地球科学学院大气科学系《诊断分析与绘图实验》报告

实验六 绘制直方图

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一、目的：

掌握直方图的绘制；练习各种相关资源的使用。

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）：

从实验四处理得到的云南 124 站年降水量数据中选取任意 10 站的数据绘制直方图，并对直方图的属性进行设置。

```
begin
;read data
data_all_one = new((/2,124,51/),"float")
data_all = new((/12,124,50/),"float");create new varible
month =
(/"01","02","03","04","05","06","07","08","09","10","11","12"/)

do i = 0,11,1
file_path = "nc/0413/yn124std/r" + month(i) + "-1961n.dat"
if (i .eq. 1 .or. i .eq. 0) then
data_all_one(i,:,:) = asciiread(file_path,(/124,51/), "float")
data_all(i,:,:) = data_all_one(i,:,0:49)
else
data_all(i,:,:) = asciiread(file_path,(/124,50/), "float")
end if
end do

data = data_all(0,0:9,1)

stations = data_all(0,0:9,0)
sts_num = tostring_with_format(stations, "%5.0f")
x = fspan(0.5,9.5,10)
```

读取云南 1961 年 1 月前 10 个站点的数据。

```
wks = gsn_open_wks("png", "test1")
```

```
res = True
res@gsnXYBarChart = True
res@trYMaxF = 8
res@trXMinF = 0
res@trXMaxF = 10
res@tiYAxisString = "(mm)"
res@tiMainString = "Precipitation of 10 stations in Yunnan
province in 1961"
res@tiMainFontHeightF = 0.02
```

设置横纵坐标范围（类似 mpLatMaxF 等），Y 轴单位即标题和标题字体大小。

```
;ref line and colors/patterns
;res@gsnYRefLine = 5
res@gsnYRefLine = 0
;res@gsnAboveYRefLineBarColors =
(/"navy","blue","SkyBlue","SlateBlue"/)
;res@gsnBelowYRefLineBarColors =
(/"firebrick","red","orange","green"/)
;res@gsnAboveYRefLineBarPatterns = (/0,1,2,3/)
;res@gsnBelowYRefLineBarPatterns = (/4,6,8,7/)
```

设置参考线和尝试在参考线上下分别设置不同填充线型和颜色。

```
;x line
res@tmXBMode = "explicit"
res@tmXBLabelsOn = True
res@tmXBValues = fspan(0.5,9.5,10)
res@tmXBLabels = sts_num;
res@tmXBLabelFontHeightF = 0.013;font size
```

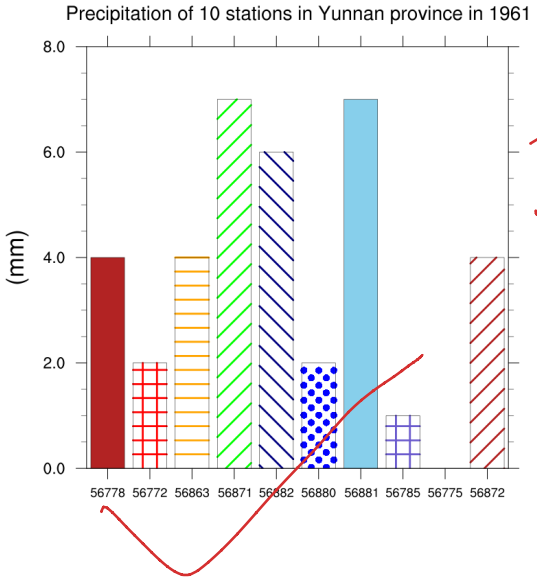
设置 x 轴，自定义 x 轴站点名称和字体大小。

```
;setting
res@gsnXYBarChartFillOpacityF = 0.9;toumingdu
res@gsnXYBarChartColors                                    =
(/"firebrick","red","orange","green","navy","blue","SkyBlue","S
lateBlue"/);filling colors
res@gsnXYBarChartPatterns2 = (/0,5,1,3,4,17/);filling styles
res@gsnXYBarChartOutlineOnly = False;true is only the outline
res@gsnXYBarChartBarWidth = 0.8;out of range will be x or y
res@gsnXYBarChartFillDotSizeF = 0.01;dot size
res@gsnXYBarChartFillScaleF = 2
res@gsnXYBarChartFillLineThicknessF = 5;lines thickness in bars


plot = gsn_csm_xy(wks, x, data, res)
```

end

对相关属性进行设置。结果如图:



