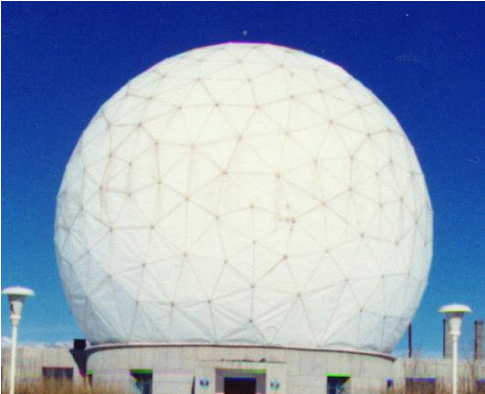
CLASS

Installation and Basic Operation Manual

li

Qinghai Radio Astronomical Station

Purple Mountain Observatory Academia

Веб-сайт: [www.dlh.pmo.cas.cn](http://www.dlh.pmo.cas.cn)

Millimeter-wave radio database: ：

[www.radioast.nsdc.cn](http://www.radioast.nsdc.cn) or [www.radioast.csdb.cn](http://www.radioast.csdb.cn)

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GILDAS - Installation and Basic Operation Manual

GILDAS（Grenoble Image and Line Data Analysis System）Is IRAM development A set of software for processing single line observations of spectral data and interference data.

First, the installation:  
Now the installation is much simpler than before, not too much trouble.

1, in the window system to install, as long as through <http://iram.fr/IRAMFR/GILDAS/> Download the latest version gildas-win-\*.msi To the local hard drive, double-click the installation on it, windows under the same software installation. Installation After the run, you can in the Start menu, click Class, etc., usually, is not recommended, the best through cmd, cd Into the directory where you store the data, run the command class and so on.

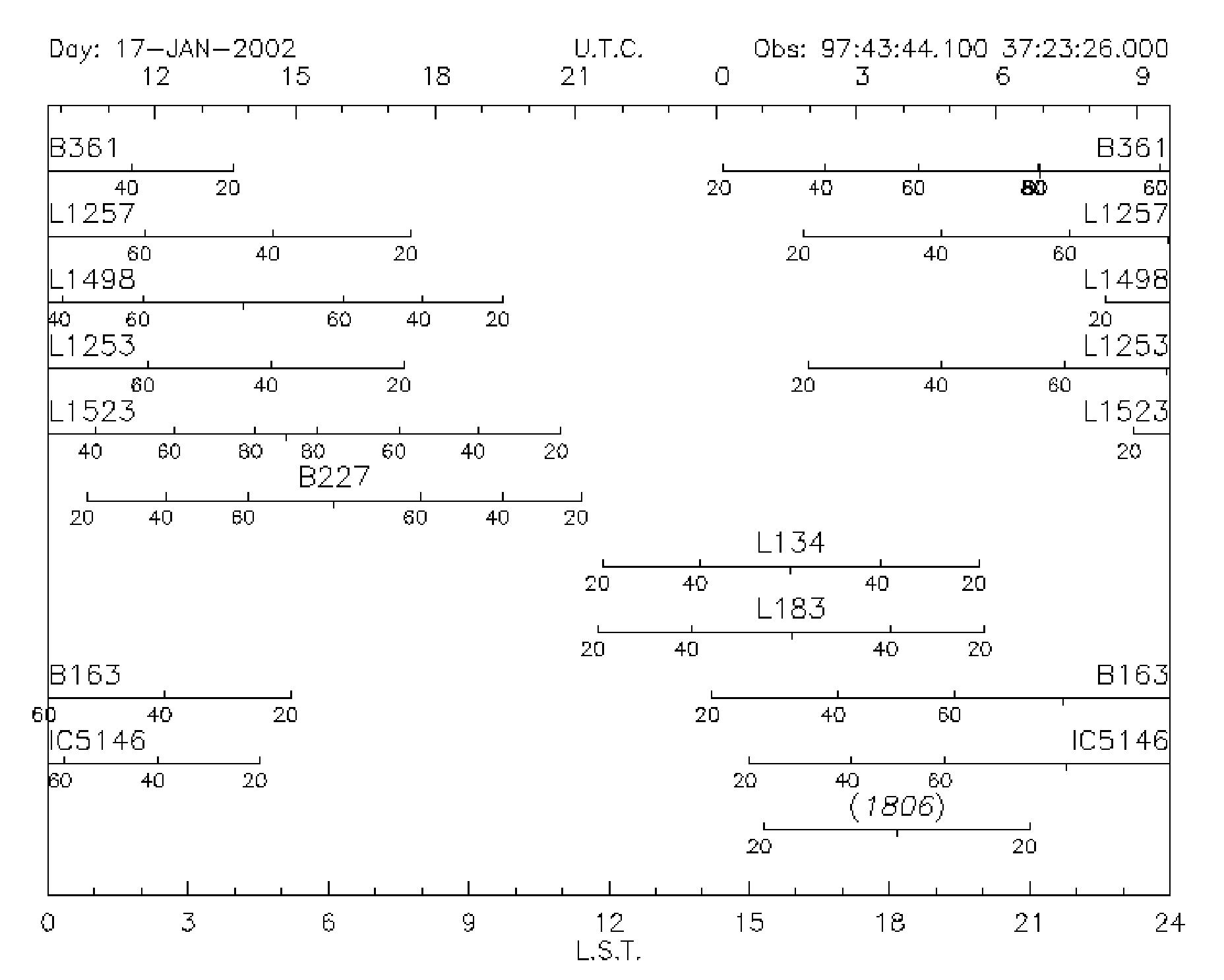
Second, GILDAS basic use of the order

***1. ASTRO command***

ASTRO is an observing use program that uses it to derive the time position information for various sources and prepare for observation.

**DEV IMAGE WHITE/BLACK** // Open an X-WINDOWS terminal  
**CATALOG filename** // Open the file filename and read the source table information  
**OBSERVATORY 97: 43: 44.1 37: 23: 26.0 3.2** // Coordinate of the Observatory's location  
**TIME 3:00 19-JAN-2002** // Observed date and time (world time)  
**HORIZON /SOURCE**  
**RULE X /MAJOR** // Draw the time grid  
**HORIZON 15 15/SOURCE** // Generates a time position map of the source in the sky

As shown below:

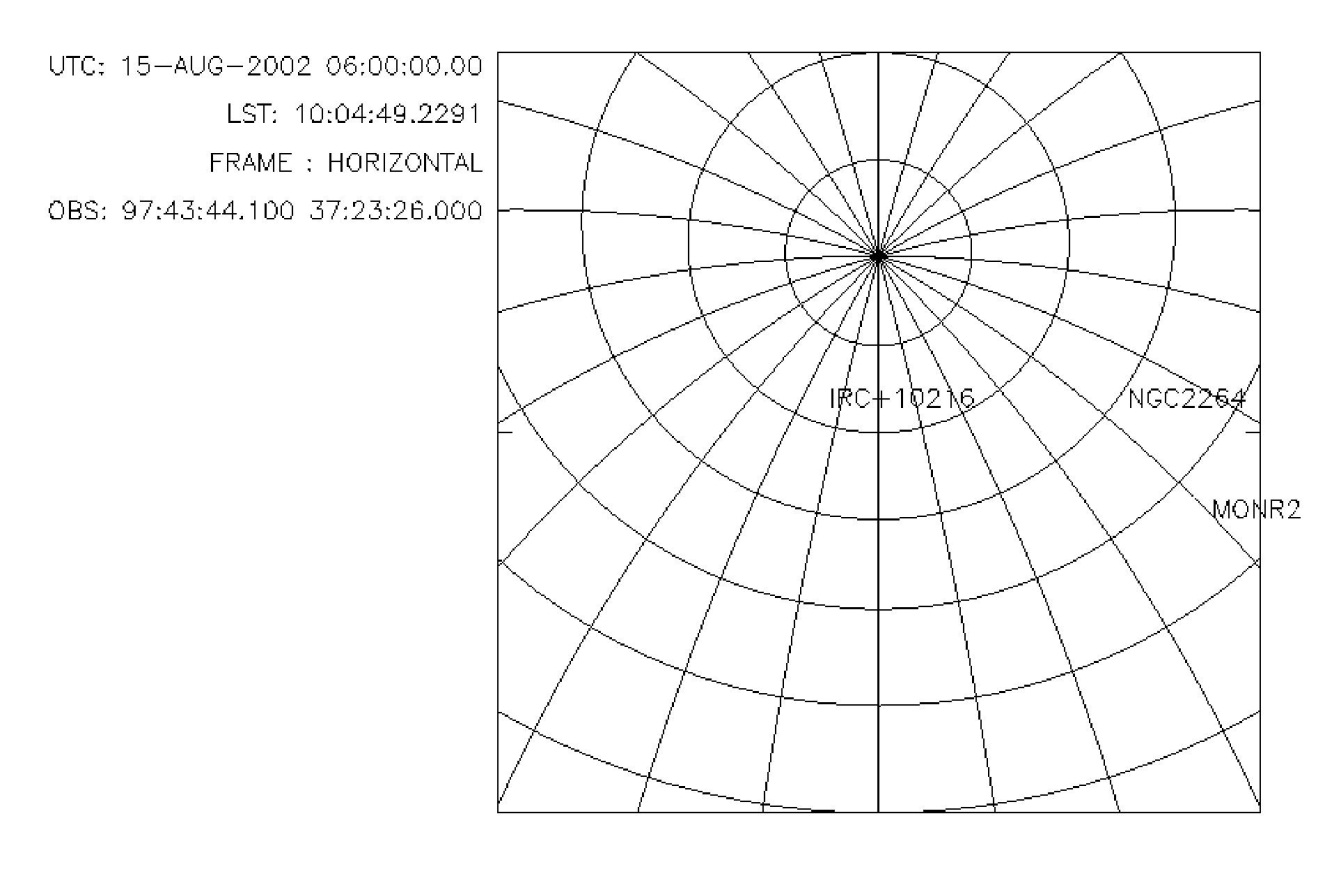


**CONVERT filename /J2000** // coordinates converted to J2000, and saved to the current directory filename file  
**CONVERT filename /B1950** // coordinates converted to B1950 and saved to the current directory filename file  
**CONVERT filename /GALACTIC** // coordinates are converted to bank coordinates and saved to the current directory filename

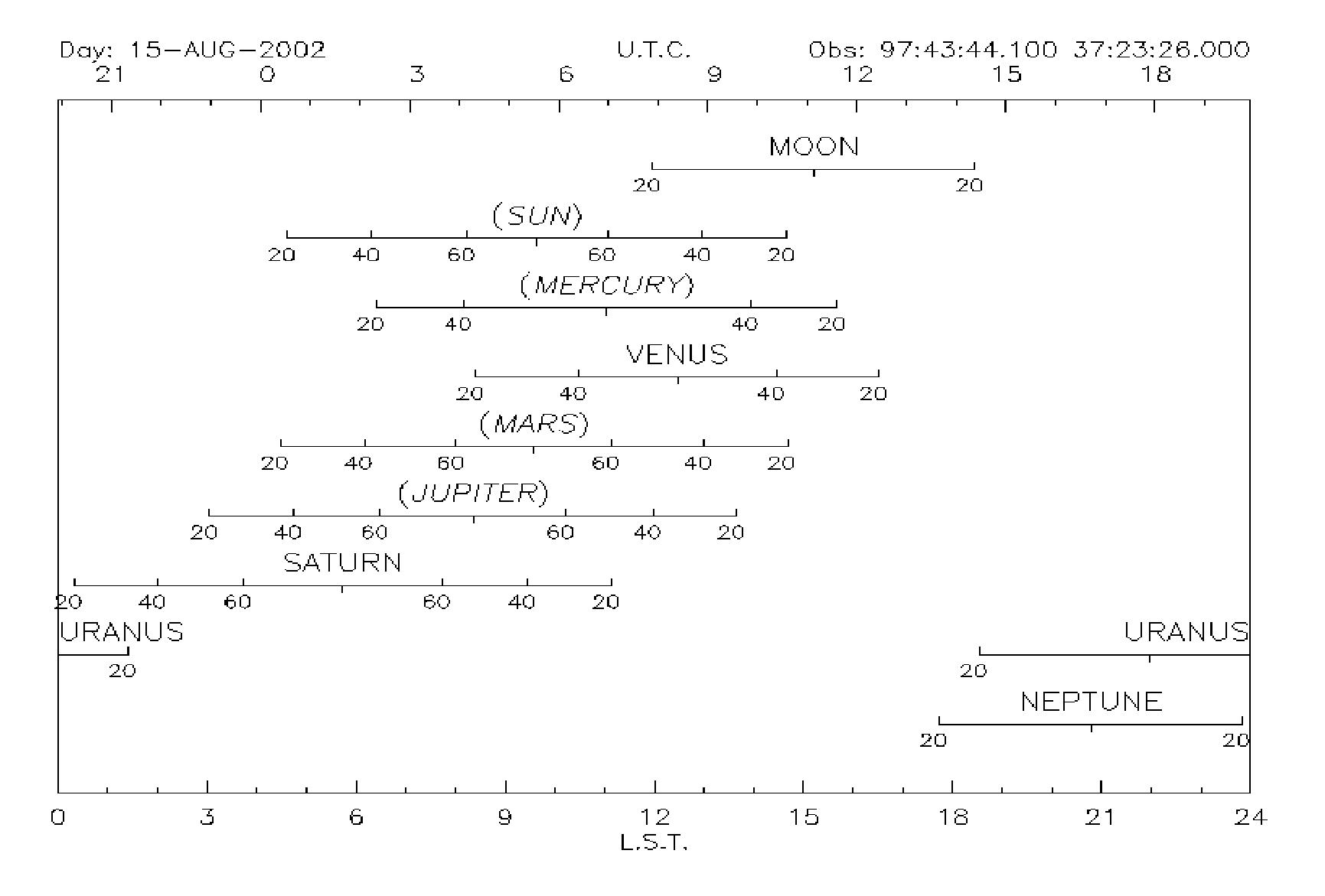
File

**CONVERT filename /PRECESS year** // coordinates are converted to any year's coordinates and saved to filename  
**FRAME HOR S** // Draw the ball coordinate system  
**SOURCE /DRAW** // Draw the position of the source in the sphere coordinate system  
**HEAD** // write the message

