FAZZ, a FITS image/cube browsing and analyzing tool in IDL

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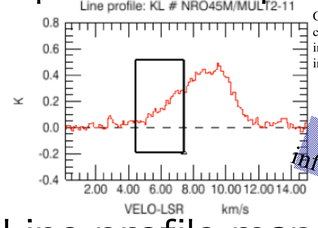
Abstract

FAZZ has been developed as a tool set for visualizing and analyzing 2-D image/3-D cube FITS file. Main features of the software are listed as follows;

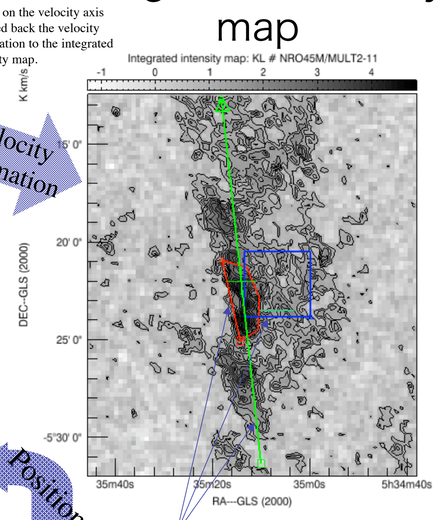
1) Visualization tools for 3-D (2 spatial and 1 spectroscopic) cube image are well-developed.
2) Quality of images and plots are high enough to be used for publication.
3) User-friendly GUI and text-base commands for automated processing are both implemented.
4) Source codes for the licensed IDL and package for the IDL Virtual Machine are freely available at http://hibari.isas.jaxa.jp/nikeda/fazz/fazz.html.

1) *Visualization tools for 3-D cube FITS*

Spectral line profile



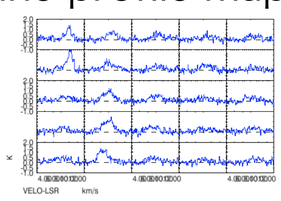
Integrated Intensity map



Cursor on the velocity axis can feed back the velocity information to the integrated intensity map.

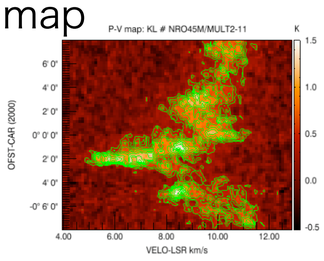
Velocity information

Line profile map



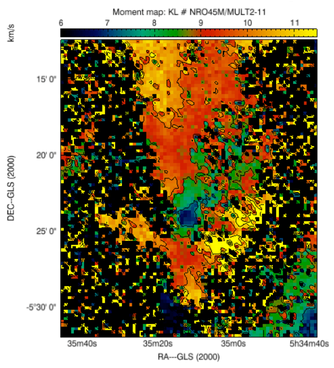
Position

Position-Velocity map

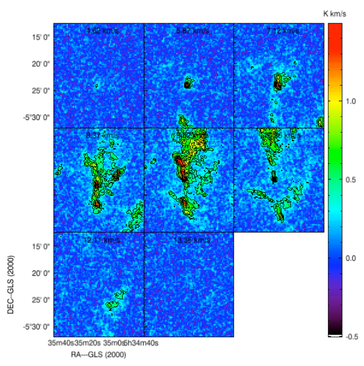


"Cursors", manipulated by Mouse

First/Second moment map

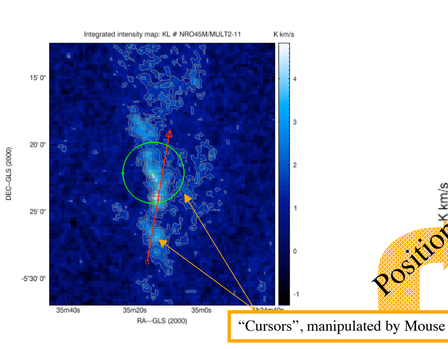


Velocity channel maps

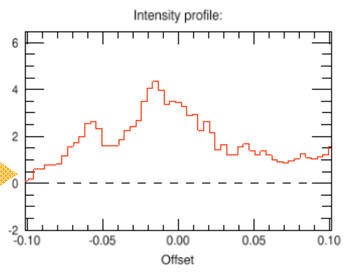


● All the parameters to create images, such as integration ranges, the order of moment map calculation, and velocity step of the velocity channel maps can be specified via GUI interactively.

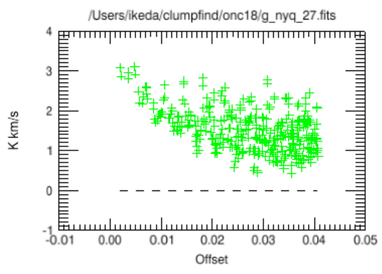
● "Cursors" can specify the region of interests interactively and visually.
Spectral line profile, line profile maps, and position-velocity maps are automatically updated when the cursors are moved.



