







Last modified: 21 May 2003

## Software Survey Results

Presented here are the results from the CXC Software User Survey conducted in March 2003. Each of 108 anonymous respondents was assigned a number in order to correlate answers within the survey. Note that a set of numbers was skipped in this process, resulting in comments being numbered up to "126" -- this error in no way affects the survey results.

**Contents:**

- [User Information](#)
- [CIAO Tools and Applications](#)
- [CIAO Documentation](#)
- [Image Display Applications](#)
- [Portable Systems](#)
- [Web Browsers](#)
- [Memory](#)
- [Software Installation](#)
- [Proposal Tools and Applications](#)

## User Information

**Total number of respondents:** 108

**How they described themselves:**

- Undergraduate Student: 2
- Graduate Student: 21
- Post-doctoral Researcher: 23
- Astronomer who occasionally works in X-Rays: 3
- X-Ray Astronomer: 39
- Other: 20 ([List](#))

**Level of experience with scientific analysis software:**

- New User: 8
- Occasional User: 11
- Regular User: 46
- Expert User: 36

## CIAO Tools and Applications

**What kinds of CIAO analysis tasks do you perform most often?**

	Never	Rarely	Sometimes	Often	Always
ACIS Imaging Spatial	10	9	21	22	34
HRC Imaging Spatial	51	19	12	3	0
ACIS Imaging Spectral	8	6	16	36	32
ACIS HETG Grating Spectral	34	11	19	20	11
ACIS LETG Grating Spectral	45	15	14	10	2
HRC LETG Grating Spectral	55	8	12	11	2
ACIS Timing	43	19	16	8	3
HRC Timing	63	10	7	4	1

**Can you easily perform these tasks using CIAO?**

- Yes: 52
- Sometimes: 46

- No: 5

**Responses:** [Tasks users cannot easily do now.](#)

**How often do you use the following CIAO command-line tools, scripts, or applications?**

	Never	Rarely	Sometimes	Often	Always
ahelp	2	6	28	47	16
chips	29	18	22	19	6
csmooth	33	16	20	18	6
detecttools	47	13	11	14	9
dmcopy	3	2	12	41	41
dmfilth	50	17	18	3	1
dmgroup	29	16	22	14	11
dmimg2jpg	46	18	14	10	3
dmlist	8	9	18	28	35
firstlook	66	14	6	7	0
lightcurve	24	14	28	21	9
mkgrmf	35	14	22	17	8
mkpsf	43	22	16	10	0
prism	42	14	15	18	5
psextract	29	15	19	17	15
sherpa	33	14	21	16	13
s-lang as embedded in CIAO	37	21	21	9	3

**Responses:** [Other command-line tools used often.](#)  
**These responses have also been collected into the following table:**

Tool	Number of Votes
dmextract	16

mkrmf	11
acis_process_events	11
mkarf	9
ftools	6
dmheddit	5
mkwarf	5
detect tools	4
mkexpmap	4
Isis	4
mkgarf	4
dmstat	4

**Three votes each:** destreak, dmimcalc, dmregrid, fullgarf, merge\_all, mkinmap, textract, tg\_resolve\_events, s-lang embedded in Isis

**Two votes each:** acisreadcorr, apply\_acisabs, dmcoords, dmmerge

**One vote each:** acis\_set\_arlib, acisspec, asphist, dmkeypar, hrc\_process\_events, mkeypar, plist, pset, reproject\_events, xspec

**How often do you use the following packages to analyze Chandra data?**

	Never	Rarely	Sometimes	Often	Always
External <a href="#">(List)</a>	24	1	9	15	19
FTOOLS <a href="#">(List)</a>	9	13	18	23	14
IDL	29	4	11	15	32
IRAF	52	19	11	2	0
ISIS	43	12	5	11	13
PINTofALE	69	5	2	2	6

PROS	69	10	6	0	0
SPEX	73	10	2	0	0
XMMSAS	63	12	3	2	2
XRONOS	70	8	2	5	0
XSPEC	13	11	21	20	30
Other (List)	14	1	4	10	1

**Responses:**

- CIAO features users liked best.
- CIAO features that should be added or improved.
- CIAO features users liked the least.

**How do you compare using CIAO to other astronomical analysis systems?**

	No Opinion	Much More Difficult	Somewhat More Difficult	About Equal	Somewhat Easier	Much Easier
CIAO vs. other systems	8	4	14	39	24	10

**Responses:** [Features that make other data analysis packages easier to use than CIAO.](#)

### CIAO Documentation

**Do you read any of the following CIAO documents?**

	Never	Rarely	Sometimes	Often	Always
Ahelp Pages	1	4	31	45	19
Analysis Guides	15	20	38	23	4
Dictionary	36	34	18	5	2
FAQ	31	28	27	7	3

Manuals	7	21	37	30	5
Threads	1	5	15	40	39
Why? Topics	33	24	21	8	3

**How do you rate the following with regard to documentation?**

	No Opinion	Poor	Marginal	Satisfactory	Good	Excellent
Completeness	10	4	18	29	34	5
Ease of use	6	4	10	34	37	9
Technical content	8	5	17	38	31	1

**Responses:**

- CIAO documentation features that users liked best.
- CIAO documentation features which are missing or need improvement.