The results are as follows:

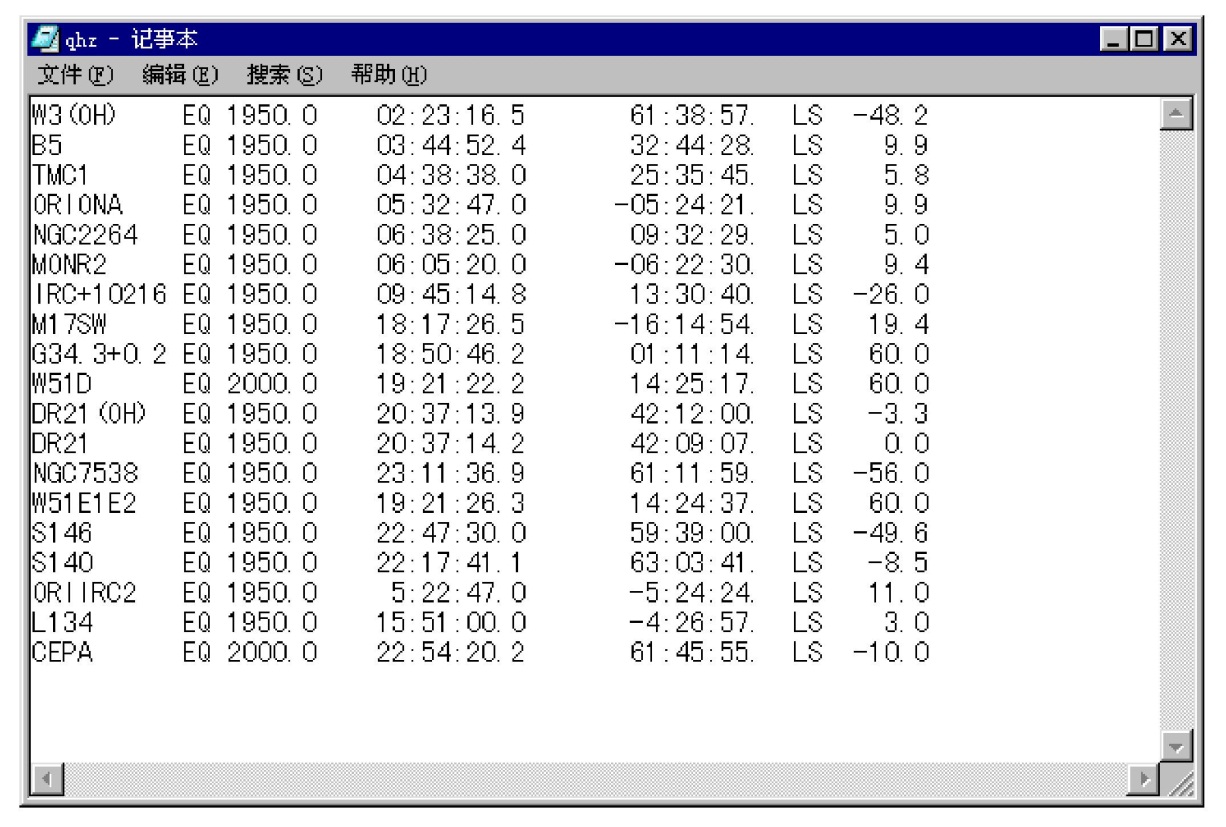
****

**HOR /PLANET**  // Generates the time position of the planet in the sky



**Note:** The format of the file is:

Source name **EQ** Epicentral declination **LS**  speed  
as follows:



***2. The conversion between the data***

1. FITS format data to class format file conversion

If you want to deal with the data format for the standard single-line FITS format, the use of CLASS software processing, the need to FITS format first converted to class format file, in the class software under the following procedures:

A, through <http://www.radioast.nsdc.cn/tools.php> Download the script file under different operating systems;

B, **FILE OUT filename SINGLE** // Initialize the file filename, in order to save the converted data;

C, *@fits2bur.pro* (Window system) or  *@wfits* (Linux system) / / need to pay attention to the implementation of *Linux*, you must ensure that the *wfits* file has executable permissions, if no command **chmod a+x wfits** to add the implementation of the authority ;

2) *class* generated *cube* data and *FITS* file between the conversion

After processing the spectral data with *class*, the generated *lmv, gdf* and other *cube* data into *FITS* format file, on the contrary, the *FITS* format file into a *class* format file to deal with are easier.

A, *cube* data to *FITS* file conversion  
**VECTOR\FITS outfile.fits FROM inputfile.gdf**  (or  **inputfile.lmv**)

B, *FITS* data to *cube* file conversion  
**VECTOR\FITS outfile.fits TO inputfile.gdf**  (or **inputfile.lmv**)

***3. CLASS command***

*CLASS* is the processing of spectral data, such as interception, polynomial fitting, *GAUSS* fitting, get spectral line information, output graphics files.

1), the basic order

**DEV I W/B** // Open a black / white graphics window

**FILE IN filename** // Open the file *filename*

**FIND** // the data is transferred to the cache

**LIST** // Lists the main header information for all *find* data

**GET n** (**n** for **SCAN**) // Read data with *SCAN* number *n*

**PLOT** // Draw the data lines in the graphics window

**SET LINE 13CO (1-0)** // Set the line name to be processed

**SET SOURCE oriona** // Set the data target name to be processed

**SET OBSERVED 15-JUN-2002** // Set the date of the observation data

**SET ANGLE SECONDS** // Set *offset* in units of seconds

**SET PLOT H** // Set the line graph to be displayed in a histogram

**FIND /OFFSET 0 0**  // Find all spectral data with offset *(0, 0)*

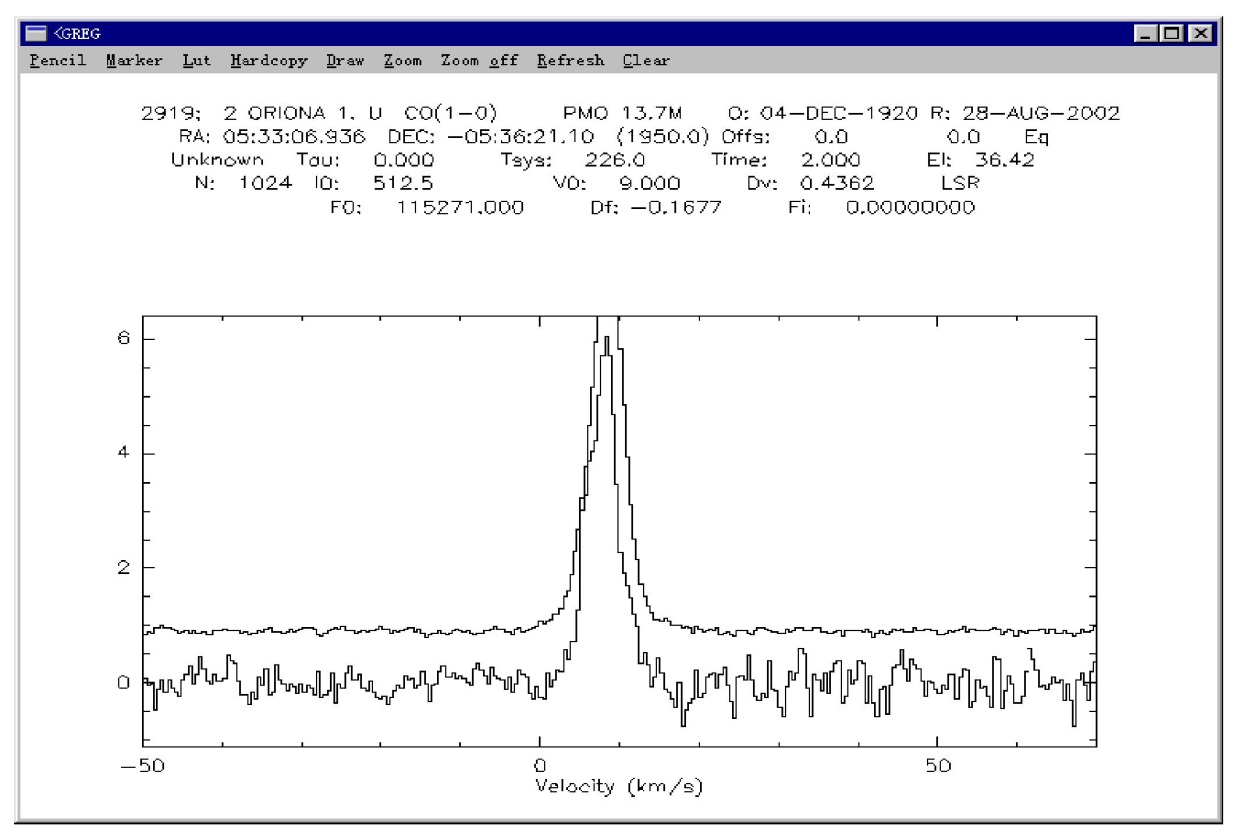
**AVERAGE** // stacks multiple lines of the same location (averaging) or different bits Set the line of the superposition, but before the need to add the command **SET NOMATCH**

**HARD filename /DEV PS FAST** (**COLOR**) // Save the line data of the graphics window as *ps* file

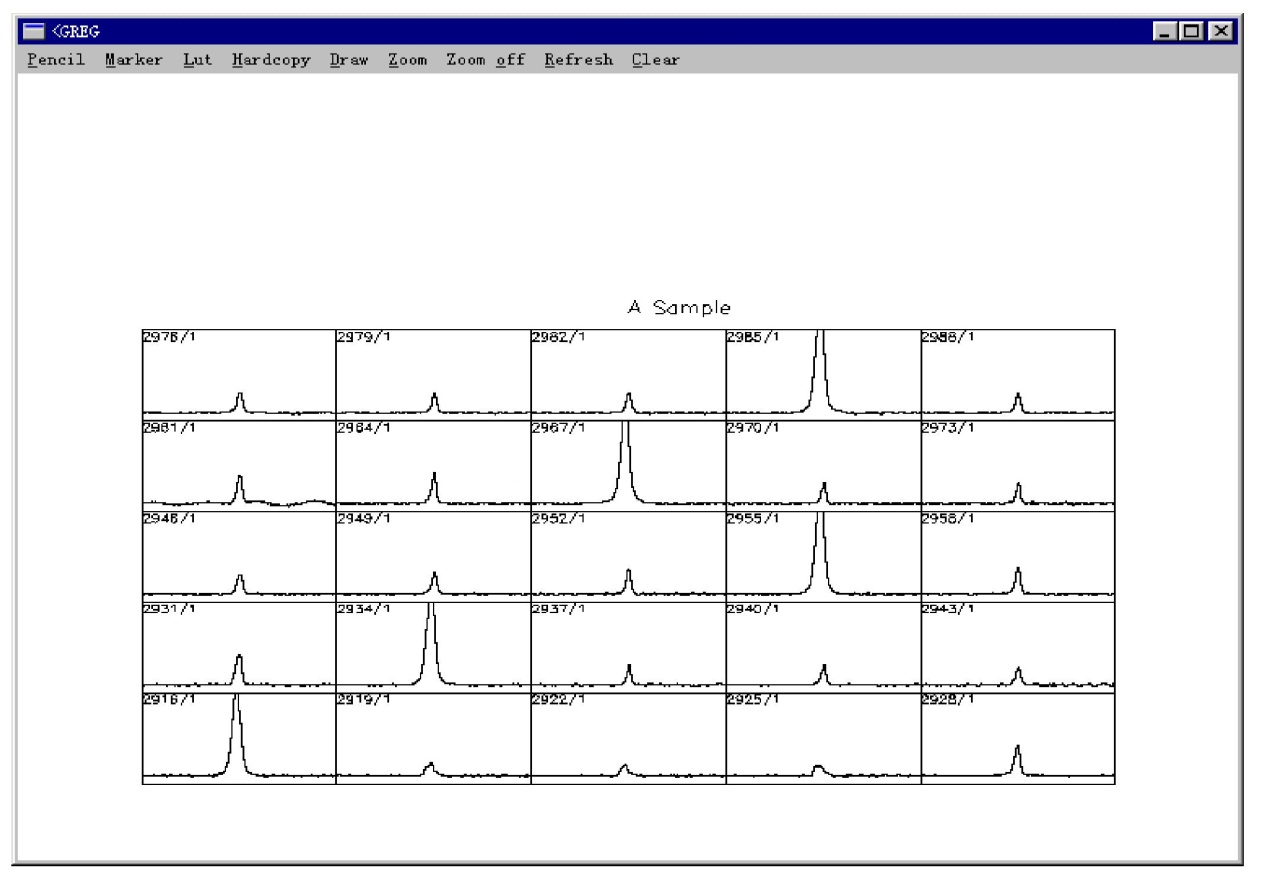
**SET SYSTEM E 2000** (**E 1950** or **G**) // *J2000, B1950*, silver channel coordinates and so on

