### 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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1. **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。

1. **方法：（见实验指导书）**
2. **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）：**

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| 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 |

1. **实验小结（本次实验收获的经验、教训、感受等）：**

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| 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。 |