使用实验四云南省 124 站 1961-2009 年的月平均降水资料，计算每个测站的气候平均降水量（所有年份对应月份降水量的平均值）；参考 http://www.ncl.ucar.edu/Applications/Scripts/unique_5.ncl 脚本尝试在同一个图中绘制任意 3 个测站的逐月降水量序列。

```
begin

data_all_one = new((/2,124,51/),"float")
data_all = new((/12,124,50/),"float");create new varible
month                                                    =
(/"01","02","03","04","05","06","07","08","09","10","11","12"/)

do i = 0,11,1
file_path = "nc/0413/yn124std/r" + month(i) + "-1961n.dat"
if (i .eq. 1 .or. i .eq. 0) then
data_all_one(i,:,:) = asciiread(file_path,(/124,51/), "float")
data_all(i,:,:) = data_all_one(i,:,0:49)
else
data_all(i,:,:) = asciiread(file_path,(/124,50/), "float")
end if
```

```
end do

data = data_all(:,:,1:49)
;print(data(0,:,:))

avg_month = dim_avg_n(data,2)
data_choose = avg_month(:,0:2)

data_choose!0 = "mon"
data_choose!1 = "sta"
data_p = data_choose(sta|:,mon|:)
x = ispan(0,11,1)

wks = gsn_open_wks("png", "test2")
res = True
res@gsnXYBarChart = True
res@trYMaxF = 280
res@trYMinF = 0
res@trXMaxF = 12.4
res@trXMinF = 0.1

;x line
res@tmXBMode = "explicit"
res@tmXBLabelsOn = True
res@gsnFrame = False
res@gsnDraw = True
res@tmXBValues = fspan(0.75,11.75,12)
res@tmXBLabels                                                    =
(/"Jan","Feb","Mar","Apr","May","Jun","Jul","Aug","Sep","Oct","
Nov","Dec"/)
res@tmXBLabelFontHeightF = 0.013;font size

res@gsnYRefLine = 0
res@gsnXYBarChartBarWidth = 0.25
res@tiMainString = "The climatic average precipitation of three
stations in Yunnan Province"
res@tiMainFontHeightF = 0.02
```

```
res@tiYAxisString = "(mm)"
```

读取数据，计算每个测站的气候平均量，并对图像属性进行设置。注意的是res@gsnFrame = False和res@gsnDraw = True，不输入的话无法将数据进行叠加。也可以在代码末尾添加；overlay(plot1,plot2) overlay(plot1,plot3) draw(plot1) frame(wks)，这样会得到每个plot单独的图像和一张全部叠加的图像。

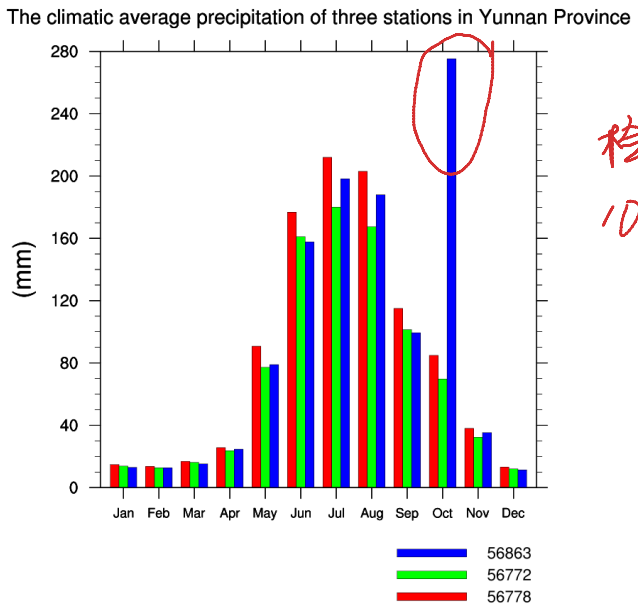
```
res@gsnXYBarChartColors = (/"red"/)
plot1 = gsn_csm_xy(wks,fspan(0.5,11.5,12),data_p(0,:),res)
res@gsnXYBarChartColors = (/"green"/)
plot2 = gsn_csm_xy(wks,fspan(0.75,11.75,12),data_p(1,:),res)
res@gsnXYBarChartColors = (/"blue"/)
plot3 = gsn_csm_xy(wks,fspan(1,12,12),data_p(2,:),res)

lbres                          = True            ; labelbar only
resources
lbres@vpWidthF           = 0.3           ; labelbar width
lbres@vpHeightF          = 0.1           ; labelbar height
lbres@lbBoxMajorExtentF  = 0.36            ; puts space between
color boxes
lbres@lbFillColors       = (/"red","green","blue"/)
lbres@lbMonoFillPattern  = True          ; Solid fill pattern
lbres@lbLabelFontHeightF = 0.035          ; font height. default
is small
lbres@lbLabelJust        = "CenterLeft"  ; left justify labels
lbres@lbPerimOn          = False
lbres@lgPerimColor    = "white"
lbres@lbLabelFontHeightF = 0.016
labels = (/"56778","56772","56863"/)
gsn_labelbar_ndc(wks,3,labels,0.55,0.13,lbres)   ;  draw  right
labelbar column
; overlay(plot1,plot2)
; overlay(plot1,plot3)
; draw(plot1)
frame(wks)

end
```

参考官网进行三个数据的叠加绘图并对colorbar的属性如颜色、位置和

字体等进行设置。结果如图:



检查一下这个站点数据
10月份为什么这么大?

四、实验小结（本次实验收获的经验、教训、感受等）：

直方图、折线图可以修改的属性还是很多的，能满足大多数情况的需求，主要还是了解哪些可以进行设置和修改，在真正需要的时候就可以现查现用。

值得一说的是，利用好 x 轴的数值以及 xy 轴的数值范围可以使生成的图像更美观（与轴有一定距离）。具体调试的时候若对于直方条宽度和 x 轴数值难以把握可以使用 overlay()和 darw()获得单个数据的图像并进行调整（感觉直接提前安排好更方便，如本题提前设置直方图宽度 0.25，不同直方图也相对错位 0.25）