**SET FORMAT L** (**L**, **B**, **F**) // Set the line information to be displayed

**SPECTRUM Yoff** // Draw the following figure:



**STAMP 5 5 /num** // Draw the following figure:



**EXIT** // exits the *CLASS* program

2) polynomial (spectral line baseline) fitting

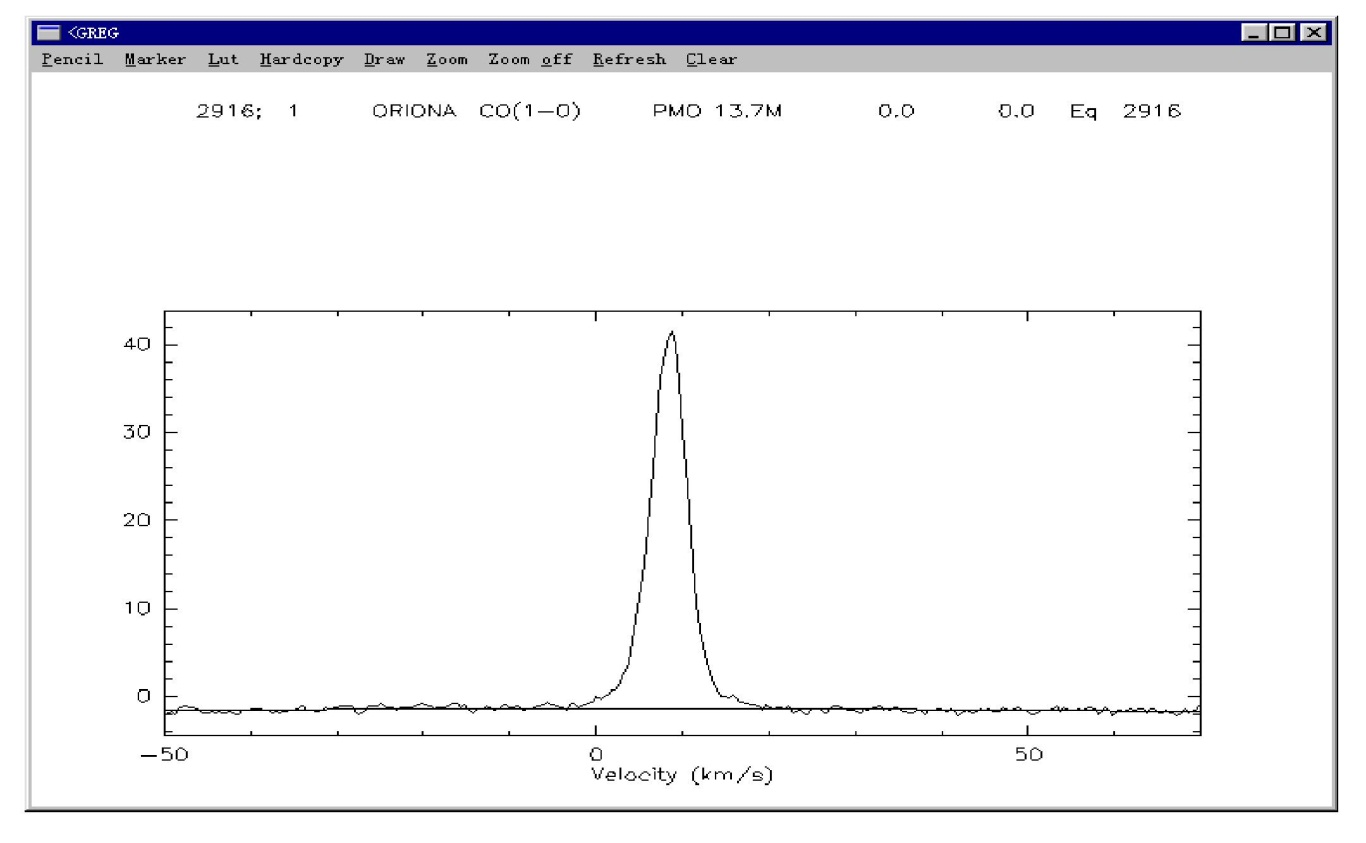
**SET MOD X n1 n2** // intercepts the line *n1 ~ n2* of the X axis

**SET MOD Y n1 n2  
SET MOD Z n1 n2**  // Select the line data from the range *n1 ~ n2*, usually in **PLO /INDEX**

**SET WIN m1 m2 …** // set the polynomial fitting range m1 m2, to avoid the signal to join the fitting

**BASE n /PLOT**  // n polynomials fit and draw the fitting curve

**PLOT** // Confirm the line after the quasi-error is corrected

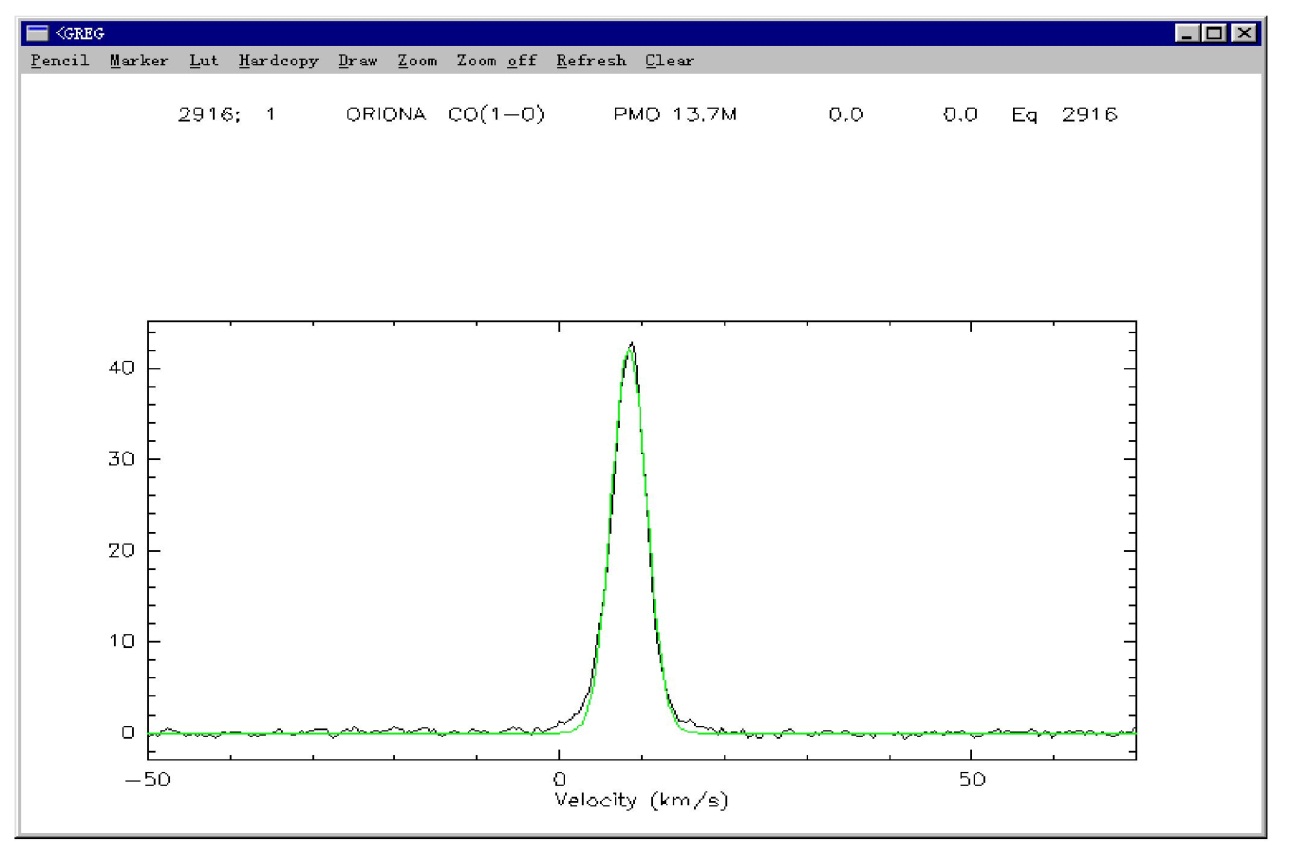


3) *GAUSS* fitting

**LINE 0**

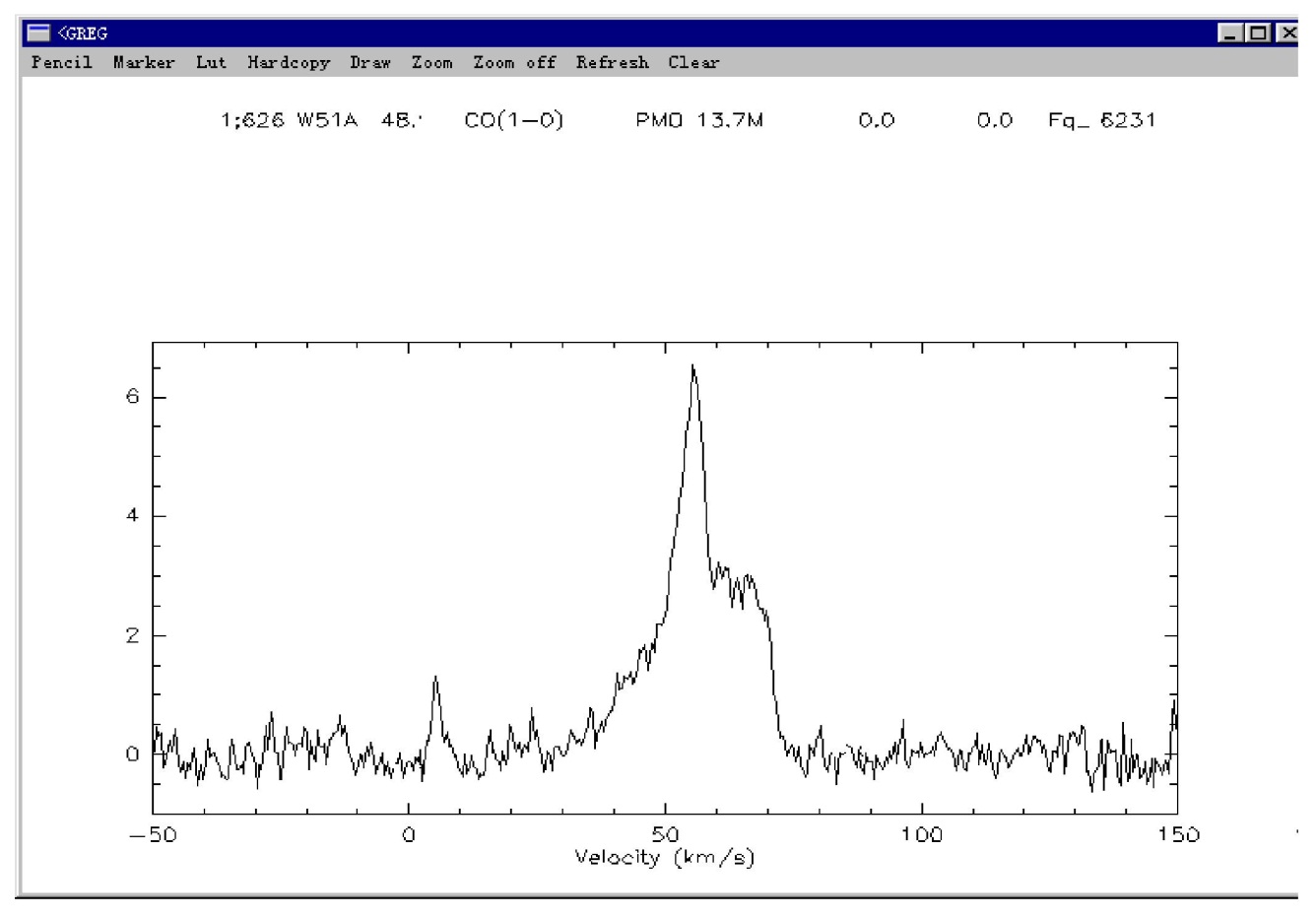
**MIN** // for *GAUSS* fit

**VISUALIZE** // Draw the curve after *GAUSS* fit



If it is bimodal or multi-peak spectral data, use **LINE n**; **MIN**; **VISUALIZE**.

For example: the following spectrum by three peaks fit.