### Image Display Applications

**How often do you use the following image display applications? (Free software)**

	Never	Rarely	Sometimes	Often	Always
aipsview	81	1	3	2	0
aladin	72	6	7	2	0
ds9	0	1	10	22	66
fitsview / xfitsview	73	4	8	2	0
gaia	77	3	2	2	0
gimp	46	21	11	9	2
karma	79	4	0	1	1
POW (fv)	57	5	15	9	3

saomage	59	14	10	5	2
saomg	68	14	4	1	0
skycat / jskycat	75	7	4	0	0
ximtool	67	13	6	2	1
xv	20	14	29	21	7
Other ( <a href="#">List</a> )	25	0	0	10	4

How often do you use the following image display applications? (Commercial software)

	Never	Rarely	Sometimes	Often	Always
idl	25	6	20	9	30
mathematica	61	17	5	5	1
matlab	79	6	0	0	0
photoshop	61	10	12	4	0
Other ( <a href="#">List</a> )	28	0	1	5	1

**Responses:**

- [Can you make publication quality images in a journal's desired format?](#)
- [Image display features which are missing.](#)
- [Image display features users like the most.](#)
- [Image display features users like the least.](#)
- [Reasons for using one particular image display application.](#)

## Current and Future Portable Systems

### Window Managers / Desktops

Which window manager/desktop do you use now?  
Which will you use in the next year?

	Currently	In the next year
CDE (dtwm)	35	28

## Workstations

- Sun Spare/Solaris

Which version of Solaris do you use now?  
Which will you use in the next year?

	Currently	In the next year
Solaris 2.6	9	7
Solaris 7	4	2
Solaris 8	39	31
Solaris 9	1	10
Other ( <a href="#">List</a> )	4	3

- Compaq Alpha / Tru64 Unix

Which version of the OS do you use now?  
Which will you use in the next year?

	Currently	In the next year
Compaq Tru64 Unix 4.0f	4	3
Compaq Tru64 Unix 5.0	2	1
Compaq Tru64 Unix 5.1	2	3

Other Tru64 version	0	0
Alpha linux	0	0

## PC Systems

- **PC-Linux (x86)**

Which version of the PC-Linux (x86) OS do you use now?  
Which will you use in the next year?

	Currently	In the next year
Redhat 6.2	19	13
Redhat 8.0	24	42
SuSE 7.x	2	3
SuSE 8.x	2	3
Debian 2.x	9	5
Debian 3.0	8	13
Mandrake 8.x	2	1
Mandrake 9.0	2	3
Slackware 8.0	1	1
Other ( <a href="#">List</a> )	17	11

- **Apple PowerPC (G3-G4)**

Interested in a PowerPC port?

- o Yes: 31
- o No: 22

Which version of the OS do you use now?  
Which will you use in the next year?

	Currently	In the next year
Mac OS 10.2	23	31
Linux PPC	0	0

- **Windows XX**

Interested in a Windows port?

- o Yes: 12
- o No: 51

Which version of the OS do you use now?  
Which will you use in the next year?

	Currently	In the next year
Windows 2000	7	4
Windows XP Pro	8	10
Other ( <a href="#">List</a> )	4	4

## Web Browsers

Which browser do you use now?  
Which will you use in the next year?

	Currently	In the next year
Netscape Communicator 4.x	49	29
Netscape 6.x	11	15
Netscape 7.x	23	30
Mozilla 1.x	37	42

Microsoft Internet Explorer 5.x	6	3
Opera 6	2	5
Konqueror 2.2	6	6
Other ( <a href="#">Link</a> )	11	12

### Memory

How much memory do you have available?  
How much will you have in the next year?

	Currently	In the next year
<= 128 Mb	7	2
256 Mb	15	11
512 Mb	27	21
1 Gb	35	41
2 Gb	12	17
=> 4 Gb	7	9

### Software Installation

What kind of installation do you generally use?

- Individual: 28
- System Manager: 36
- Both: 35

What pieces of software are you generally installing?

- ATOMDB: 44
- CALDB: 70
- CIAO: 78
- NRA: 32

### Proposal Tools and Applications

How often do you use the following Proposal Tools?  
For each, indicate if you use the web or the portable version.

