animation – vectors on contour (2/5)

```
f      = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
temp = f->tsurf                          ; temperature data
u    = f->u10                            ; 10m u-velocity
v    = f->v10                            ; 10m v-velocity
time = f->time                           ; time values

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

res                     = True
res@gsnMaximize         = True             ; maximize plot output
res@gsnRightString      = ""               ; don't draw right string
res@gsnLeftString       = ""               ; don't draw left string
res@gsnScalarContour    = True             ; must be set for overlay
                                           ; vectors on contour map
res@cnFillPalette       = "MPL_jet"        ; choose color map
res@cnLevelSelectionMode = "ManualLevels"  ; use manual contour levels
res@cnMinLevelValF      = 250.0            ; contour min. value
res@cnMaxLevelValF      = 300.0            ; contour max. value
res@cnLevelSpacingF     = 1.0              ; contour interval
```

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Time animation – vectors on contour (3/5)

```
res@cnFillOn            = True             ; enable color fill
res@cnLinesOn           = False            ; disable contour lines
res@cnFillMode          = "RasterFill"     ; set fill mode
res@cnRasterSmoothingOn = True             ; smooth contouring
res@cnLabelBarEndStyle  = "ExcludeOuterBoxes" ; don't draw outer boxes

res@lbBoxLinesOn        = False            ; no lines around labelbar boxes
res@lbBoxMinorExtentF   = 0.2              ; decrease height of labelbar boxes
res@lbTitleString       = temp@long_name+" ["+temp@units+"]" ; labelbar title
res@lbTitlePosition     = "Bottom"         ; labelbar title position
res@lbTitleFontHeightF  = 0.015            ; labelbar title font size
res@lbBottomMarginF     = 0.1              ; move the labelbar title up

res@mpDataBaseVersion   = "MediumRes"      ; set map data base
res@mpMinLonF           = -10.6            ; lon min. value
res@mpMaxLonF           = 34.6             ; lon max. value
res@mpMinLatF           = 36.8             ; lat min. value
res@mpMaxLatF           = 69.8             ; lat max. value
```

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NCL

Time animation – vectors on contour (4/5)

```
res@vcLineArrowColor     = "grey30"            ; vector line color
res@vcGlyphStyle         = "CurlyVector"       ; curly vectors
res@vcRefMagnitudeF      = 10                  ; define vector ref mag
res@vcRefLengthF         = 0.045               ; define length of vec ref
res@vcRefAnnoOrthogonalPosF = -0.124           ; move ref vec into plot
res@vcRefAnnoParallelPosF = 0.999       ; move ref vec to the right into plot
res@vcLineArrowThicknessF = 2.0                ; make vector lines thicker

res@tiMainFontHeightF    = 0.02                ; main title font size
res@tiMainOffsetYF       = 0.06                ; move title upward

;-- create plots, loop along time
ntimes = dimsizes(time)
do i=0,ntimes-1
   res@tiMainString = "Horizontal wind field~F29~~Z70~            " + \
                      getDate(time(i)) + "~N~~C~~Z60~[m/s] ~N~"  ; draw title
   plot  = gsn_csm_vector_scalar_map(wks,u(i,:,:),v(i,:,:),temp(i,:,:),res)
                                                ; vectors on contours map
   print("Plot time:  "+i+"  "+getDate((time(i))))
end do
```

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NCL

Time animation – vectors on contour (5/5)

```
;-- convert the plot output from PNG to Animated GIF
print("Converting to GIF....")

system("convert -delay 50 part_VIII_animation_simple_vector_contour_map*.png +\
                   part_VIII_animation_simple_vector_contour_map.gif")

system("rm -rf part_VIII_animation_simple_vector_contour_map.*.png")

end
```
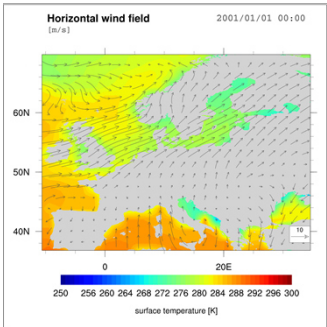
Note:
The warning message written to stdout

   warning:vcRefAnnoFontHeightF is not a valid resource in …

for each plot come from a bug in `gsn_csm_vector_scalar_map` and is fixed in NCL version 6.4.0.

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NCL
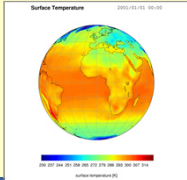
Time animation of a contour plot

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NCL

Task: Animation – spinning globe

- Use the script **part_VIII_Animation_contour_map.ncl**
- Modify:
- Use variable **tsurf** of data file
  ECHAM5_OM_A1B_2001_01011001_2D_interpolated_half_hour_NCL.nc (470 time steps)
  - Choose **Orthographic** projection.
  - **Don't draw a box** around the globe. Draw **grid lines**.
  - Set contour levels interval to **230-320° K**.
  - Rotate the globe **westward** in **360./ntimes steps**. Stop the rotation of the globe at **longitude=90°W**.
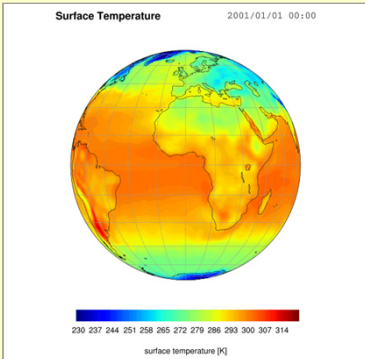
  Hints:
  - ➤ **mpProjection**
  - ➤ **mpPerimOn / mpGridAndLimbOn**
  - ➤ **cn MinLevelValF / cnMaxLevelsValF**
  - ➤ **mpCenterLonF**