LAS> **LINE 3**

Line 1: 0 0.000 0 0.000 0 0.000

Line 1: 0 1 0 5 0 5

Line 2: 0 0.000 0 0.000 0 0.000

Line 2: 0 6 0 50 0 13

Line 3: 0 0.000 0 0.000 0 0.000

Line 3: 0 3 0 65 0 10

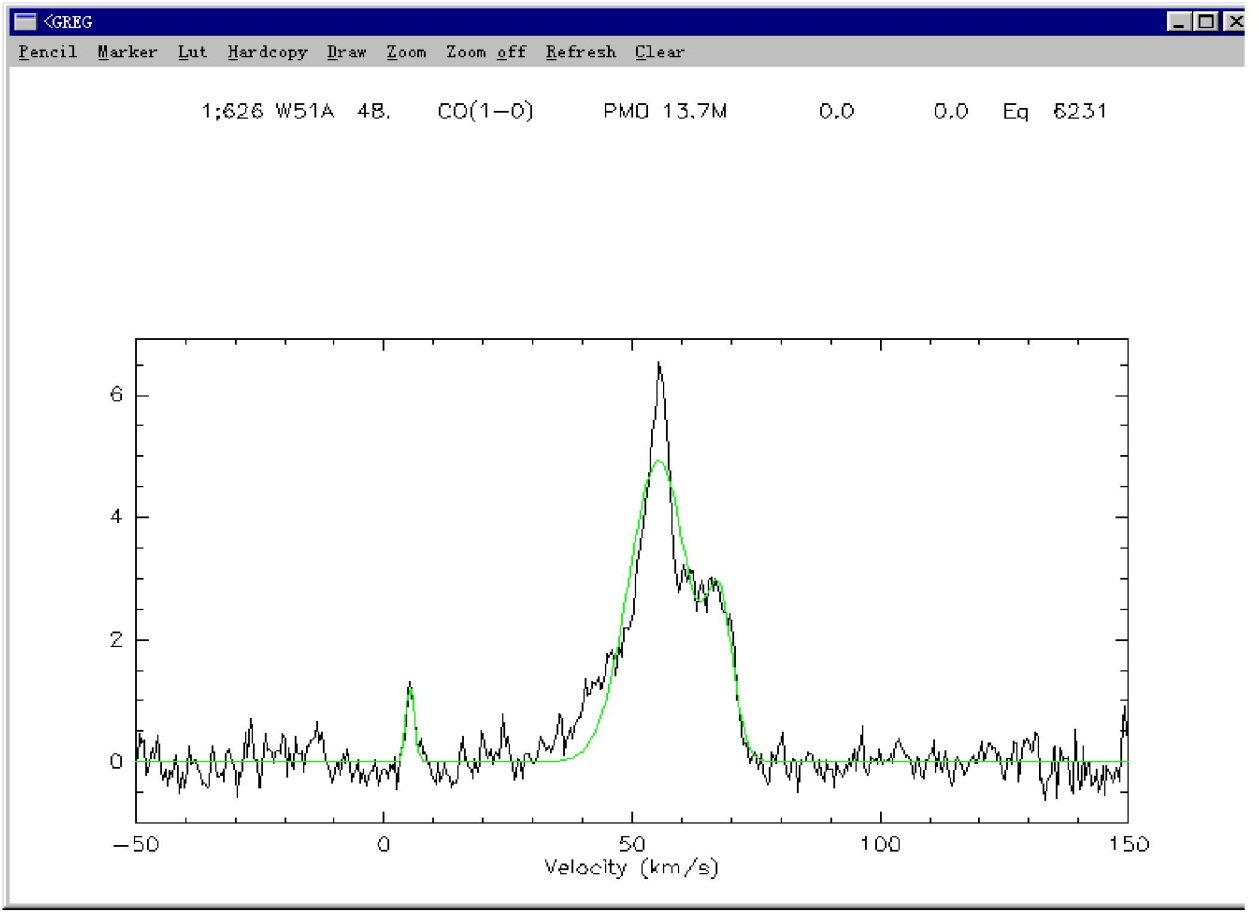
Where the second column shows the intensity; the fourth column shows the position where the line is located; the sixth column shows the line half width , You can also enter the above parameters into a file, read with the command

**LINE /INPUT** **filename**, this is suitable for the same batch of data processing.

LAS>**MIN**

LAS>**VISUALIZE**

The results are as follows:



For a special spectral data, you can set **METHOD arg** directly, where ***arg*** includes ***SHELL***, *NH3 (1,1), NH3 (2,2), NH3 (3,3),* HFS filename*,* CONTINUUM, and so on.

4) GRID processing of the relevant orders

**LET MAP%BEAM \*** // Set the beam of the telescope

**TABLE filename1 NEW** (or **OLD**) // Create an index table

**XY\_MAP filename1** // GRID calculation

This set of commands can also write the line data you process as a *cube* file and convert it to a *FITS* format file. ***XY\_MAP*** after the data for the ***gdf*** file, *class* can not read directly, if you would like to write the file *class*  readable line data, further processing, analysis, need to go through two steps.

**FILE OUT filename SINGLE**

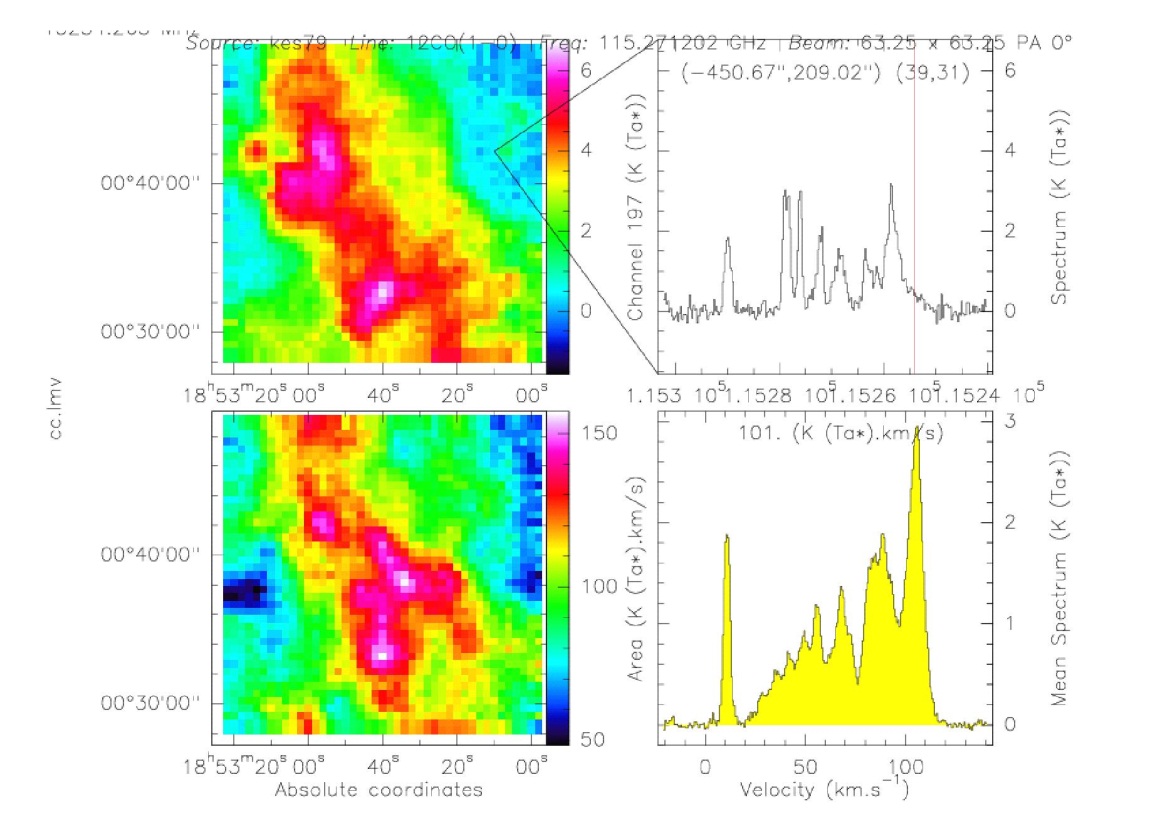
**LMV filename1**

*Class* provides a number of view *cube* file *task*, you can easily view the data you are dealing with the results.

