Data visualization:



First,

Copy ~tcanty/IDL/symbols.pro ~tcanty/IDL/oploterror.pro ~tcanty/IDL/colorbar1.pro

into your *idl* directory.

These programs allow you to plot different types of symbols, error bars, and a color bar.

Copy ~tcanty/IDL/generic.pro into your *working* directory

This program can be thought of as a customizable "stncl"

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Manipulating data:

The "where" command, like the "find" command in MATLAB, determines the indices of an array that satisfies a logical argument

p1=where(month eq 12 and tave ne -999.00)

```
dec_mean=mean(tave(p1))
dec_sdev=stddev(tave(p1))
```

ne	not equal
eq	equal
lt	less than
le	less than or equal to
gt	greater than
ge	greater than or equal to

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Data visualization:

EXELIS

Please take a look at plot_temp.pro

filename1='beltsville.dat' read_file.filename1.v1.h1	read in data from first file	
·····		
p1=where(v1(3,*) ne -999.00)	find indices where there is missing data	
year=v1(1,p1)	assign data to specific variable names	
month=v1(2,p1)		
tave=v1(3,p1)		
tave_c=(tave-32.)*5./9.	Convert temperature to Celsius	
year_frac=year+month/12.	Calculate the year fraction	
pq=where(year ge 1951 and year le 1980)	Find the subset of years to calculate baseline temperature	
baseline=mean(tave_c(pq))	Determine the baseline mean temperature	
t_anom=tave_c-baseline	Calculate the temperature anomaly	

```
filename2='beltsville_10yr_mean_sd.dat' read in data from second file
read_file,filename2,v2,h2
p2=where(v2(2,*) ne -999)
year2=v2(0,p2)
temp_mean=v2(1,p2)
temp_sd=v2(2,p2)
temp_mean_c_anom=((temp_mean-32.)*5./9.)-baseline
temp_sd_c =(temp_sd-32.)*5./9.
```

Data visualization:



; Load std. gamma II color table loadct,5

Loads the color table we want to use

	Determines size of platting window
p.position = [0.15, 0.15, 0.95, 0.95]	Determines size of plotting window
!p.charthick=1.8	Character thickness
!p.charsize=1.6	Character size
!p.thick=2	
!p.background=255	Background color
!p.color=0	
;determines x range, number of ticks,a	axis label,thickness of x axis
ly range=[1861 2010]	Range of the x- axis

,
!x.range=[1861,2010]
!x.tickv=[1900,2000]
!x.ticks=1
!x.minor=10
!x.title='!5YEAR'
!x.thick=2.0

; same as for x axis	i
!y.style=0	
!y.range=[-20,20]	
!y.tickv=[-20,-10,0,1	0,20]
!y.ticks=4	-
ly.minor=5	

!y.title='!5T (ave)' !y.thick=2.0 Range of the x- axis The major tick marks on the x-axis The number of intervals between major ticks (count the # of commas) The number of minor tick marks Title of x-axis

Range of the y-axis The major tick marks on the y axis The number of intervals between major ticks (count the # of commas) The number of minor tickmarks

Title of y-axis

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Typing xloadct at the IDL command prompt will show you the list of color tables available. Each color table has 256 colors.

The xpalette command will show you the "index number" associated with each color in the color table

Red Under OF Colors: 16777216 Current Index: D D Bone Redmark Current Color: Done Redmark Color System: R68 (Red/Green/Blue) O Redmark Color System: R68 (Red/Green/Blue) O Done Redmark Color System: R68 (Red/Green/Blue) O Done Redmark Color System: R68 (Red/Green/Blue) O Done Redmark Redmark Done Redmark Redmark Done Redmark D D D D D D D D D D D D
Red Number OF Colors: 16777216 Current Index: D By Index D Current Color: D Done Redman Predefined Stretch Top Predefined Stretch Top Rainbow White Stretch Top Done Redman Predefined Stretch Top Rainbow Number Of Colors: Done Redman Done Redman
50 J J 0 Column 0 Direction Blue Direction

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XLoadct	_ 🗆 ×
Done Help	
0	
<u> </u>	Þ
Stretch Bottom	
Stretch Top	لغلب
1.00000	
Commo Correction	•
Bainbow	
Blue Waves	
Volcano	
Bainbow18	
Rainbow + white	
Rainbow + black	
Magenta and White Spine	

Data visualization:



; plot data with the plot command ; plots x vs. y

plot,year,t_anom,linestyle=1

plots the data as a dotted line

oplot,year2,temp_mean,linestyle=0,color=40 plots mean t as solid blue line over the raw data oploterror,year2,temp_mean,temp_sd*1.e-20,temp_sd,errcolor=40,psym=3 plots blue error bars in Y-direction

if ila eq 1 then begin device,/close set_plot,'x' ila=0 endif read,'input 1 for laser plot, 0 for not: ',ila if ila eq 1 then goto,ils

end

;

Index	Linestyle
0	Solid
1	Dotted
2	Dashed
3	Dash Dot
4	Dash Dot Dot
5	Long Dashes

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Data visualization:



Can we do more than just line plots?

