地球科学学院大气科学系《诊断分析与绘图实验》报告

实验八 图形叠加和矢量图绘制

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一、目的：

掌握矢量图的绘制；用 overlay 实现图形的叠加显示；练习通过修改已有脚本完成所需绘图工作。

二、方法：（见实验指导书）

三、回答习题（可逐题回答，也可以把执行的命令或脚本一次写完，把要说明的内容加成注释或在最后说明）：

使用 jul20016.nc 数据中的风场数据绘制任一时次任意范围的风矢量图，并进行适当的设置。

```
;;;;;read data;;;;;
begin
f = addfile("nc/0511/jul2016.nc","r")
u1 = f->u(0,0,:,:)
v1 = f->v(0,0,:,:)
u = 0.001133831665007396 * u1 + 8.62988810125734
v = 0.001110601088278639 * v1 + 4.061525082756642
copy_VarMeta(u1,u)
copy_VarMeta(v1,v)
wks = gsn_open_wks("png", "ques1")
;;;;;plot set;;;;;
;range of map;
res = True
res@gsnAddCyclic = False
res@mpCenterLonF = 75
res@mpMinLatF = 0
res@mpMaxLatF = 70.5
res@mpMinLonF = -60
res@mpMaxLonF = 210

res@vcRefMagnitudeF = 5;ref value
res@vcRefLengthF = 0.018;ref length
res@vcMinDistanceF = 0.02;mindistance

res@vcMonoLineArrowColor = False;arrowcolor
res@vcLevelPalette = "helix1";color table
```

```
res@vcLineArrowThicknessF= 2
res@vcGlyphStyle =
"CurlyVector";"FillArrow";"WindBarb";"LineArrow"
;;;;;title and label set;;;;;
res@tiMainString = "~Z70~ 2016.07.01 00:00 500hPa Vector"
res@tiMainFontHeightF = 0.017
res@tiMainOffsetYF = -0.02
res@gsnMajorLatSpacing = 15
;;;;;colorbar;;;;;
res@lbOrientation = "Vertical"
res@lbBoxMinorExtentF = 0.15;weight of colorbar
res@pmLabelBarOrthogonalPosF = -0.055;the position of colorbar
res@pmLabelBarParallelPosF = 0.55
res@lbLabelOffsetF = 0.05;position of bar's label
res@vcRefAnnoSide = "Right";position of refanno
res@vcRefAnnoParallelPosF = 0.06;me too
res@vcRefAnnoOrthogonalPosF = 0.02;me toooo


plot = gsn_csm_vector_map_ce(wks, u, v, res)
end
```
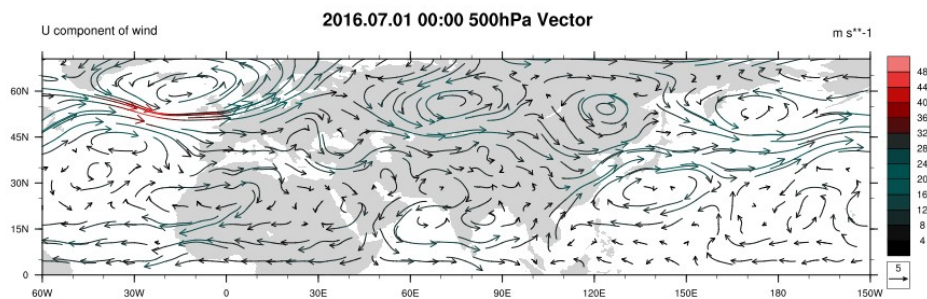