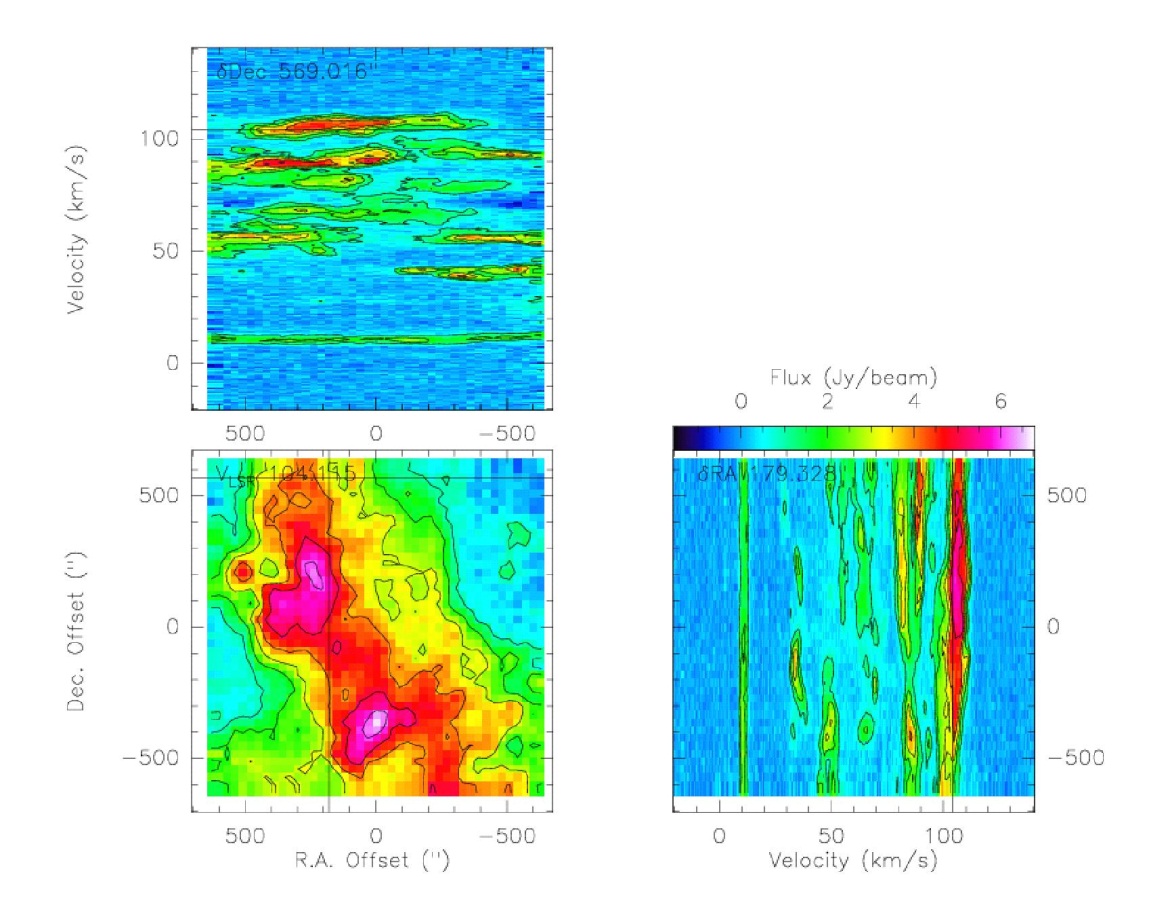
**LET NAME filename1**

**LET TYPE LMV** ( **GDF** )

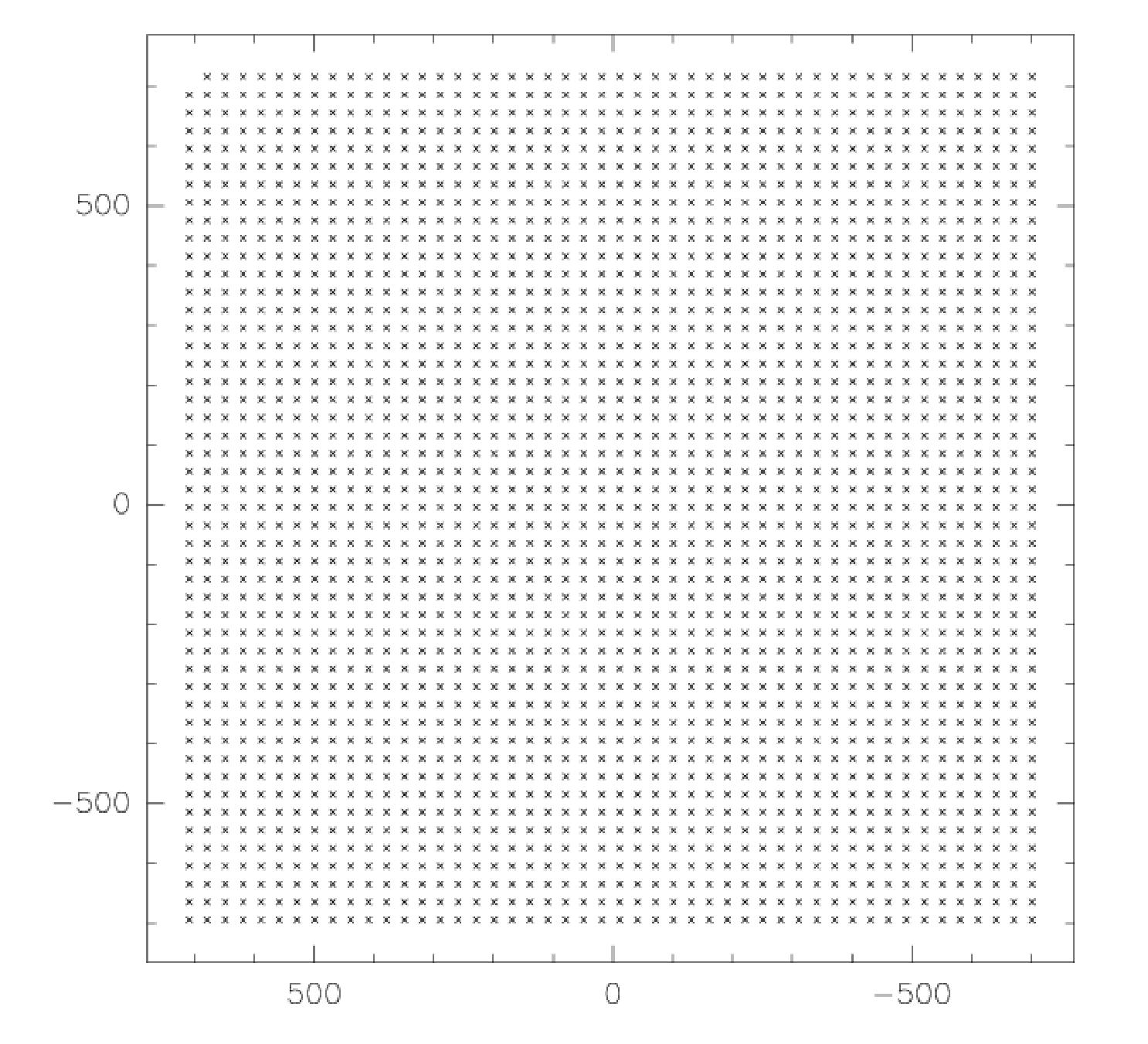
**GO VIEW**

****

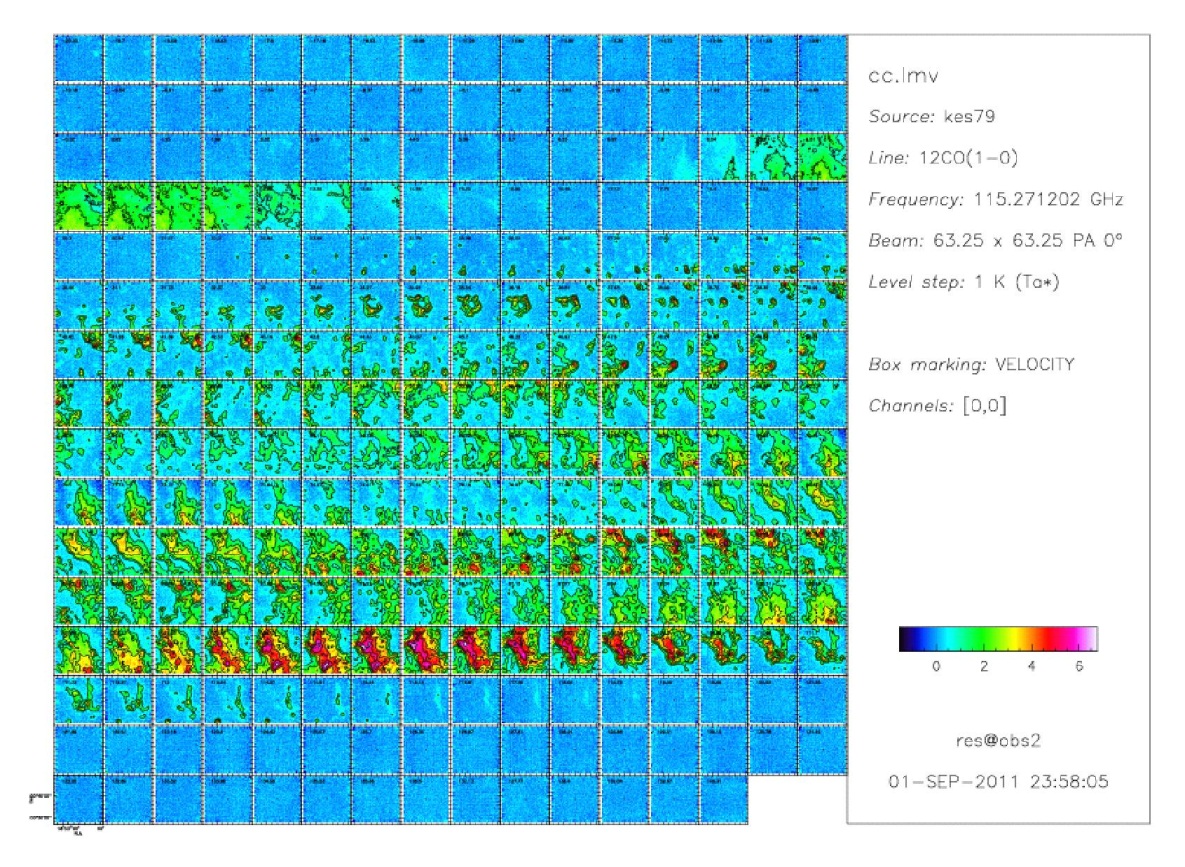
**GO 3VIEW**

****

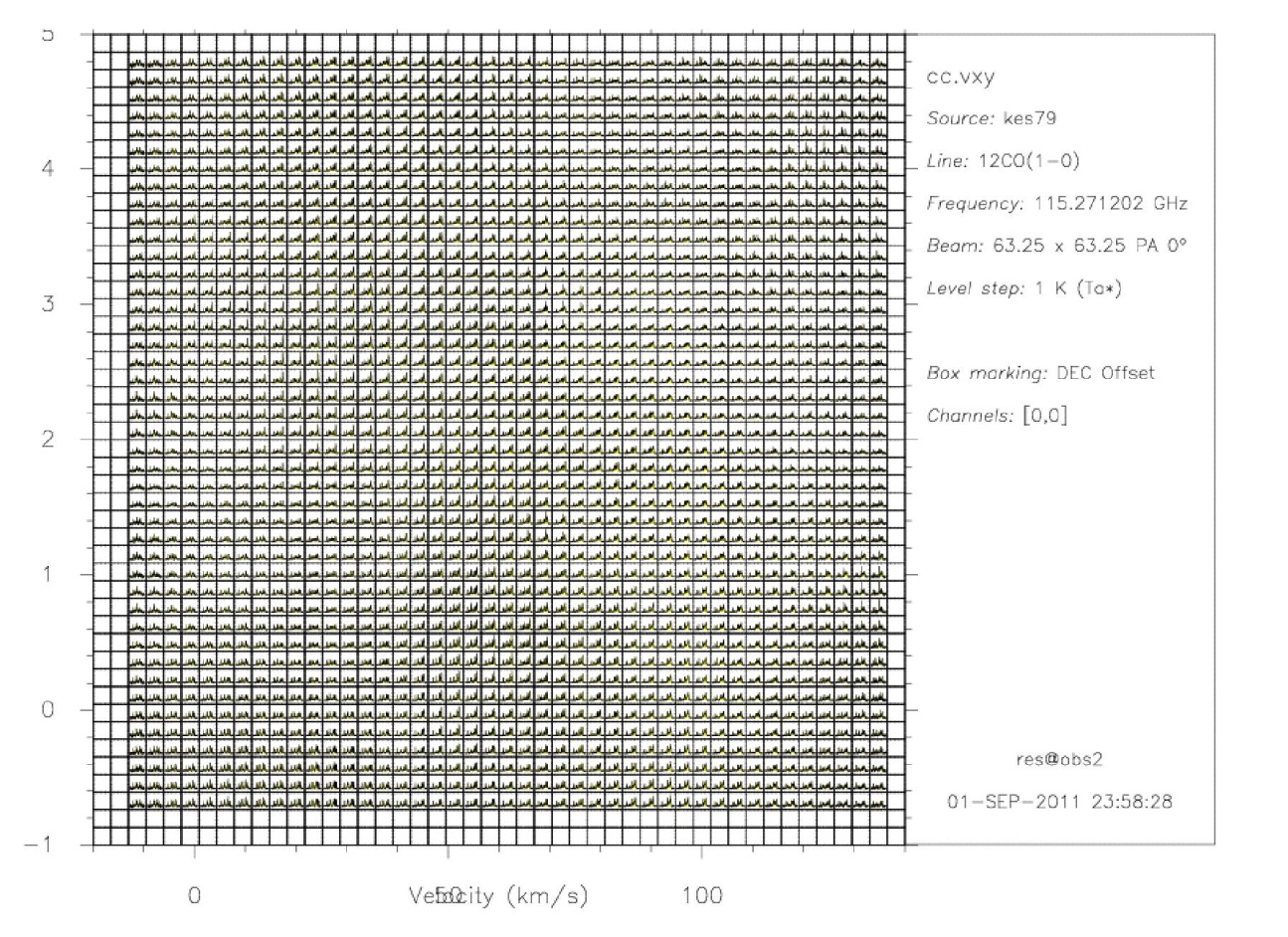
**GO WHERE**

****

**GO BIT**

****

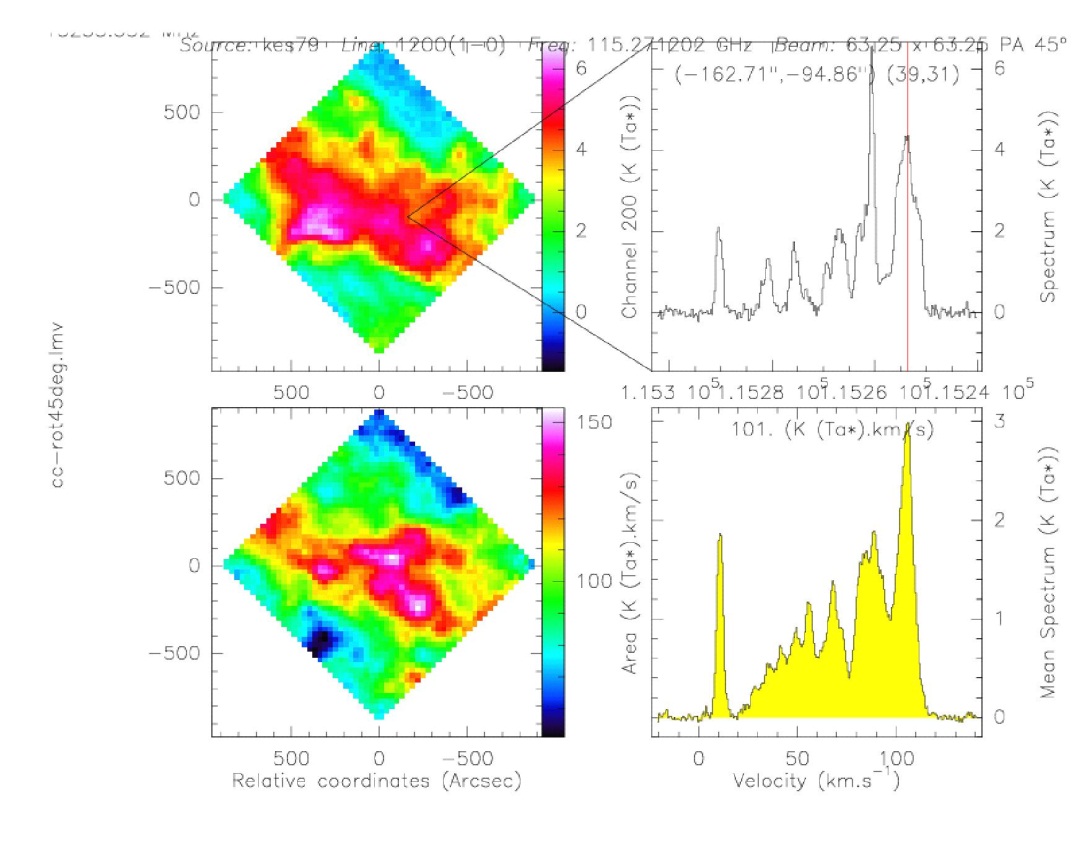
**GO SPECTRUM**

****

**LET ANGLE 45**

**GO ROT**

**GO VIEW**

****

5) the output file

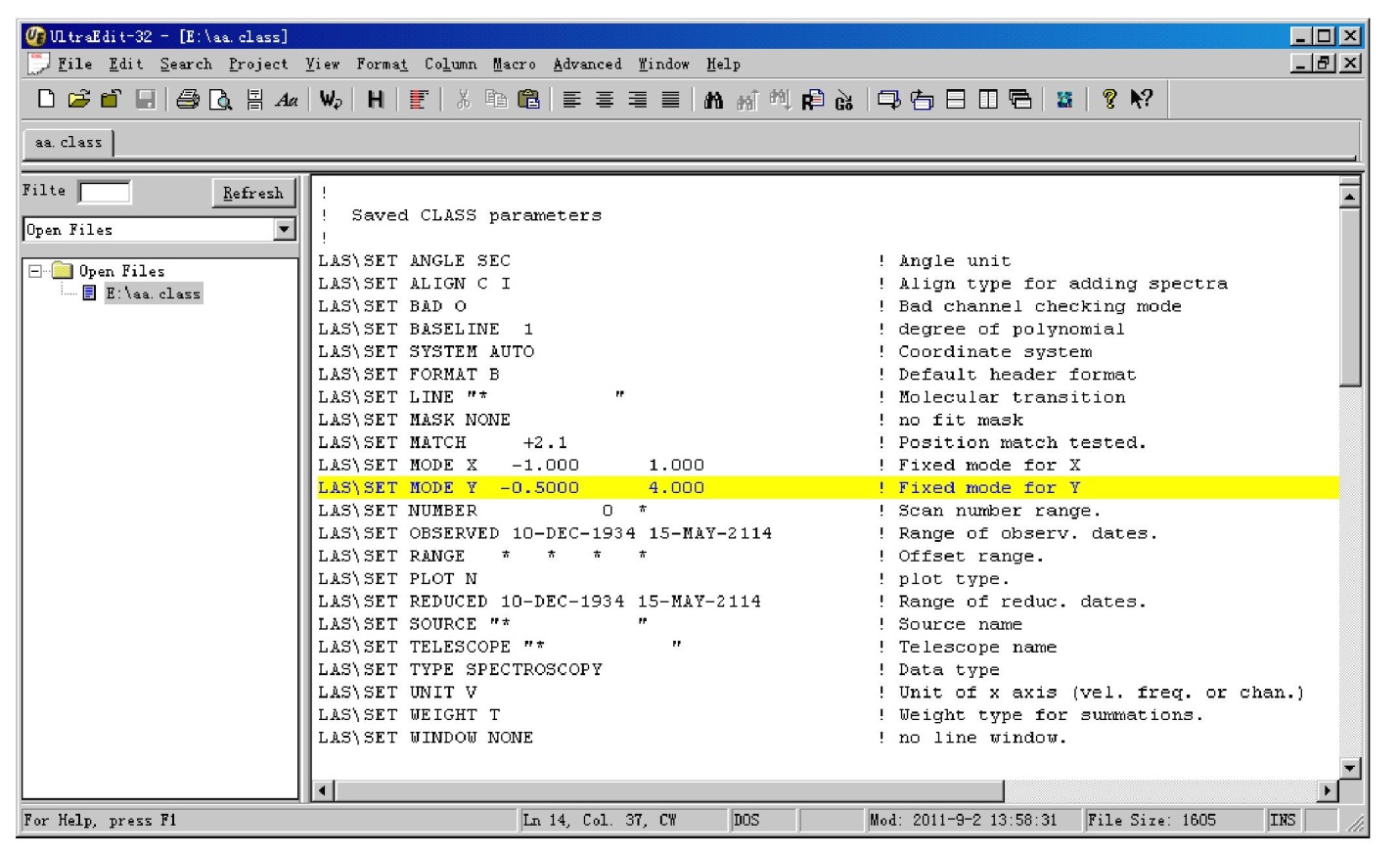
**FILE OUT filename SINGLE** // Initialize a filename file

**WRITE** // Write **FIND**, **GET** data to *filename*

**PRINT AREA n1 n2 /OUTPUT filename** // The integral area between the spectral data rates *n1 ~ n2.* Output to file ***filename***

**SAVE filename** // all the settings that were previously knocked to the file, the next time you can use as a macro to tune

Use the following documents:



6) Some other commands:

**MODIFY //** // Modify the line information of the line data, such as center channel, speed, source frequency, and so on the following commands are used to set the control action when processing data:

**SET BAD Check**

**SET BASE arg**

**SET CUR Arg**

**SET MASK [m1 m2 [… . .]]**

**SET WIN [w1 w2 [… …]]**

**SET NOMATCH**

**SET MATCH Tol**

The following commands are used to set the data to be displayed in a different way:

**SET FORMAT Type**

**SET SYSTEM Type [E, G]**

**SET UNIT Lower [V, C, F]**

The following command is used to set the search mode:

**SET NUMBER n1 n2**

**SET RANGE west east south north**

**SET TELESCOPE name**

If you want to batch processing a lot of lines, you can use the **FOR** loop statement, you can also execute the language

Write the file as a file, and then execute the command: **LAS>@ filename**

For example, for many lines of polynomial batch processing, first set the scope of the fit, and then the following statement:

