### 地球科学学院大气科学系《诊断分析与绘图实验》报告

### 实验十 相关分析

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1. **目的：**

掌握相关分析的基本方法；能对相关分析的结果进行显著性检验；了解其他数据分析函数的使用方法。

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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| 根据文献《南海夏季风变化及其与全球大气和海温的关系》，使用实验9中计算出的1950-1999年南海夏季风指数（SCSSMI），计算其与同期850hPa经向风或纬向风的相关系数，并检验；结果的图形输出参考文献图2。 |
| begin  f = addfile("nc/0518/ssta5099.nc", "r")  fu = addfile("nc/0518/uwnd.mon.mean4803.nc", "r")  fv = addfile("nc/0518/vwnd.mon.mean4807.nc", "r")  ; level = fv->level  ; print(level);850hPa is 2  ;time = fv->time  ;printVarSummary(time)  ;tim1 = cd\_calendar(time, 4)  ;print(tim1)  ;;;;;;;;vwnd;;;;;;;;;;;;;  vwnd1 = fv->vwnd  ;printVarSummary(vwnd1)  vwnd2 = 0.01\*vwnd1+202.65  copy\_VarCoords(vwnd1,vwnd2);not metedata  vwnd = vwnd2(24:623,2,:,:)  ;printVarSummary(vwnd)  vclm = clmMonTLL(vwnd)  ;printVarSummary(vclm)  v1m = vclm(0,:,:)  ;v1m\_ex = conform(vwnd1, v1m, )  v17m = vclm((/0,6/),:,:)  ;print(v17m)  v = dim\_avg\_n(v17m, 0)  ;copy\_VarCoords(vwnd(0,:,:), v)  ;printVarSummary(v)  v\_ep = conform(vwnd, v, (/1,2/))  ;printVarSummary(v\_rs\_ep)  v1m\_ep = conform(vwnd,v1m,(/1,2/))  ;;;;;;;;;uwnd;;;;;;;;;;;  uwnd1 = fu->uwnd  ;printVarSummary(uwnd1)  uwnd2 = 0.01\*uwnd1+202.65  copy\_VarCoords(uwnd1,uwnd2);not metedata  uwnd = uwnd2(24:623,2,:,:)  uclm = clmMonTLL(uwnd)  u1m = uclm(0,:,:)  u17m = uclm((/0,6/),:,:)  u = dim\_avg\_n(u17m, 0)  u\_ep = conform(uwnd, u, (/1,2/))  u1m\_ep = conform(uwnd,u1m,(/1,2/))  ;print(u\_rs\_ep)  ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;  v\_t = sqrt(v\_ep^2 + u\_ep^2)  ; wind = sqrt(vwnd\_rs^2 + uwnd\_rs^2)  ;printVarSummary(v1m\_t)  v\_fenzi = (v1m\_ep - vwnd)  u\_fenzi = (u1m\_ep - uwnd)  fenzi = sqrt(v\_fenzi^2 + u\_fenzi^2)  delta = fenzi/v\_t - 2  copy\_VarCoords(uwnd,delta) |
| 读取数据并计算SCSSMI指数。 |
| delta\_c = delta(lat|:,lon|:,time|:)  uwnd\_c = uwnd(lat|:,lon|:,time|:)  corc = escorc(delta\_c, uwnd\_c)  copy\_VarCoords(delta\_c,corc)  ;printVarSummary(corc)  prob = rtest(corc, 48, 0)  print(prob) |
| 计算相关系数并检验。 |
