To show a profile from another position, move the cursor in the original window and press the mouse button again.

When plotting profiles from an image, you may switch between a horizontal and vertical mode.

To zoom in and out of the profile plot, use the right/left mouse buttons.

You may average the profiles over several lines by moving the slider at the bottom of the profile widget.

5.6 Inspecting CDS data in command mode

Many users will probably like to work with CDS data interactively from the IDL prompt (command mode). This section demonstrates just a few of the routines available to extract data from the data structures and display them, by providing an "example session". For more detailed information on the data extraction routines, we refer to CDS Software Note No. 41. Since most of the data extraction routines start with "gt_", another tip is to use `IDL> tftd,'gt_'` and see what comes out.

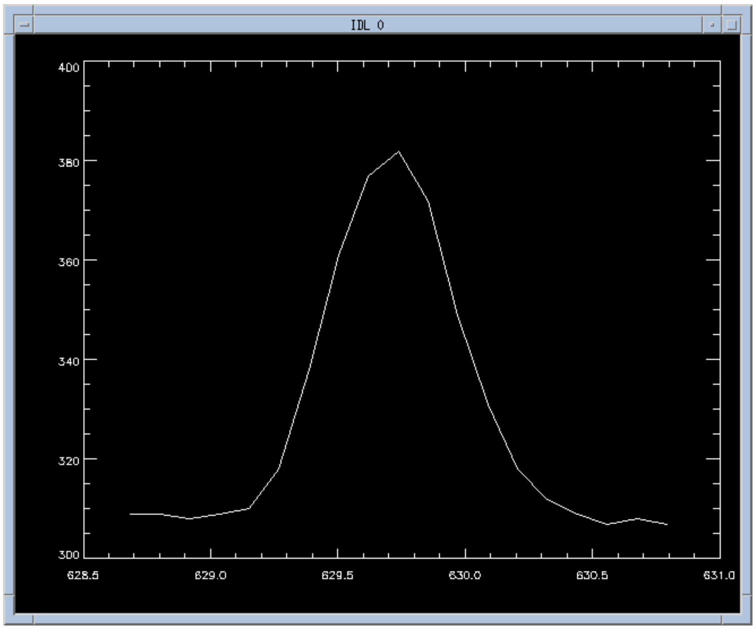
First, we read in the data and find out a little bit about what we have:

```
IDL> a=readcdsfits("s3300r00")
IDL> print,gt_wlimits(a)           ; What kind of windows do we have

       Window:       0            Label: HE_1_584_34
       Band:         NIS2
       Det-X:              602         to      620
       Det-Y:              336         to      478
       Wavelength:          583.33722    to       585.44635

       Window:       1            Label: HE_2_303_78
       Band:         NIS2
       Det-X:              800         to      818
       Det-Y:              338         to      480
       Wavelength:          606.53755    to       608.64667

       Window:       2            Label: MG_9_368_06
       Band:         NIS1
       Det-X:              854         to      872
       Det-Y:              586         to      728
       Wavelength:          367.45407    to       368.71681

       Window:       3            Label: O_5_629_73
       Band:         NIS2
       Det-X:              989         to     1007
       Det-Y:              340         to      482
       Wavelength:          628.68332    to       630.79244
     602      620      336      478
     800      818      338      480
     854      872      586      728
     989     1007      340      482
IDL> dim = gt_dimension(a)      ; What data dimensions are present, and
IDL> help,dim,/str              ; what sizes do they have?
```

```
** Structure QL_DIMENSION, 17 tags, length=152:
   WAVELNTH        BYTE         1
   SWAVELNTH       LONG                19
   SOLAR_X         BYTE         1
   SSOLAR_X        LONG                60
   SOLAR_Y         BYTE         1
   SSOLAR_Y        LONG               143
   DEL_TIME        BYTE         0
   SDEL_TIME       INT              0
   WAVELNTH_ORIGIN DOUBLE    Array(4)
   WAVELNTH_SPACINGDOUBLE    Array(4)
   SOLAR_X_ORIGIN  DOUBLE          -597.58600
   SOLAR_X_SPACING DOUBLE           4.0640000
   SOLAR_Y_ORIGIN  DOUBLE           66.662500
   SOLAR_Y_SPACING DOUBLE           1.6800000
   DEL_TIME_ORIGIN FLOAT          0.00000
   DEL_TIME_SPACINGDOUBLE           10.000000
   NDIMS           INT              3
IDL>
```