觉得默认 colormap 太花了，换了一个相对较暗的，调整间距等让风场图
美观一些。

使用 jul20016.nc 数据，参照 http://www.ncl.ucar.edu/
Applications/Scripts/overlay_6.ncl，用 overlay 函数尽可能地在一个
图形中叠加上多个物理量信息。要求在实验报告中逐条说明属性设置的
功能。

```
Begin
;;;;;read data;;;;;
f = addfile("nc/0511/jul2016.nc","r")
print(f)
```

```
u1 = f->u(0,0:1,:,:)
v1 = f->v(0,0:1,:,:)
t1 = f->t(0,0,:,:)
q1 = f->q(0,0,:,:)
u = 0.001133831665007396 * u1 + 8.62988810125734
v = 0.001110601088278639 * v1 + 4.061525082756642
t = 0.001017212865917744 * t1 + 275.7908121943483
q = 3.303342109145216e-07 * q1 + 0.01082373075482521

copy_VarMeta(u1,u)
copy_VarMeta(v1,v)
copy_VarMeta(q1,q)
copy_VarMeta(t1,t)
u500 = u(0,:,:)
u700 = u(1,:,:)
v500 = v(0,:,:)
v700 = v(1,:,:)
printVarSummary(u500)
```

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

 vcres              = True
 vcres@gsnDraw      = False
 vcres@gsnFrame     = False
 stres              = vcres
 cnres              = vcres
 mpres              = vcres

;
 stres@stMinDistanceF = 0.015
;---Set up some vector resources.
 vcres@vcLevelSelectionMode     = "ManualLevels";contour mode
 vcres@vcMinLevelValF           = 244
 vcres@vcMaxLevelValF           = 276
 vcres@vcLevelSpacingF          = 4
 vcres@vcLevelPalette           = "MPL_Reds"   ; assign color
map to vectors

;---Vector lengths and color
 vcres@vcFillArrowsOn           = True
 vcres@vcLineArrowThicknessF    =  2.0
 vcres@vcMinDistanceF = 0.01
 vcres@vcMinFracLengthF         = 0.33;minimum distance to
separate the data locations of neighboring vectors
```

```
  vcres@vcMinMagnitudeF           = 0.001;minimum magnitude for
elements of the vector field
  vcres@vcMonoFillArrowFillColor = False
  vcres@vcMonoLineArrowColor     = False

  vcres@vcRefLengthF             = 0.018
  vcres@vcRefMagnitudeF          = 5
  vcres@vcRefAnnoFontHeightF = 0.013
  vcres@vcRefAnnoSide = "Right";position of refanno
  vcres@vcRefAnnoParallelPosF = 0.12;me too
  vcres@vcRefAnnoOrthogonalPosF = 0.06;me toooo

  vcres@lbTitleString            = "500hPa Temperature"
  vcres@lbTitleOffsetF           = -0.25;position
  vcres@lbTitleFontHeightF       = 0.013
  vcres@lbLabelFontHeightF       = 0.01
  vcres@lbLabelAutoStride        = True;Prevent label overlap
  vcres@vcGlyphStyle = "CurlyVector"

  vcres@gsnLeftStringOrthogonalPosF = 0.05;leftstring position
  vcres@gsnRightStringOrthogonalPosF = 0.05;like prior one
;---Make sure vectors are drawn in "predraw" phase.
  vcres@vcVectorDrawOrder        = "Predraw";Draw vector arrows
before the standard draw phase

;---Turn on contour fill, and turn other things off.
  cnres@cnFillOn           = True
  cnres@cnLinesOn          = False
  cnres@cnInfoLabelOn      = False
  cnres@cnFillPalette      = "MPL_PuBu"
  cnres@lbOrientation      = "Vertical";label direction
  cnres@lbTitleString      = "Specific humidity"
  cnres@lbTitlePosition    = "Left"
  cnres@lbTitleFontHeightF = 0.02
  cnres@lbLabelFontHeightF = 0.01
  cnres@pmLabelBarOrthogonalPosF = -0.092
  cnres@pmLabelBarParallelPosF = 0.55
  cnres@lbBoxMinorExtentF = 0.2;colorbar width
  cnres@pmLabelBarHeightF = 0.5;colorbar height
;---Define contour levels
  cnres@cnLevelSelectionMode = "ManualLevels"
  cnres@cnMinLevelValF     = 0.0005
  cnres@cnMaxLevelValF     = 0.0075
```