| ; pwks = "x11";这里的设置是对画布的，但是不是我想要的效果  ; pwks@wkWidth = 800  ; pwks@wkHeight = 800  wks = gsn\_open\_wks("png", "ehh")  res = True  res@mpShapeMode = "FreeAspect";if plot map, have to write this to change picture size  res@vpHeightF = 0.7  res@vpWidthF = 0.7;这几句是设置绘图大小的，因为画成长方形跟论文不太一样，实验9没改，这里还是改了😂  res@tmXBLabelFontHeightF = 0.013  res@tmYLLabelFontHeightF = 0.013  res@cnInfoLabelOn = False  res@pmTickMarkDisplayMode = "Always"  ;res@tmXBTickSpacingF = 60  res@cnLevelSelectionMode = "Explicitlevels"  res@cnLevels = (/-0.6,-0.4,-0.2,0,0.2,0.4,0.6/)  res@cnExplicitLineLabelsOn = True  res@cnLineLabelStrings = (/"-0.6","-0.4","-0.2","0","0.2","0.4","0.6"/)  res@gsnContourZeroLineThicknessF=3  res@gsnContourPosLineDashPattern=5  res@gsnContourNegLineDashPattern=5  res@cnLabelMasking=True  res@cnLineLabelBackgroundColor="gray30"  res@cnLineLabelFontColor = "white"  res@cnLineLabelFontHeightF = 0.009  res@mpCenterLonF = 180  res@cnLineLabelDensityF = 0.7  plot = gsn\_csm\_contour\_map\_ce(wks, corc, res)  end |
| 设置相关属性并绘图，这里没加标题啥的，主要是想尽可能复现论文图像。 |
| 设置不同的置信水平，在图中显示95%和99%置信水平的相关显著区域。 |
| ;这里SCSSMI指数的计算和上题一样，，代码便不再放，从改动地方开始。  ;;;;;;;;;;;;;q2;;;;;;;;;;;;  prob = rtest(corc, 48, 0);n = 50-2  copy\_VarCoords(delta\_c,prob)  prob95=rtest(0.273,48,0)  prob99=rtest(0.354,48,0)  ;print(prob)  ;;;;;;;;;;;;;q2;;;;;;;;;;;;  wks = gsn\_open\_wks("x11", "ehh")  res = True  res@mpFillOn = False  res@mpCountyLineThicknessF = 0.5  res@mpShapeMode = "FreeAspect"  res@vpHeightF = 0.7  res@vpWidthF = 0.7  res@tmXBLabelFontHeightF = 0.013  res@tmYLLabelFontHeightF = 0.013  res@cnInfoLabelOn = False  res@pmTickMarkDisplayMode = "Always"  res@cnLevelSelectionMode = "Explicitlevels"  res@cnLevels = (/-0.8,-0.6,-0.4,-0.2,0,0.2,0.4,0.6,0.8/)  res@cnExplicitLineLabelsOn = True  res@cnLineLabelStrings = (/"-0.8","-0.6","-0.4","-0.2","0","0.2","0.4","0.6","0.8"/)  res@gsnContourZeroLineThicknessF=3  res@cnLineThicknessF = 2  res@gsnContourPosLineDashPattern=5  res@gsnContourNegLineDashPattern=5  res@cnLabelMasking=True  res@cnLineLabelBackgroundColor="gray30"  res@cnLineLabelFontColor = "white"  res@cnLineLabelFontHeightF = 0.009  res@mpCenterLonF = 180  res@cnLineLabelDensityF = 0.7  res@cnLabelDrawOrder = "PostDraw"  res@cnLineDrawOrder = "PostDraw"  plot = gsn\_csm\_contour\_map\_ce(wks, corc, res) |
| 还是先画相关系数的等值线图，下一步再叠加检验的图。 |
