

GRAMON_PGPILOT

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Introduction

Basic plotting subroutine which is option driven. Basic calling method can be seen in PLT_SPEC or DISPGEN. Package has a lot of options for making pretty plots. At present it does not allow multiple panels on the same page. This is not a limitation --- postscript files can easily be combined to give a panel format either by editing, or by running simple scripts (programs). **n_col_merge.exe, land_col_merge.exe, n_multi_merge.exe & land_multi_merge.exe** are fortran programs designed to facilitate plot merging. .sve files are not utilized by GRAMON_PGPILOT.

The PGPILOT subroutines are intrinsically single precision. GRAMON_PGPILOT uses a mix of precision. Data can be passed as single or double precision, but is always stored as single-precision to save space.

Data is passed to GRAMON_PGPILOT by calls of the form

```
CALL DP_CURVE(NPTS,XVEC,YVEC)
CALL DP_CURVE_LAB(NPTS,XVEC,YVEC,LABEL)
or
CALL DP_CURVE_AND_ER(NPTS,XVEC,YVEC,SIGMA,OPT)
CALL DP_CURVE_AND_ER_LAB(NPTS,XVEC,YVEC,SIGMA,OPT,LABEL) .
```

If OPT=LOG, the log of y is plotted - it checks whether Y and Y-SIGMA > 0. LABEL is a character sting which is used to identify the plot (like a plot title). DP denotes double precision calls (REAL*8). Single precision calls are made using the same calls except omit "DP_". Up to 50 plots, of "arbitrary" length, can be passed. Error bars can also be passed. The plot package is called by

CALL GRAMON_PGPlot(XLABEL,YLABEL,TITLE,OPTIONS)

All arguments are CHARACTER, and may be blank.

Basic philosophy is that plot package should provide reasonable default plots. These defaults can then be modified to make pretty plots. Once the user is a happy with a plot, it can be written to a hard file using the Z option. For pretty plots with strings, it advisable to set an explicit aspect ratio (the default aspect ratio is device dependent). When this is done, the hardcopy plot should look identical to that on the screen(except for the vagaries of color).

Plot options

Basic

H	Help
P	Plot graphs (default)
NOI	Leave data intact on exit (actually a switch). Default is to destroy data on exit. Make sure to cancel VEL option before issuing this command.
RPO	Reverses the ordering of how plots are drawn on the screen.
E	Exit from PLOT package
CL	Clear Graphics Screen
LP	Long plot. This adjusts the plotting window with the device CPS so that long plots (e.g., 2m) can be produced. When the resulting postscript file is converted to PDF, the can be easily scrolled.
LOC	Use cursors to read of (X,Y) positions on a graph. On many systems you need to hit Mouse button 1 (MB1) to activate the plot window and hence the cursor (this may also be necessary after every output to the terminal). Use "a" or "MB1" to read the cursor position, and "x" or "MB3" to exit.
Z	Hardcopy (ZN=Asks for new hard device). Plots are automatically numbered as pgplot_1.ps pgplot_2.ps etc, although the file name can be changed (e.g., myplot.ps/cps). Warning: existing files from an earlier plot session will be overwritten. Default I color, landscape (cps).

Axis and plot format

A Define basic axis Parameters (Xstart, Xend etc)
2A Define parameters for axis on right hand side.
BRD Switch border on/off
F Change default axis parameters
L Modify Axis Labels and Titles
EDCL Modify curve labels.
N Set aspect ratio of plot. Change size of labels, tick marks, and plot borders.
LX Switch between LINEAR/LOG X axis labeling.
LY Switch between LINEAR/LOG Y axis labeling.
LXY Switch between LINEAR/LOG labeling for X and Y axes.
VEL Convert X axis in plotting to km s^{-1} . Entering 0 will return you to the original input axis. Use LAM option to find the wavelength of common lines.

Line styles

B Switch error bars on/off
C Indicate how curves are to be connected
 L Normal line
 E Non-monotonic
 EC Non-monotonic - switches color
 B Broken
 I Invisible
 V Vertical lines
 VB Vertical lines - sets base for vertical lines.
 A Histogram - X vert
 H Histogram
 LG Plots $\text{Log}(\text{ABS}(Y))$ - Used with -ve marker style.
CC Change color settings
CP Change pens (Color Index)
D Switch dashed lines on/off
DE Edit dashed lines one by one
W Change thickness (line weights) of curves.
 If w(1) is -ve, all curves set to $\text{ABS}[w(1)]$.
WE Edit line weights one by one
M Switch marking of data points on/off
RPO Plot curves in reverse order (switch): does not affect color.
OFF Set offsets when plotting multiple plots.

Profile options (for an analyzing spectra)

Continuum options

- CONT Define a continuum using cursors. The continuum is either defined as a piecewise linear, or a monotonic cubic. Continuum location is set either by the cursor y values, or by the average of N values at the X locations.
- DC Define a continuum for EW measurements
- MCN Allows a continuum to be defined using cursors. Can be called multiple times. The continuum definitions can be edited by additional MCN calls.