Intensity profile plot

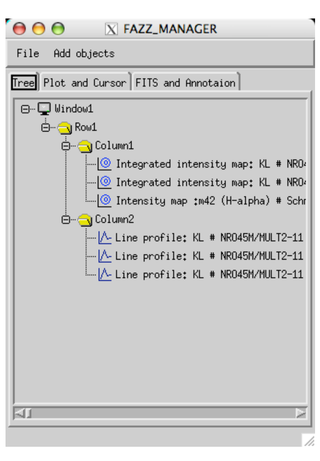


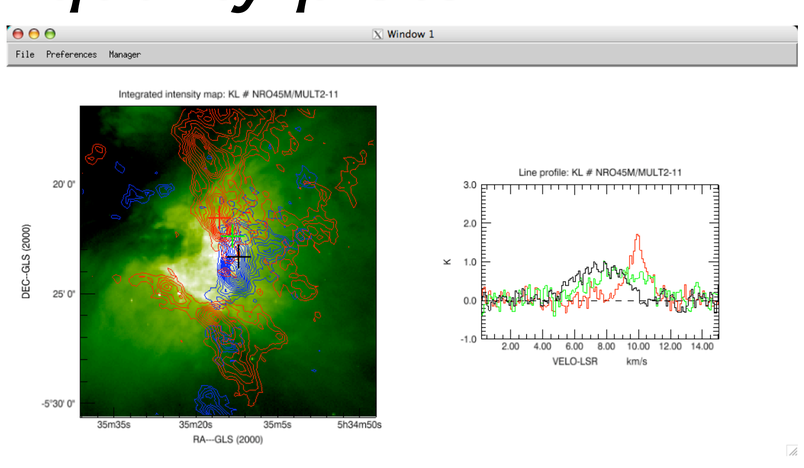
Radial intensity profile



● Intensity profile along any cut and radial profile over any area can be created for any 2-D plot.
● The region of interests can be selected interactively via "Cursors". Simultaneously, one can input exact coordinates of the ROI using the GUI and command line interface.

2) *Easy layout of publication-quality plots*

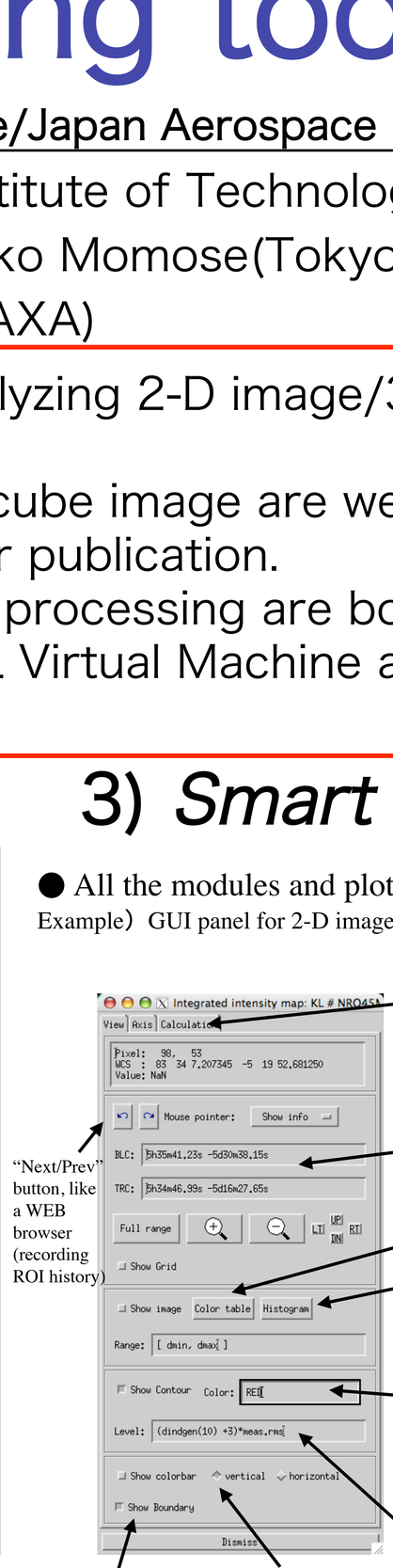




● Resizable window can be divided into arbitrary number of regions. Maps and plots can be placed into the region by a drag-and-drop manipulation on the tree of FAZZ_MANAGER.
● If more than one map or plots are placed on the same region, they are automatically overlaid with each other by considering WCS.
● The arrangement of maps and plots can be saved as an EPS file.

3) *Smart operating ways*

● All the modules and plots have its own GUI panel.
Example) GUI panel for 2-D image visualization



"Next/Prev" button, like a WEB browser (recording ROI history)

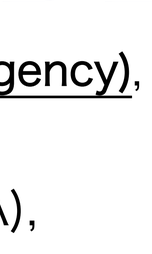
Boundary line plot

Color bar, whose direction is selectable, is available.

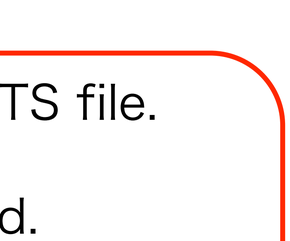
Arithmetic calculation (inverse, polynomial, logarithm, convolution) can be applied to the currently-indicated maps and plots.