I.e., we have four windows, and the line windows have dimensions (19,60,143). Let's say we'd like to have a look at the O V window – first we'll extract a spectrum from the middle of the raster:

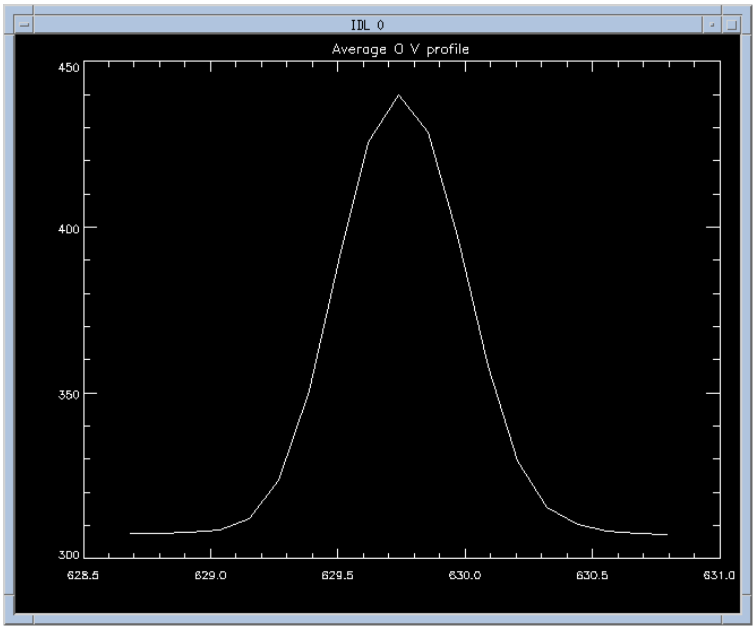
```
IDL> spec=gt_spectrum(a,window=3,xix=30,yix=70,lambda=lam)
IDL> window,0
IDL> plot,lam,spec,/ynozero ; lambda returns the wavelength array
```



And if we want to get the spectrum averaged over the whole raster:

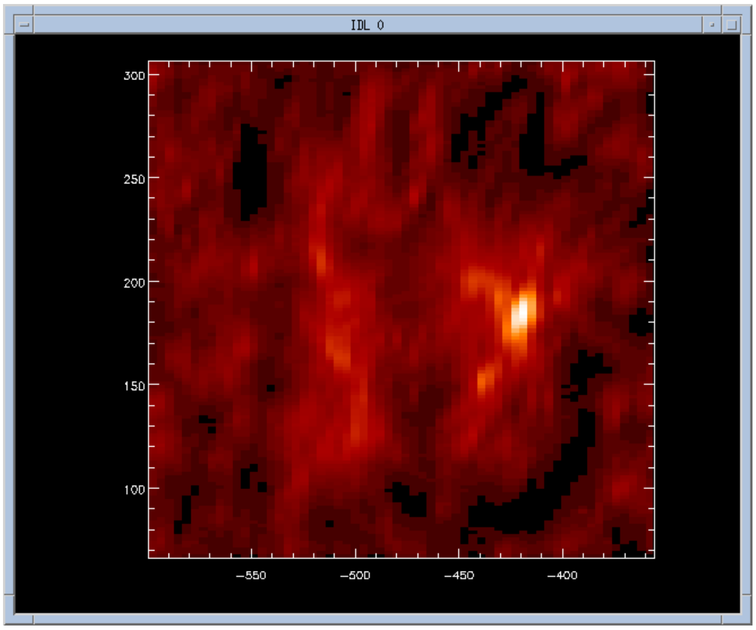
```
IDL> data=gt_windata(a,3) ;; Returns the whole data array for this window
```

```
IDL> help,data
DATA            FLOAT     = Array(19, 60, 143)
IDL> ; Successive averaging over both spatial dimensions
IDL> plot,lam,average(average(data,2),2),title='Average O V profile',/ynozero
```