Equivalent widths and profile fitting

- CEW Measure the EW of a line using a cursor. A straight line continuum across the line to be measured is assumed, with the continuum defined either by the cursor y value, or by the average of N pixel values at the cursor location.
- EW Measure the EW or AREA of a single line in a plot. If the continuum has not been previously defined, the continuum is assumed to be unity.
- GF Fit a set of Gaussians (with an exponent not necessarily=2) to a section of a **normalized** spectrum. The parameters of the Gaussian, and the EWs are output. Rerunning GF allows previous fit parameters to be used/edited.
- MGF Fit multiple plots with Gaussians. Use GF on a representative plot to first define approximate parameters of fit. This option will then fit multiple data sets that have been read into the plot buffer. NB: Don't forget that the BOX option can be used to read in multiple file to PLT_SPC.
- DG Draw the Gaussian fits (in black) (allows the plot screen to be cleared and updated).

Miscellaneous options

CUT	Reduces number of points in each curve. Allows smaller plots to be made. Retained data can be connected by a straight line to the specified (fractional) accuracy.
KMS	Switches to km/s as the default unit for velocity plots.
MMS	Switches to Mm/s as the default unit for velocity plots.
LNKE	Link a vector as errors to another plot.
RCP	Reset default color pens
CBP	Set pens for color blindness
GP	Set default for grey pens
SFP -	Adds an offset to color pen definitions (may not work with all options).
B	Switch error bars on/off
FILL	Color in region between 2 curves
RPO	Plot curves in reverse order (switch): does not affect color of plots.
OFF	Adds an increasing offset to each plot, to create a stacked set of plots.
LAM	List wavelengths of common lines. Useful for VEL option.

Line and string options

VC	Define line vectors on the plot using cursor control.
VF	Read vector definitions from a file.
VE	Online edit of vectors (colors, size, location etc).
SC	Define strings on the plot using cursor control. String location is done by the numeric keypad (1 to 9).
SF	Read string definitions from a file.
SE	Online edit of strings (colors, size etc).

Data IO

RID Read line ID's from data file created using DISPGEN (option LNID). This can be used to automatically identify lines on a plot, and works best for stars dominated by photospheric absorption lines. Only reads line for current plot window (not whole spectrum). Works best in optical where there are relatively few lines. Use SID to change defaults. Plot should be normalized.

REW Read in line ID's. Similar to RID but read in EWDATA file created by CMF_FLUX. Works best for emission lines in W-R stars, LBVs, Type IIP SN.

RP Read plots from a (WP) direct access file. WP and RP are useful to transfer plots between different programs or models. This option and WP can be used to compare plots from different models. RUN DISPGEN in two windows, and use these options to transfer data between the programs. On program can open a null window for plotting.

RPF As for RP but file name can be changed.

RXY Read a simple data file that is in ascii format.

WXY Write a simple ascii data file in column format

WOBS Write plot to ascii file in same format as OBSFLUX. Option assumes units are 10^{15} Hz and Jy at $d=1$ kpc.

WP Write plots to a direct access file. Plots are labeled, and these labels are subsequently used by RP to access the plot.

WPF As for WP but file name can be changed.

SXY Writes ascii format in column format with id, I, and x(i), y(i) given sequentially for all plots.

WTIT Write titles to ascii file

RTIT Read titles from ascii file

RDXL Read abscissa values from file

RDYL Read ordinate values from file

Simple plot manipulation.

- NM Normalize -- scale plot level to unity, or to match another plot.
- NMS Similar to NM but set up for automatic plotting.
- BXSM Use a BOX car to smooth a plot. Assumes data are "equally" spaced (also see SM and GSM options).
- GSM Smooth data using a Gaussian. Data may be unequally spaced (also see SM and BXSM options).
- SM Use HAN (i.e., weighting according to Pascals triangle) to smooth a plot. Assumes data are "equally" spaced (also see SGM and BXSM options).
- ADDN Add Poissonian noise. The input spectrum is assumed to be normalized so that COUNTS times the input spectrum will give the counts in each pixel.
- REP Simple option to replace data with a straight-line segment defined using cursors, or using nodes read from a file. In the latter case, straight line is defined using the data value at the nodes.
- FREP Simple option to edit data using cursors. Individual data values can be replaced and added using cursors. It is also possible to shift the data vertically or horizontally.
- REG Regrid a single data vector into a new plot. Options are
 UG (uniform grid, same number of data points)
 dX (specify spacing dX)
 R (fixed resolution - i.e., $dx/x = \text{constant}$)
 NINS (number of grid points).
- CAX Replace data with data from another plot. Plots are assumed to have the same number of data points - no replacement is done if this is not true. RX (RY) replace x-axis (y-axis) data from a second plot. RXWY (RYWX) replaces X (Y) data with Y (X) data from second plot. SXY switches X and Y data in the same plot.
- XAR Simple X axis arithmetic with a constant (-, +, *, /, R=[const/X], Log, ALOG, XN). The default constant for the R option allows conversion between wavelength (Angstroms) and frequency (in units of 10^{15} Hz). XN set the plot to array index (or creates a new plot with the same property).

YAR Simple arithmetic operations on the Y axis. You can perform simple math operations (-,+,*,/) with a constant or perform simple math functions (R[=1/Y] Log, ALOG, ABS). Further, ?X performs an operation on Y with X. Options are MX or *X, DX or /x, +x and -x. For MX and DX the answer can be scaled.

VAR Simple arithmetic on two plots. Data will be interpolated as necessary. You should give the plot with the highest x-resolution first. This may mean using a YAR option (as R of multiply by -1) on the second data set first. Current options are *,+,-,/,c(copy) and cc (cross-correlation).

History mechanism

OLF Open file to log commands.

CLF Close log file.

OIF Open a previously generated log file for input.
Cumbersome, as some commands can't be used in this mode, and previously issued commands can be important.

CIF Return to terminal IO.