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NCL

Task: Animation – spinning globe

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NCL

Task: Animation – spinning globe (1/5)

```
;-- define function getDate to format the date string on top of the plot

undef ("getDate")
function getDate(time)
local utc_date, year, mon, day, hours, mins, str_date
begin
    utc_date = cd_calendar(time, 0)          ; convert date to UT-referenced date

    year    = sprinti("%0.4i",tointeger(utc_date(:,0)))   ; get year as integer
    mon     = sprinti("%0.2i",tointeger(utc_date(:,1)))   ; get month as int
    day     = sprinti("%0.2i",tointeger(utc_date(:,2)))   ; get day as integer
    hours   = sprinti("%0.2i",tointeger(utc_date(:,3)))   ; get day as integer
    mins    = sprinti("%0.2i",tointeger(utc_date(:,4)))   ; get day as integer

    str_date = year+"/"+mon+"/"+day+" "+hours+":"+mins      ; yyyy/mm/dd HH:MM

    return(str_date)
end
```

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NCL

Task: Animation – spinning globe (2/5)

```
begin

f    = addfile("$NCL_TUT/data/rectilinear_grid_2D.nc","r")
temp = f->tsurf                          ; temperature data 1st time step
time = f->time                           ; time values
lat  = f->lat                            ; lat values
lon  = f->lon                            ; lon values

system("mkdir -p pictures")
wks = gsn_open_wks("png", "./pictures/task_VIII_animation_spinning_globe")

res                    = True
res@gsnMaximize        = True            ; maximize plot output
res@gsnAddCyclic       = True            ; don't add cyclic point
res@gsnRightString     = ""              ; don't draw right string
res@gsnLeftString      = ""              ; don't draw left string

res@cnFillPalette         = "MPL_jet"       ; choose color map
res@cnLevelSelectionMode  = "ManualLevels"  ; use manual contour line levels
res@cnMinLevelValF        = 230.0           ; contour min. value
res@cnMaxLevelValF        = 320.0           ; contour max. value
res@cnLevelSpacingF       = 1.0             ; contour interval
```

Karin Meier-Fleischer, DKRZ   16

NCL

Task: Animation – spinning globe (3/5)

```
res@cnFillOn           = True            ; enable color fill
res@cnLinesOn          = False           ; disable contour lines
res@cnFillMode         = "RasterFill"    ; set fill mode
res@cnRasterSmoothingOn = True           ; smooth contouring

res@lbBoxMinorExtentF  = 0.2             ; decrease height of labelbar boxes
res@lbBoxLinesOn       = False           ; no lines around labelbar boxes
res@lbTitleString      = temp@long_name+" ["+temp@units+"]"
                                         ; labelbar title
res@lbTitlePosition    = "Bottom"        ; labelbar title position
res@lbTitleFontHeightF = 0.015           ; labelbar title font size
res@lbBottomMarginF    = 0.1             ; move the labelbar title up

res@mpProjection       = "Orthographic"  ; use projection
res@mpCenterLatF       = 0.              ; center at lat=0
res@mpOutlineOn        = True            ; outline map
res@mpGridLineColor    = "grey60"        ; grid line color
res@mpGridAndLimbOn    = True            ; draw grid lines
res@mpGeophysicalLineColor = "black"     ; outline color
res@mpPerimOn          = False           ; don't draw the box around the plot
```

Karin Meier-Fleischer, DKRZ   17

NCL

Task: Animation – spinning globe (4/5)

```
res@tiMainFontHeightF  = 0.02                    ; main title font size
res@tiMainOffsetYF     = 0.06                    ; move title upward

;-- create plots, loop along time
ntimes = dimsizes(time)                          ; number of time steps
incr = 360./ntimes              ; calculate the longitudinal steps for rotation

do i=0,ntimes-1
   rlon = 0. - (i*incr)                          ; step westward
   if (rlon .gt. -90) then                       ; stop at lon -90 deg
      res@mpCenterLonF = rlon                    ; center lon position
   end if
   res@tiMainString = \
         "Surface Temperature~F29~~Z70~         " + getDate(time(i)) + "~N~"
                                                 ; draw title
   plot = gsn_csm_contour_map(wks,temp(i,:,:),res)  ; create the plots

   print("Plot time:  "+i+"  "+getDate((time(i))))  ; info to stdout
end do
```

Karin Meier-Fleischer, DKRZ   18

NCL

Task: Animation – spinning globe (5/5)

```
;-- convert the plot PNG to Animated GIF
  print("Converting to GIF....")

  system("convert -delay 50 ./pictures/task_VIII_animation_spinning_globe*.png" +\
                             "task_VIII_animation_spinning_globe.gif")

  system("rm -rf ./pictures/task_VIII_animation_spinning_globe*.png")

end
```

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