ROI can be specified, not only by dragging mouse with the left button on the image, but also by entering numeric coordinates directly.

All the color table implemented in IDL can be selected.
Color range and transparency can be adjusted individually.

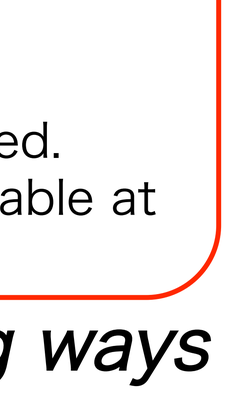


Intensity histogram plot is available. Intensity range can be specified on the histogram.

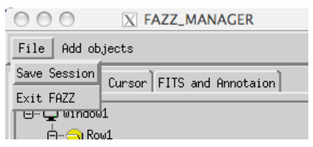


Symbol/line color can be specified as RGB value, color name, or via GUI color selector (right panel)

By dragging mouse with right button on the image, the statistical information within the ROI is shown in the terminal. This statistics can be re-used via "meas" structure, for such as contour levels.



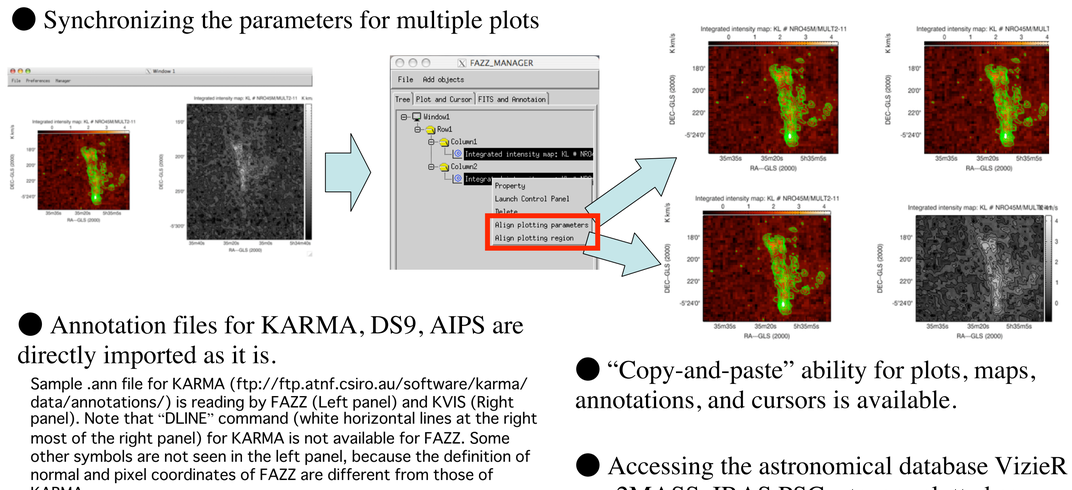
● Also, all the operations can be executed by typing commands in the IDL command prompt or by executing IDL script file.
● It is easy to import data to FAZZ and/or export maps/plots to IDL command line as the IDL variables. This feature makes FAZZ as an viewer of one's own small IDL programs.
● "Save Session" command creates an IDL script file, which describes all the currently-showed modules and plots.



IDL> @fazz_script.pro
… all the session will be recovered …
IDL>

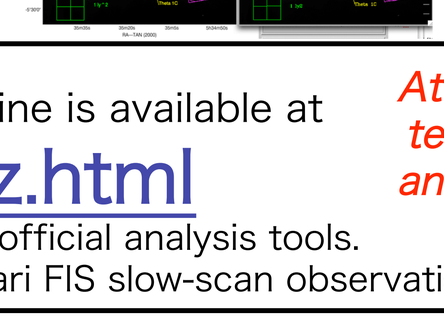
.. *and other convenient features* ..

● Synchronizing the parameters for multiple plots



● Annotation files for KARMA, DS9, AIPS are directly imported as it is.

Sample .ann file for KARMA (ftp://ftp.atnf.csiro.au/software/karma/data/annotations/) is reading by FAZZ (Left panel) and KVIS (Right panel). Note that "DLINE" command (white horizontal lines at the right most of the right panel) for KARMA is not available for FAZZ. Some other symbols are not seen in the left panel, because the definition of normal and pixel coordinates of FAZZ are different from those of KARMA.



● "Copy-and-paste" ability for plots, maps, annotations, and cursors is available.

● Accessing the astronomical database VizieR
- 2MASS, IRAS PSC, etc. are plotted as annotation symbols.

● Observation preparation tools (in prep.)
- NRO 45m telescope OTF observation simulator/observing time estimator is now under testing.

4) How to get FAZZ

- Source codes for the licensed IDL and package for the IDL Virtual Machine is available at

http://hibari.isas.jaxa.jp/nikeda/fazz/fazz.html

- FAZZ has been tested at Nobeyama Radio Observatory for release as one of the official analysis tools.
- FAZZ will be also used as a visualization module for the reduction software of Akari FIS slow-scan observation.

At this time, FAZZ has not been tested enough, and some bugs and problems may be occurred. Please feel free to contact nikeda@isas.jaxa.jp