| pres = True  pres@vpHeightF = 0.7  pres@vpWidthF = 0.7  pres@tmXBLabelFontHeightF = 0.013  pres@tmYLLabelFontHeightF = 0.013  pres@cnInfoLabelOn = False  pres@pmTickMarkDisplayMode = "Always"  pres@cnLineLabelsOn = False  pres@cnLinesOn = False  pres@cnLevelSelectionMode = "Explicitlevels"  pres@cnLevels = (/-0.05,-0.01,0.01,0.05/)  plot1 = gsn\_csm\_contour(wks,prob,pres)  plot2 = gsn\_csm\_contour(wks,prob,pres)  opt = True  opt@gsnShadeFillType = "color" ; color is the default  opt@gsnShadeLow = "gray70"  ;opt@gsnShadeHigh = "gray70"  ;opt@gsnShadeMid = "gray70"  plot1 = gsn\_contour\_shade(plot1,0.05,0.05,opt)  ;plot1 = gsn\_contour\_shade(plot1,0,0.273,opt)  ;plot1 = gsn\_contour\_shade(plot1,-0.05,0.05,opt)  opt1 = True  opt1@gsnShadeFillType = "color"  opt1@gsnShadeLow = "gray50"  ;opt1@gsnShadeHigh = "blue"  ;opt1@gsnShadeMid = "gray50"  plot2 = gsn\_contour\_shade(plot2,0.01,0.01,opt1)  ;plot2 = gsn\_contour\_shade(plot2,0,0.354,opt1)  ;plot2 = gsn\_contour\_shade(plot2,-0.01,0.01,opt1)  overlay(plot, plot1)  overlay(plot, plot2)  draw(plot)  frame(wks)  end |
| 浅灰色为95%置信，深灰色为99%置信 |
| 嗯…我是打算像论文图像那样(最后发现论文的阴影颜色好像是区分的正相关和负相关，我就不改了)直接叠两个不同亮度的灰色在一张图来同时体现95%和99%置信区间的，仔细观察是发现99%的区域更小一些比较符合常理，不过这张图阴影范围占比好大，~~对比原论文发现原论文设置了陆地掩膜，只有海洋区域有（不过我的图还是更多）（看错啦）~~最后发现了原因是…我读取的是1-12月的数据….所以本实验的两道题全都是1-12月的…肯定和原文不一样…. |
| m3 = ispan(5, 593, 12)  m4 = ispan(6, 594, 12)  m5 = ispan(7, 595, 12)  m6 = ispan(8, 596, 12)  uwnd\_ch = new((/50,73,144/), "float")  uwnd\_ch(0:49,:,:) = (uwnd(m3,:,:)+uwnd(m4,:,:)+uwnd(m5,:,:)+uwnd(m6,:,:))/4.0  vwnd\_ch(0:49,:,:) = (vwnd(m3,:,:)+vwnd(m4,:,:)+vwnd(m5,:,:)+vwnd(m6,:,:))/4.0  print(uwnd\_ch)  ; uwnd\_ch(0:49,:,:) = uwnd(m3,:,:)  ; uwnd\_ch(50:99,:,:) = uwnd(m4,:,:)  ; uwnd\_ch(100:149,:,:) = uwnd(m5,:,:)  ; uwnd\_ch(150:199,:,:) = uwnd(m6,:,:)  delta\_ch = new((/50,73,144/), "float")  delta\_ch(0:49,:,:) = (delta(m3,:,:)+delta(m4,:,:)+delta(m5,:,:)+delta(m6,:,:))/4.0  copy\_VarCoords(delta(m3,:,:),delta\_ch)  copy\_VarCoords(delta(m3,:,:),uwnd\_ch)  printVarSummary(delta\_ch)  ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;  delta\_c = delta\_ch(lat|:,lon|:,time|:)  uwnd\_c = uwnd\_ch(lat|:,lon|:,time|:) |
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| 还是得改，改到6-9月，确实有变化但变化不大….这SCSSMI和u风场的相关性太好了吧…和原文也不太一样，还是阴影面积好大，于是我顺手看了下和v风场的…噫…正常多了..  所以这样看起来，只能说SCSSMI指数和u风场的相关性更普遍显著了吧🙂 |

1. **实验小结（本次实验收获的经验、教训、感受等）：**

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| 破大防了，最要吐槽的是gsn\_contour\_shade()与之配套的gsnShadeHigh, gsnShadeLow和gsnShadeMid，开始寻思直接用Mid取中间范围方便，但总是报错，而且我有两个shade函数，还只有第二个报错，并且应该是原gsn程序的错，超出x维度范围啥的…改来改去…  最后我改用Low或者High就好了…绷不住了 |