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These figures show plots of total column ozone (left), tropopause pressure (center), and total column bromine. The ozone and bromine observations are taken by the OMI instrument onboard the Aura satellite. From Salawitch et al., 2010

http://aura.gsfc.nasa.gov/instruments/omi.html

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OMI Total Ozone Apr 13, 2007





Recognize this?

Please copy:

~tcanty/AOSC652/2014/week_10/plot_omi*.pro ~tcanty/AOSC652/2014/week_10/L3_ozone_omi_20070413.txt

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L3_ozone_omi_20070413.txt



Please run plot_omi.pro

This link explains various types of map projections (note IDL can not do all of these styles)

http://www.quadibloc.com/maps/mapint.htm

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A quick review of contour plotting



If you wish to make a contour plot over a map of the globe in IDL,

1st Set up your map projection:

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30

map_set describes how the map projection is displayed

/AITOFF is the map projection

0,0 is the Longitude and Latitude that the map will be centered on.

/continents adds continents to the map

latdel/londel determines the spacing between lines of latitude and longitude

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A quick review of contour plotting



If you wish to make a contour plot over a map of the globe in IDL,

1st Set up your map projection:

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30

2nd Set and plot data contours:

o3_levels=100+25*indgen(17) ;the contour levels we wish to plot o3_colors=7+indgen(16)*16 ;the color index for each contour contour,ozone,lon,lat,levels=o3_levels,c_colors=o3_colors,/cell_fill,/overplot

contour - plots contours on the map projection
We specify the contour levels, levels=o3_levels
We specify the colors for each contour, c_colors=o3_colors
/cell_fill fills the contours
/overplot preserves the existing map without erasing it.

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A quick review of contour plotting



If you wish to make a contour plot over a map of the globe in IDL,

1st Set up your map projection:

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30

2nd Set and plot data contours:

o3_levels=100+25*indgen(17) ;the contour levels we wish to plot o3_colors=7+indgen(16)*16 ;the color index for each contour contour,ozone,lon,lat,levels=o3_levels,c_colors=o3_colors,/cell_fill,/overplot

3rd Most of our continents are now covered with colored contour lines, so we will replot our map.

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30,/noerase,title=filename

Note: you must add /noerase to the second call to map_set or everything we've plotted previously will be erased.

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A quick review of contour plotting



If you wish to make a contour plot over a map of the globe in IDL,

1st Set up your map projection:

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30

2nd Set and plot data contours:

o3_levels=100+25*indgen(17) ;the contour levels we wish to plot o3_colors=7+indgen(16)*16 ;the color index for each contour contour,ozone,lon,lat,levels=o3_levels,c_colors=o3_colors,/cell_fill,/overplot

3rd Most of our continents are now covered with colored contour lines, so we will replot our map.

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30,/noerase,title=filename

4th Add a colorbar:

```
colorbar1,o3_levels,o3_colors,format='(I3)',unit='DU'
```

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If we've done everything correctly, our figure should look something like:



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To use a much wider range of colors, please look at and run plot_omi_vers02.pro



First, set up you map projection as before:

map_set, /AITOFF,0,0,/continents,latdel=30,londel=30

Second, assign a specific color to each data point:

```
col_range=[7,245]
o3_range=[100,500]
symbols,2,1
for i=0,nlat-1 do begin
for j=0,nlon-1 do begin
if (ozone(j,i) ne -999.00) then begin
color=interpol(col_range,o3_range,ozone(j,i))
if color gt 245 then color=250
plots,lon(j),lat(i),psym=8,color=color
endif
endfor
```

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If you wish to make a contour plot that uses a much wider range of colors,

To plot symbols, we'll use the program symbols.pro that you copied into your idl directory.

```
symbols, symbol #, scale size
```

Example:

```
symbols,2,1
plots,x,y,color=40,psym=8
```

```
plots a filled circle, of size =1
psym=8 tells IDL to use a "user" defined symbol
```

SYMBOL NUMBER:

2 = filled circle1 = open circle3 = arrow pointing right 4 = arrow pointing left 5 = arrow pointing up6 = arrow pointing down 7 = arrow pointing up and left (45 degrees)8 = arrow pointing down and left 9 = arrow pointing down and right. 10 = arrow pointing up and right. 11 through 18 are bold versions of 3 through 10 19 = horizontal line 20 = box21 = diamond30 = filled box22 = triangle31 = filled diamond32 = filled triangle

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Follow steps 3 and 4 from earlier and our plot should look like this.

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To create multiple plots on one page you'll need to use the position option.

Example:

plot,x,y,position=[0.15,0.15,0.95,0.4],/noerase oplot,x1,y1 oplot,x2,y2

plot,xx,yy,position=[0.15,0.45,0.95,0.95],/noerase oplot,xx1,yy1 oplot,xx2,yy2

When plotting maps, use the position option (and /noerase) in the map_set command

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We can print both styles of contour plots on figure.

This code can be found in plot_omi_vers03.pro

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