Now, we'll extract an image by integrating over a wavelength band:

```
IDL> im = gt_bimage(a,629.2,630.5)
IDL> origin=[dim.solar_x_origin,dim.solar_y_origin]  ; Make sure we get
IDL> scale=[dim.solar_x_spacing,dim.solar_y_spacing] ; coordinates etc. right
IDL> plot_image,im,origin=origin,scale=scale
IDL> loadct,3
IDL> gamma_ct,.3       ; Get a reasonable color table
```



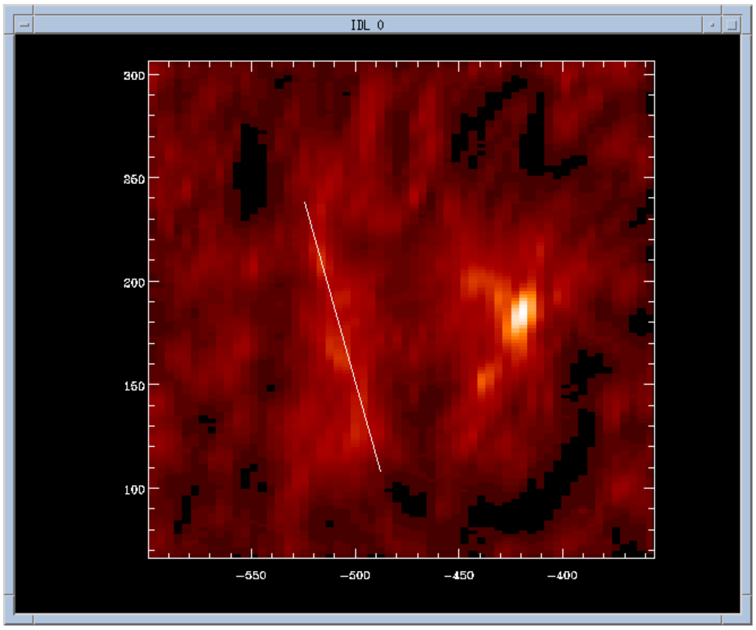
To view profiles (horizontal or vertical) profiles from this image, use

```
IDL> tvprofile,im
```

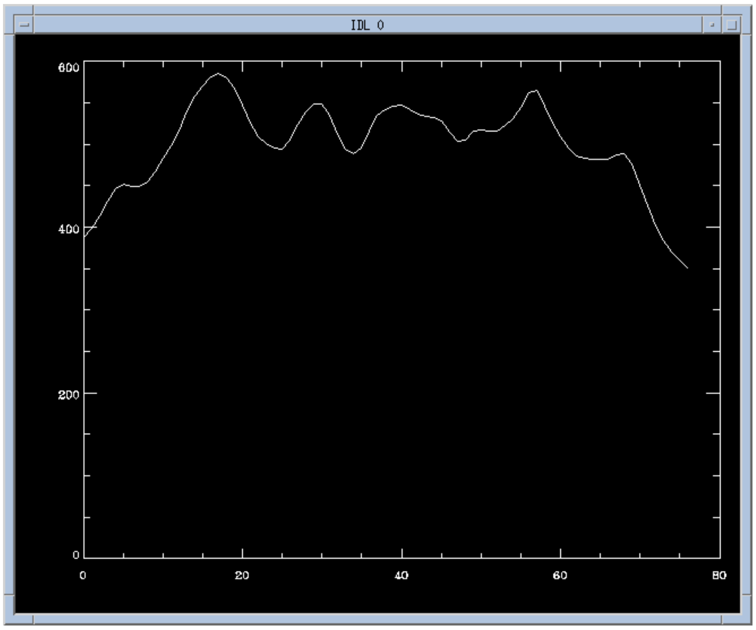
A window pops up to display the profiles. Move the mouse inside the displayed image. Click the left button to switch between horizontal/vertical, press the right button to exit.