```
  cnres@cnLevelSpacingF       = 0.001

  cnres@gsnLeftStringOrthogonalPosF = 0.1
  cnres@gsnRightStringOrthogonalPosF = 0.1
;---Make sure contours are drawn in "predraw" phase.
  cnres@cnFillDrawOrder       = "Predraw"

;---Control appearance of map.
  mpres@mpProjection          = "LambertEqualArea"
  mpres@mpLabelsOn            = False
  mpres@mpPerimOn             = True
  mpres@mpGridAndLimbOn       = False
  mpres@mpFillOn              = True
  mpres@mpOutlineOn           = True
  mpres@mpOutlineDrawOrder    = "PostDraw"
  mpres@mpFillDrawOrder       = "Predraw"
  mpres@mpOceanFillColor      = "lightskyblue1"
  mpres@mpLandFillColor       = "gray"

;---Zoom in on area that is roughly the United States.
  mpres@mpLimitMode           = "LatLon"
  mpres@mpCenterLonF = 75
  mpres@mpMinLatF = 0
  mpres@mpMaxLatF = 70.5
  mpres@mpMinLonF = -60
  mpres@mpMaxLonF = 210

  mpres@mpGridAndLimbDrawOrder = "Predraw"
  mpres@tiMainString          = "2016.07.01 00:00 700hPa Vector
with Temperature , Specific humidity and 500hPa Vector"
```

分别对 500hPa 比湿等值线，地图，500hPa 风场流线以及 700hPa 风场及温度矢量图进行相关属性的设置，有些属性是官网示例自带但效果不明显（如 vcMinFracLengthF 和 vcMinMagnitudeF），仍保留。

```
;plot~~
  vcid = gsn_csm_vector_scalar(wks,u700,v700,t,vcres)
  stid = gsn_csm_streamline(wks,u500,v500,stres)
  cnid = gsn_csm_contour(wks,q,cnres)
  mpid = gsn_csm_map(wks,mpres)
  ;overlay~~
  overlay(mpid,cnid)
  overlay(mpid,stid)
  overlay(mpid,vcid)
```

```
  maximize_output(wks,True);Maximizes the sizes of a series of
plots drawn in a single frame
end
```

官网示例使用了新函数 maxmize_output()，出来的结果与 draw()然后
frame()在此示例中并无二致，官网说明也就这样，看来这样还方便一
些，只用写一句哈哈哈
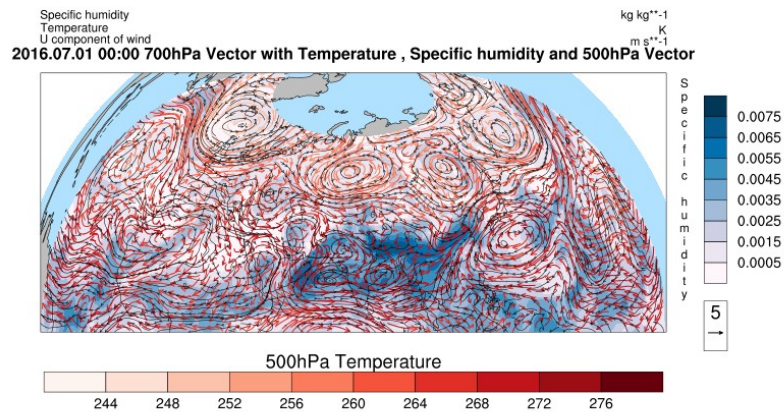
四、实验小结（本次实验收获的经验、教训、感受等）：

值得一说的是 colorbar 和风向基准标，调他们的位置可是费了好些时间
hhh。但是还是达到了比较美观的程度，对于 gsn_csm_vector_scalar，
会生成一个 colorbar 和一个基准风向标，他们好像是联在一起的，调整
位置只能统一的移动，所以最后还是去调整了 contour 的 colorbar。