**LAS> FOR I 1 TO FOUND**

**LAS: GET N**

**LAS: BAS 1 //** (You can also use the higher order, it is recommended to use 1 item)

**LAS: NEXT**

When you are dealing with data, sometimes you may want to see some information at any time, but after you type the command **LIST**, all the data is displayed. At this point you can use the command **LIST /OUTPUT filename** to save it as a file, and then open the file as a file, and browse to see the information you need.

***4. GREG command***

GREG is the data processed by CLASS, the image analysis and processing.

**COL X n1 Y n2 Z n3 /FILE *filename* //** According to the data X, Y, Z of the read file ***filename***

**LIM /REV X //** Defines the border of the graph and inverts the X axis

**LEV 1 TO 7**

**RAND 100 100 /BLANKING -1**

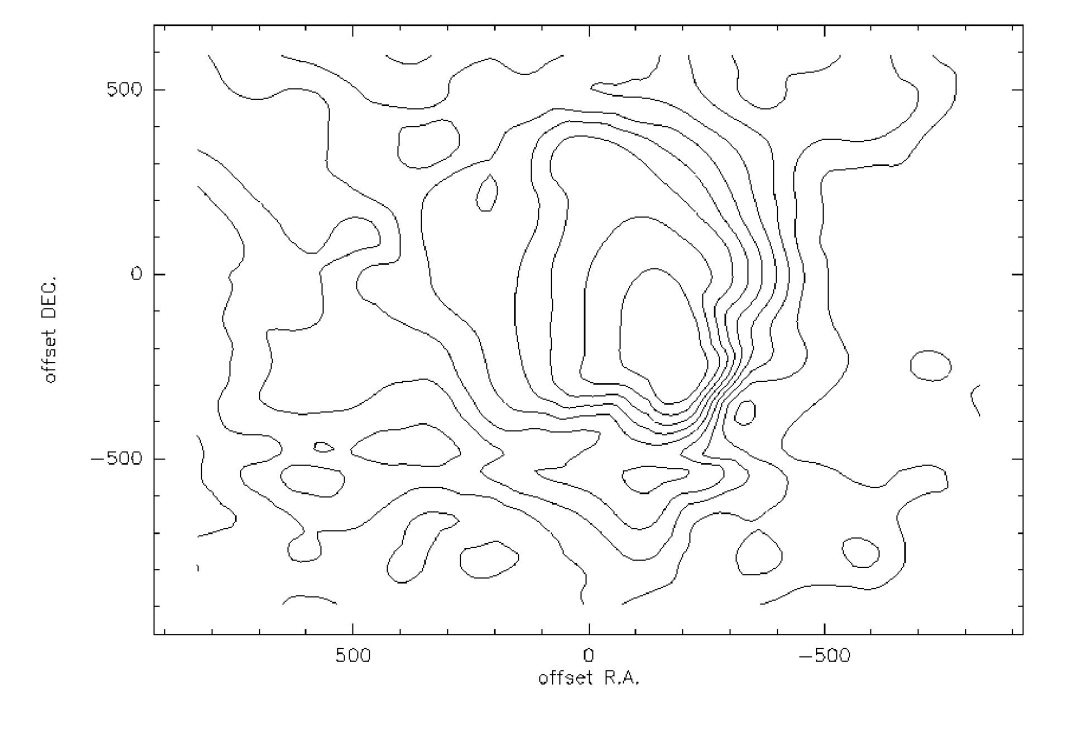
**RGMAP /PER 10 //** Draw a contour map at 10% of the maximum value

**BOX //** Draw a border, ruler

**LAB “R.A.” /X //** Indicates the meaning of the **X** axis

**LAB “DEC.” /Y //** Indicates the meaning of the **Y** axis

As shown below:

****

When you run the GILDAS software, you do not need to exit the running program to execute LINUX or MS-DOS commands, such as: To list the files in the current directory, you can execute the command **SYS** “**ls -1”** or **SYS “dir”**.

For more detailed manuals please click on the website:

<http://iram.fr/IRAMFR/GILDAS/>

When using these software, you can also use the help command command at any time, you use the command method (meaning).

**Example:**

The following to a data file, for example, to illustrate the polynomial fitting, Gaussian fitting, and finally make the contours of each step process.

Under the CLASS software:

**Dev I w**

**File in qhz14.m**

**Find**

**Set ang min**

**Set plo h**

**Set source 0145+000**

**Set line 12CO\***

**Get f**

**Plo**

**Set mod x -50 120**

**Plo**

**Set win -10 80**

**Bas 1 /plo**

**Plo**

**find**

**Sic del qhz.bas //** Before creating a new file, make sure that no file name exists

**File out qhz.bas s**

**For i 1 to found**

**Get n**

**Bas 1**

**Write**

**Next**

**File in qhz.bas**

**Find**

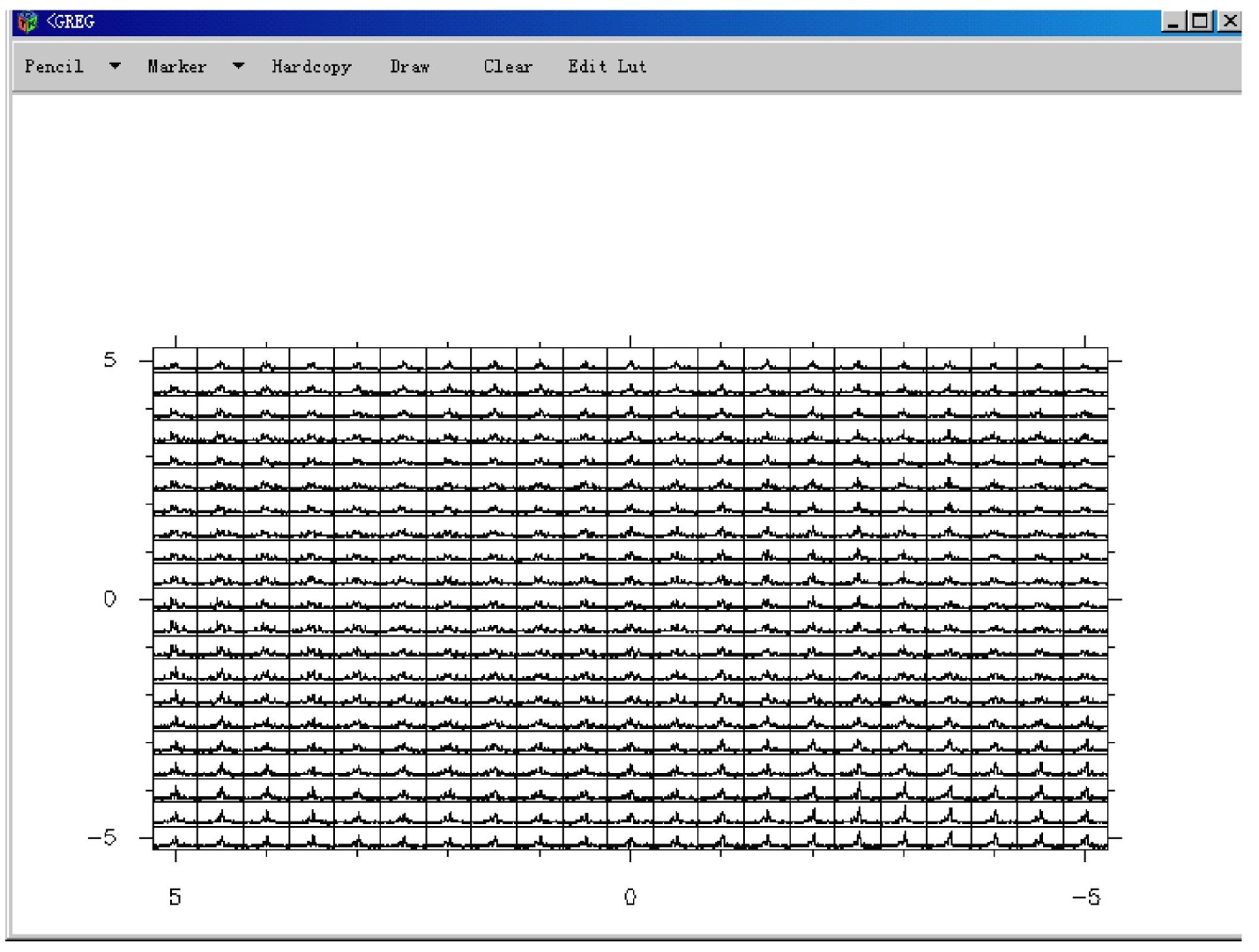
**List**

**Get f**

**Set mod y -5 30**

**Map /gr**

The following results were obtained:

****

**Get f**

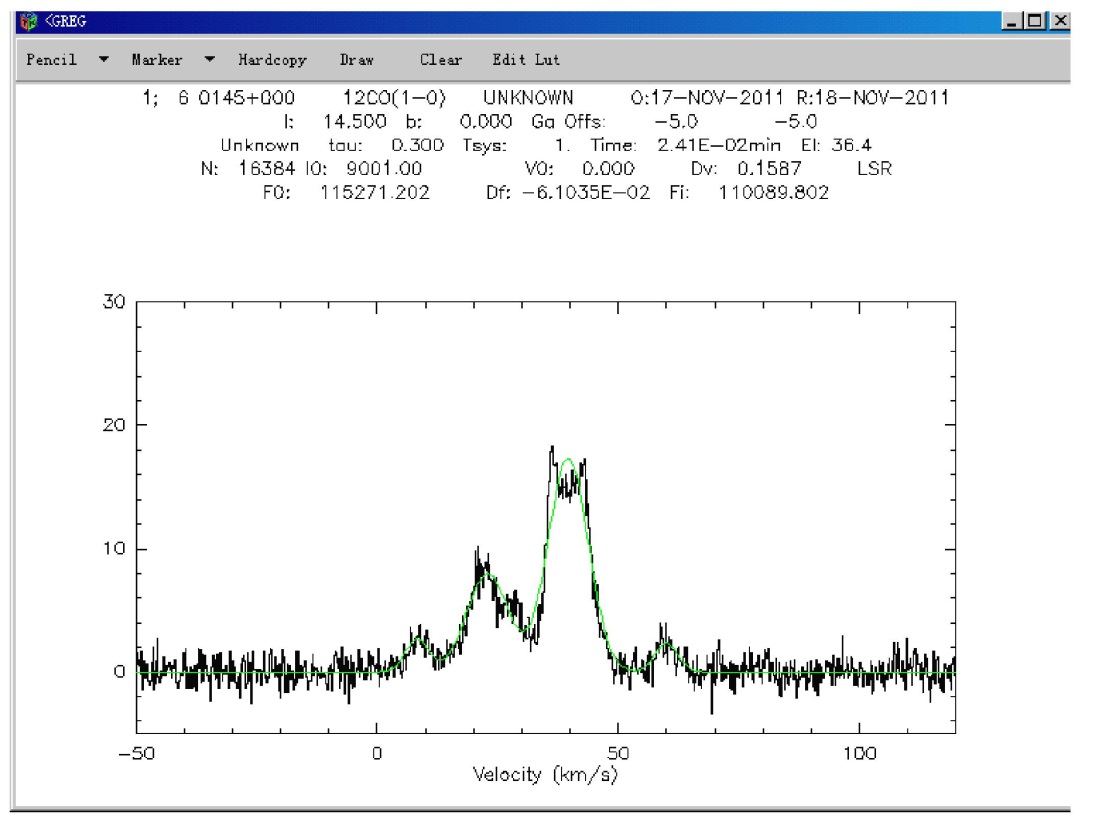
**Plo**

**Line 4 //** Select the range of gauss fit spectral lines

**min**

**Vis**

The results are as follows:

****

**File in qhz.bas**

**Find**

**List**

**Sic del qhz.dat**

**Print area -3.96 52.9 /output qhz.dat**

Because this source has three ingredients, you can map the two components

**Sic del qhz1.dat**

**Print area -3.96 13.0 32.07 52.9 /out qhz1.dat**

**!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

The following operations need to be performed under the Gildas / GREG package

**!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Under the GREG software:

**Dev I w**

**Col x 2 y 3 z 4 /file qhz.dat**

(The file qhz.dat in the same coordinates of the data deleted, leaving only one of them)

**Set box m**

**lev 4 to 10**

**lim /rev x**

**rand 100 /blank -1 -1**

**rgmap /per 10**

**box**

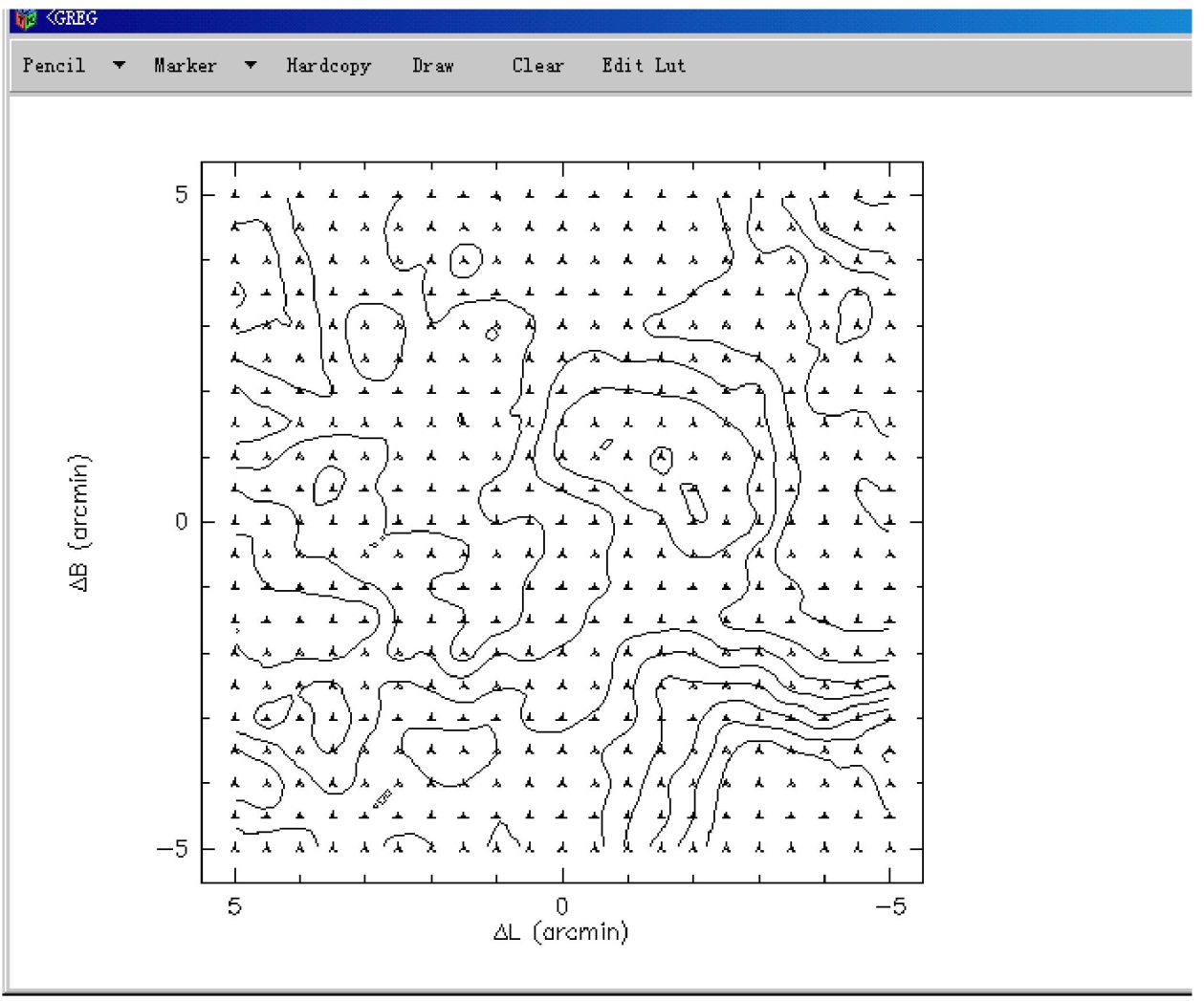
**lab “\gDL (arcmin)’ /x**

**lab “\gDB (arcmin)’ /y**

**set mar 3 2 0.2**

**point**

The final result is as follows:

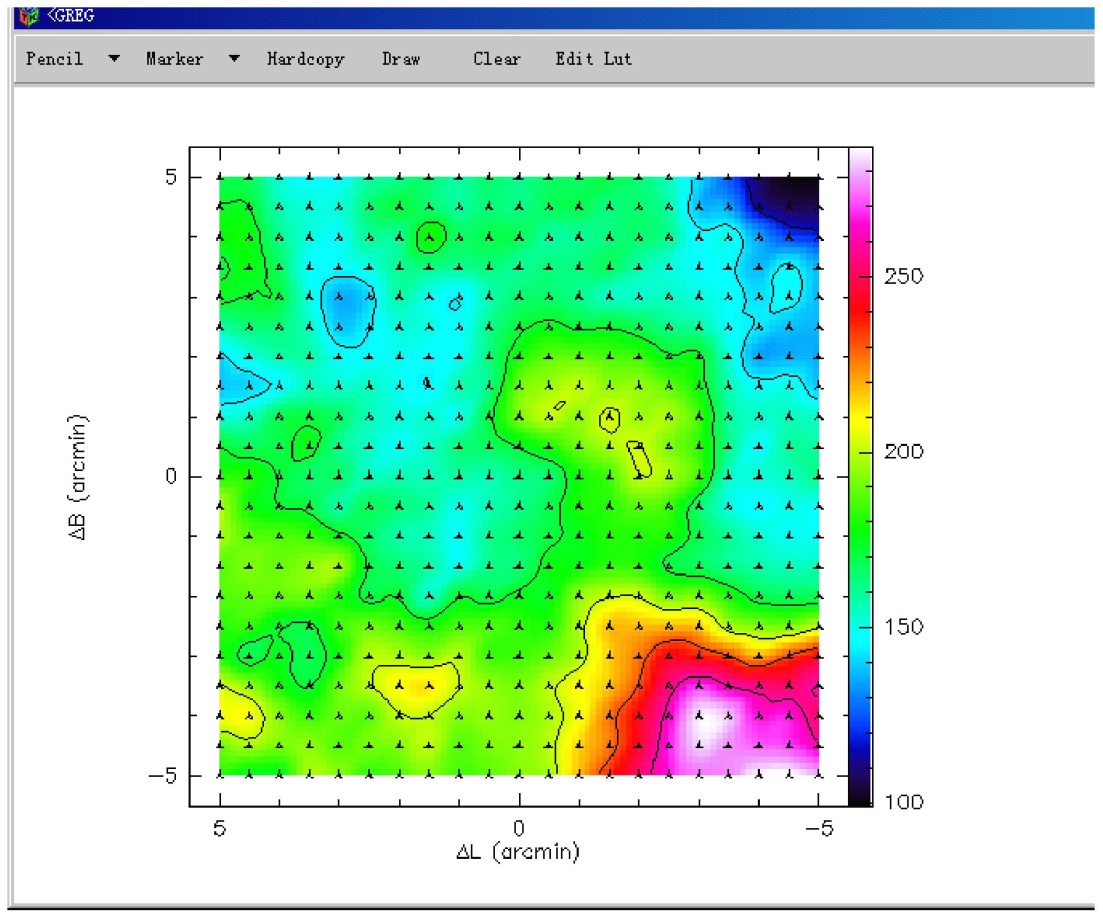
****

Or you want a color chart, please type the last command

**plot**

**lut rainbow3 //** Use lut to change the color

**rgmap /per 10**

****

Finally, save the results as a file with the following command:

**Hard qhz /dev ps fast (or colour)**

Draw the three components and plot the first ingredient

**col x 2 y 3 z 4 /file qhz1.dat**

**lim /rev x**

**lev 3 to 9**

**rand 100 /blank -1 -1**

**plo**

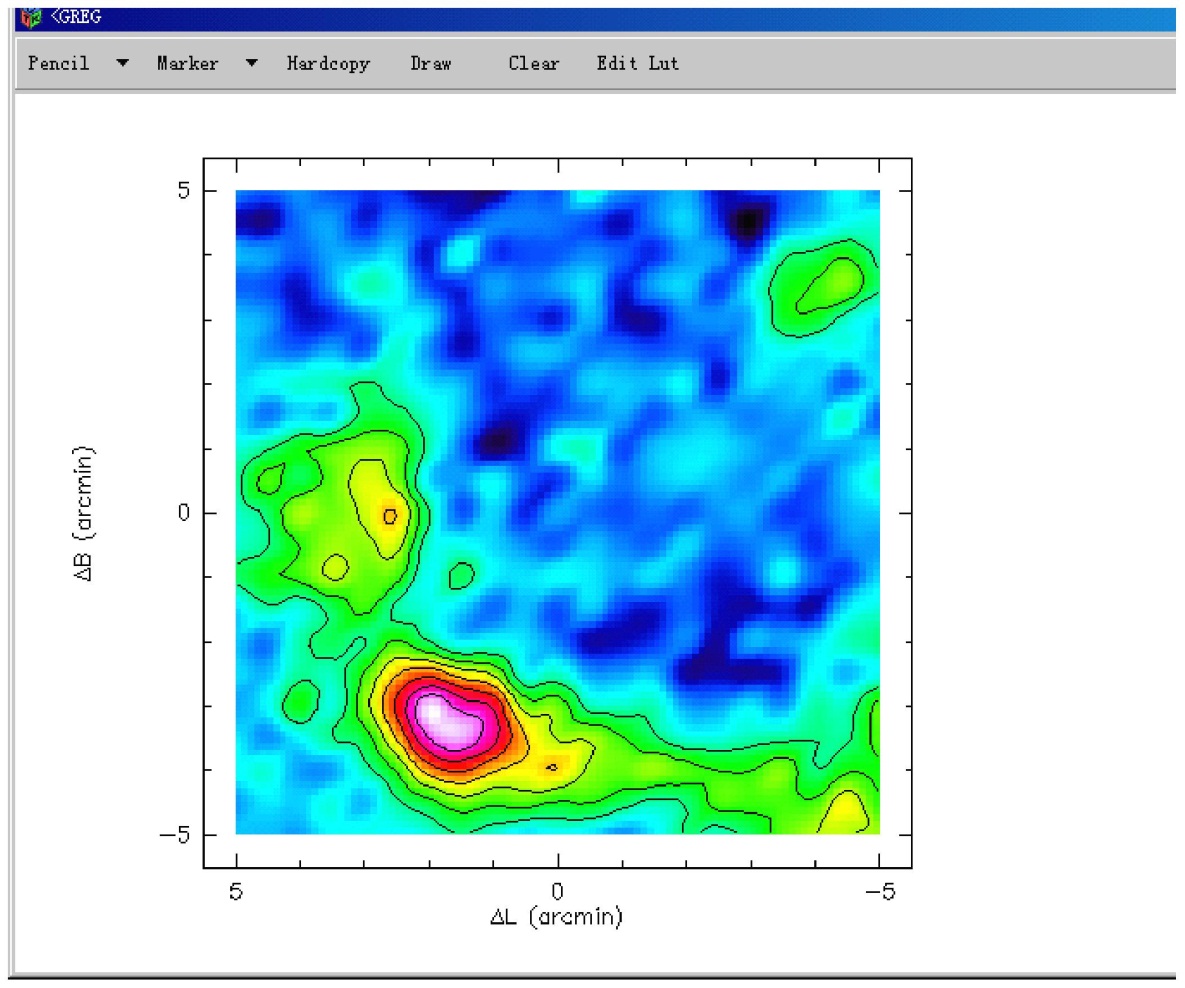
**rgmap /per 10**

**box**

**lab “\gDL (arcmin)” /x**

**lab “\gDB (arcmin)” /y**

The final result is as follows:

****

Plot the second ingredient

**col x 2 y 3 z 5 /file qhz1.dat**

**lim /rev x**

**lev 3 to 9 by 0.5**

**rand 100 /blank -1 -1**

**plo**

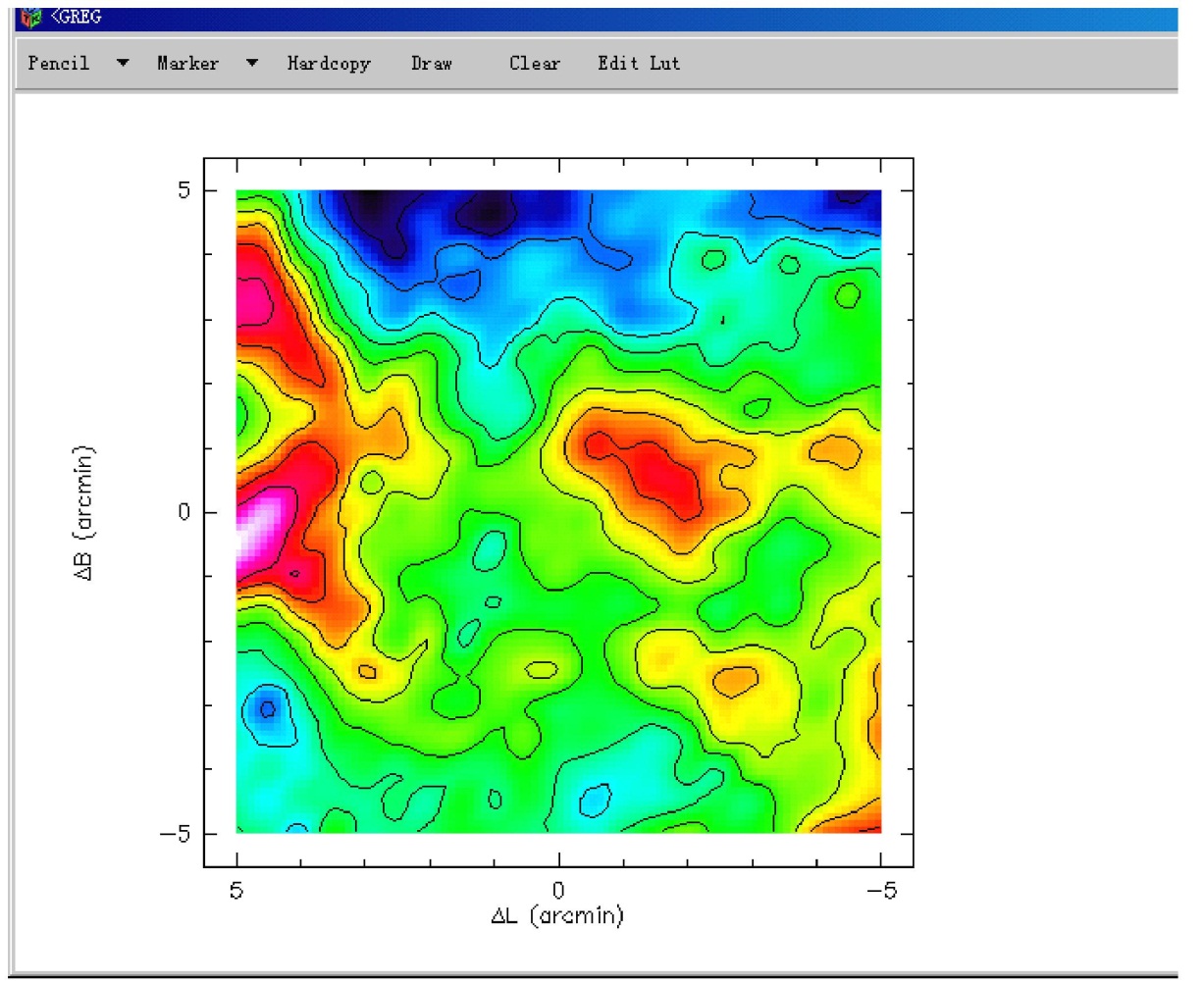
**rgmap /per 10**

**box**

**lab “\gDL (arcmin)” /x**

**lab “\gDB (arcmin)” /y**

The final result is as follows:

****

Plot the third ingredient

**col x 2 y 3 z 6 /file qhz1.dat**

**lim /rev x**

**lev 3 to 9 by 0.5**

**rand 100 /blank -1 -1**

**plo**

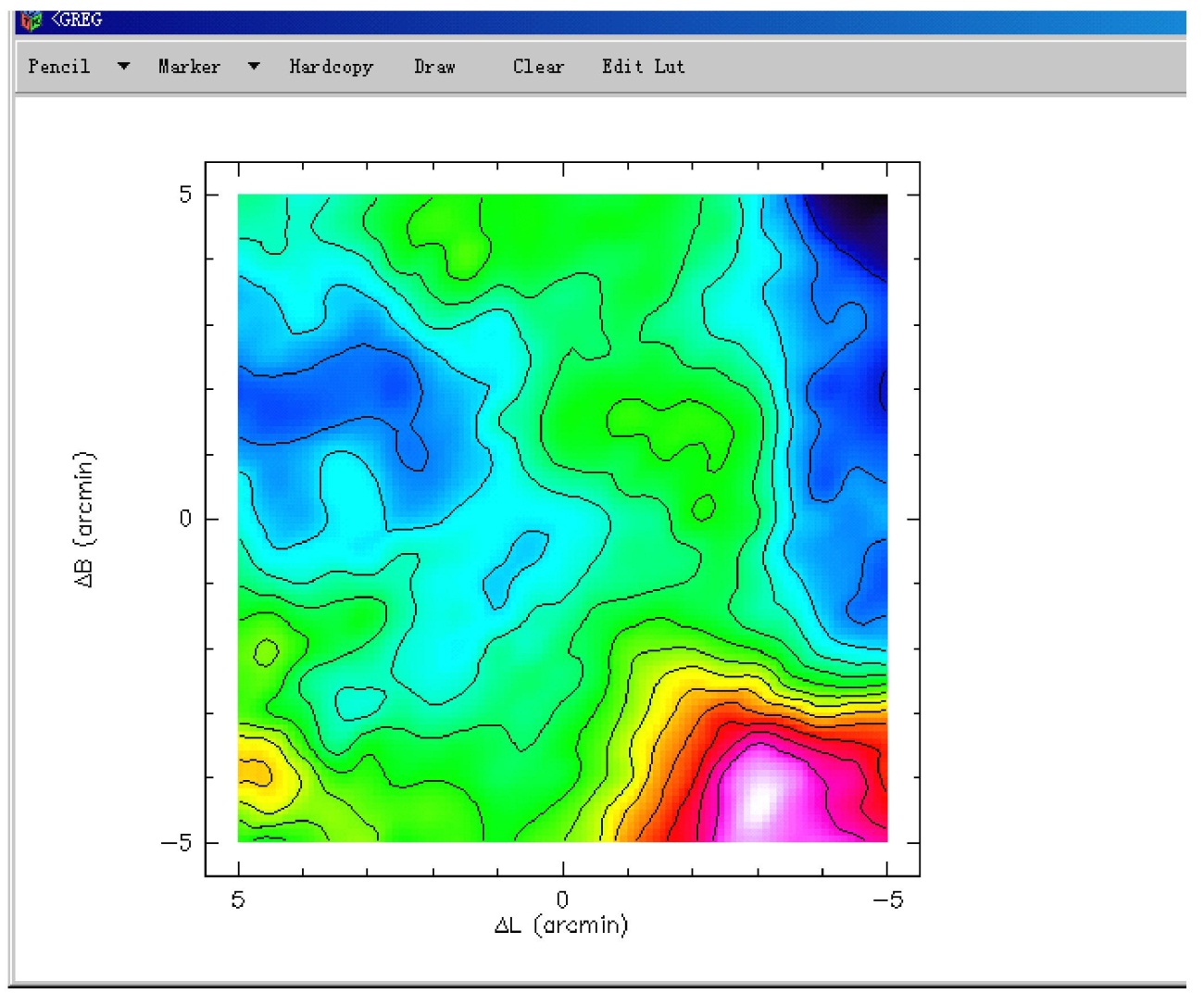
**rgmap /per 10**

**box**

**lab “\gDL (arcmin)” /x**

**lab “\gDB (arcmin)” /y**

The final result is as follows:

****

**!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

If you like to convert the data into FITS Cube format, and then analysis and processing, you can Gildas / CLASS under the following operations

**!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**File in qhz.bas**

**Find**

**Let map%beam 52**

**Let map%cell 30**

**Table qhz new /rang -3 33 v**

**xy\_map qhz /nogrid**

**vector\fits qhz.fits from qhz.lmv**

**The following is the process for the speed \_ position (Position-Velocity) map:**

Use the command **strip** in the *class* to generate the *qhz.gdf* file

Execute the following command under greg

**def image a qhz.gdf read**

**lim 0 50 \* \* /rgdata a**

**greg2\plot /sca lin 0 20**

**lev 1 to 10**

**rgmap /abs 2**

**lab “Velocity (km/s)” /x**

**lab “gDDEC. (arcmin)” /y**

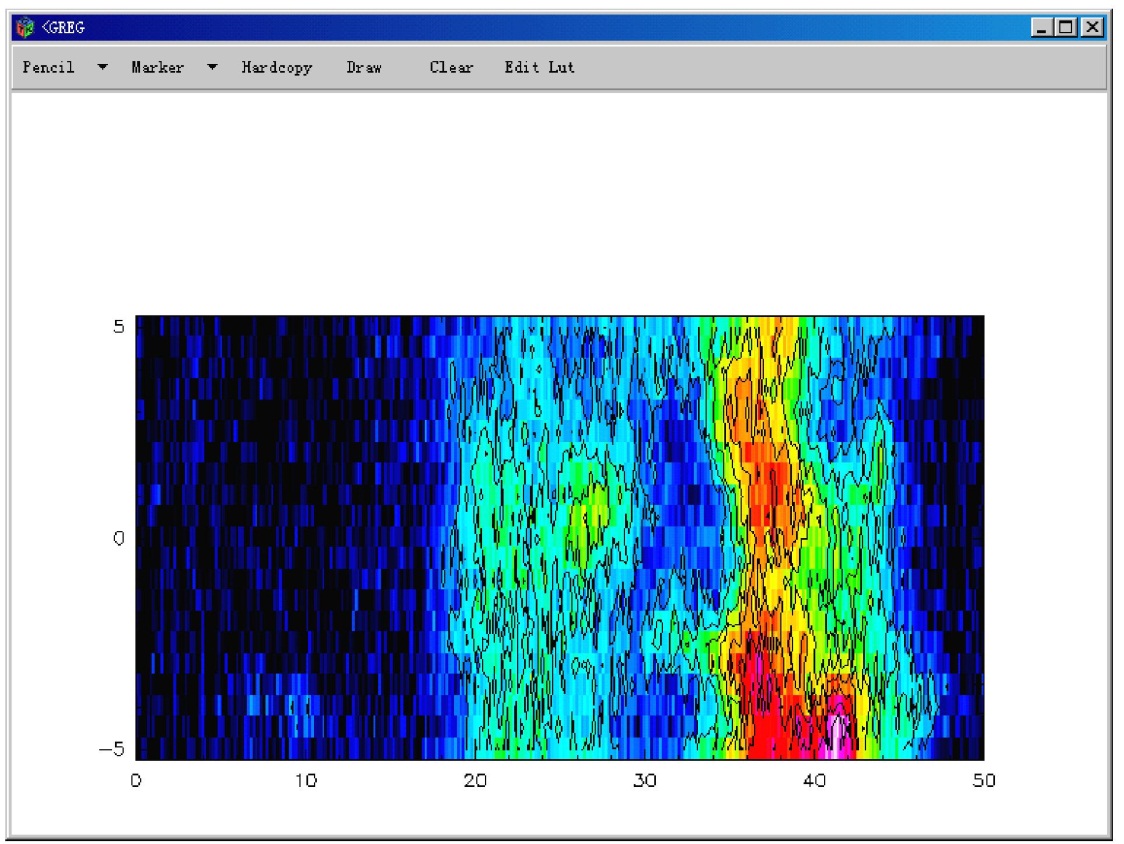
**axis xl /unit r**

**axis xu**

**axis yl /unit m**

**axis yr**

The final result is as follows:

****

Observation study group

August 2011