Another very useful routine is TVPROF to extract a profile along a user defined path. The user is prompted to enter (using the cursor, left button) a series of points defining the path to take the profile along. The procedure is completed by clicking the right mouse button.

```
IDL> tvprof, image, profile, xval, yval    ; To extract profile along a path
```



```
IDL> plot, profile                    ; Plot profile
```



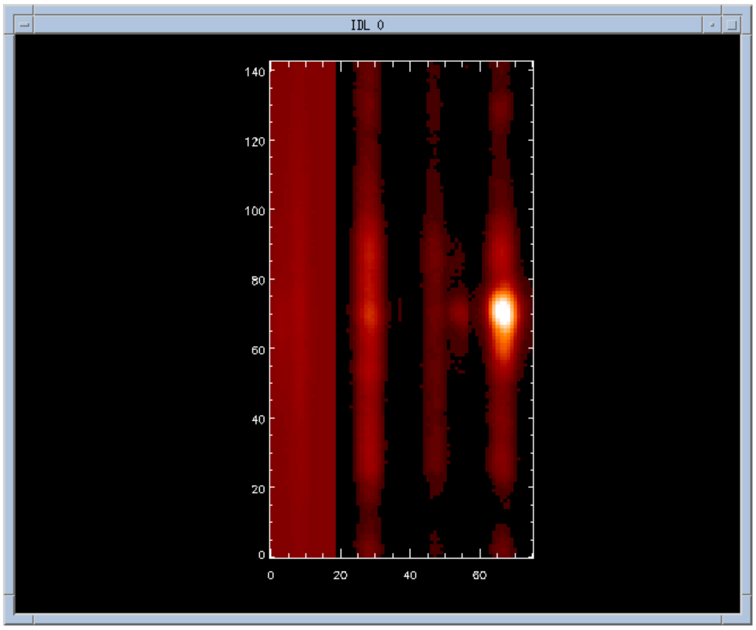
The routine TVVALUE can be used to extract values of a displayed image interactively:

```
IDL> tvvalue, image
```

A widget pops up displaying the pixel x/y coordinates, and the pixel value of the pixel under the mouse cursor. The left or center mouse buttons prints out the value, the right button exits.

To e.g., get a slit spectrogram through (with the data from all the line windows) through the bright spot in the image:

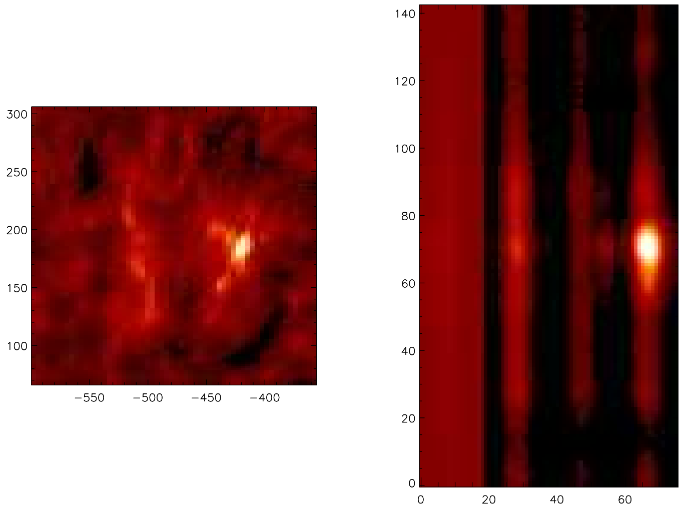
```
IDL> scan=gt_scany(a,window=[0,1,2,3],xix=44)
IDL> plot_image,scan
```



If you would like to make postscript output, this is easily accomplished:

```
IDL> ps,'psdemo.ps',/color,/copy  ; Copy color table
IDL> !P.multi=[0,2,1]
IDL> plot_image,im,origin=origin,scale=scale
IDL> plot_image,scan
IDL> psclose
```

This produces the following output in the postscript file:



For more details and examples about using the SERTS software we refer to CDS Software Notes No. 5 and 6.

5.7 Other useful stuff

PICK_LINE() Extract laboratory data of line from Kelly's line list

Kelly's line list (or part of it) is searched, and a display pops up with the lines that were within a range around the given wavelength (default +/- 0.5 Angstrom). The information from Kelly, such as laboratory wavelengths, element, energy levels, and configuration are displayed. The "unreadable" atomic configuration listed in the electronic version of Kelly is decoded into the standard format used in the printed version.

```
IDL> dum=pick_line(lambda)           ; General use
IDL> dum=pick_line(600.5)            ; List lines between 600.0 - 601.0 A
IDL> dum=pick_line(600.5,delta=0.1)  ; List lines between 600.4 - 600.6 A
```

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