	Web	Portable	Never	Rarely	Sometimes	Often	Always
Colden	42	6	24	9	17	12	8
Dates	22	4	38	10	10	4	1
EAviwer	13	2	46	6	5	2	0
Obsvis	32	15	22	11	22	9	6
Pimms	52	17	12	5	22	22	18
Precess	25	5	32	10	13	4	3

Last modified: 21 May 2003

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Last modified: 20 May 2003

## Tasks users cannot easily do now in CIAO

### [Back to the Survey](#)

- 9 - more timing analysis
- 10 - fluxes, interactively
- 12 - I mostly use CIAO to reduce data. For analysis, I tend to use IDL, mostly because canned tasks have very limited use to me.
- 13 - Doing spectroscopy of extended sources in ACIS can be tricky. Exposure correction is slow and cumbersome.
- 18 - Better support for lightcurves, new gtis, etc.....
- 19 - 1) Easily append ascii data into existing fits tables: something like `fcreate + dmpaste`  
2) Use regions in ds9 region format
- 21 - Expand `dmingthresh` to be able to crop high values as well as low ones. Define multiple user models within sherpa.
- Define elliptical annuli in the same way as circular ones, i.e. with a single region.
- 23 - Some of the timing analysis software present in IRAF/PROS is not available in CIAO, e.g. "varset" and "period". Also, Sherpa lacks some of the functionality of XSPEC. Particularly, Sherpa cannot accept a multiplicative or additive model (the XSPEC functions "mtable" and "atable"), which are necessary for some data analysis.
- These are not critical problems; overall CIAO is extremely useful.
- 24 - Most things with CIAO are fine, but I would really like to be able to do PSF photometry. I'd also like added functionality in `ds9`.
- 27 - It's not about what I would like to be able to do. My issue with CIAO is that a patch should be made available immediately if/when bugs are identified.
- 31 - Custom models in SHERPA
- Nice plots in CHIPS
- 33 - Scriptable access to the Chandra archive would be nice.
- 35 - I said "yes" but the timing tools need to be improved.

- 38 - look into the examples in the ahelp files and be able to USE them. Many times they simply do not work because the syntax is either old or wrong.
- 40 - I would like to make timing analysis more quickly and more efficiently.
- 43 - phased lightcurves  
visualize standard gti filtering components as strip-charts
- 47 - Spectral/imaging analysis of spatially extended sources in CIAO is rudimentary. For Chandra galaxy and cluster data, tools on the order of IRAF's photometry and shape analysis set are more appropriate.  
Deprojection analysis for extended sources (T(r) for example).
- 59 - create plots including contour plots to visualize the process of data analysis
- 64 - Source-searching which takes into account the PSF through matched filter techniques so that one gets accurate positions out of tools like `wavdetect`.
- 67 - It should have a better library of other astronomy tasks and tasks should be embedded in a programming (scripting) language that allows ready passing of results between routines. Embedding `s-lang` in `ciao` helps but there isn't a library as there is in IDL.
- 71 - Upper limits  
Easy flux calculation
- 72 - better integration between `ciao` and `marx`
- 75 - Easily extract broadband flux estimates
- 81 - I would like sherpa to have improved line fitting abilities including routines for photo-ionized plasmas  
I would like to see many more threads about fitting spectra (including continuum fits, line fits) of various sources. In my work I find there are many difficult and unresolved questions about this.
- 82 - Tools which specifically target spectra and variability for sources on multiple obsids.  
Scripts for batch mode processing and analysis of greater than hundreds of sources
- 83 - masking of the image (e.g. exclusion of the point source regions from an exposure map)
- 84 - interface with IDL/Mathematica, allow other analysis software to use CIAO routines.
- 90 - Data preparation is unclear. There needs to be one "go-to" up-to-date manual that spells out things. The manual pages as they are now are disjointed and confusing about what needs to be done.
- 99 - The threads are a wonderful idea, but in some places are not written well. When I hit a wall with the threads scientists often do not have the time or interest in helping, which makes that particular thread useless.  
100 - scriptability for many parallel analyses  
explanations in the threads of what we're doing and why  
102 - It's not that it cannot do it. It is that there is no way to check that it does it correctly.
- 103 - 1. calculate flux in sherpa without a model (with pha and arf files)  
2. model the acis background in sherpa  
3. easily input table models into sherpa
- 104 - The comments on how to use the software are insufficient for inexperienced users.

And when one has finally managed to use a routine, for example fullgarf, one then has no idea on what to do with the output files. Quite frustrating.

108 - CIAO is great for getting data processed to the analysis point and for low resolution spectra - ACIS only - using Sherpa, and for lightcurves. For other analysis I prefer to use IDL

109 - Things which I do outside of CIAO (probably are others, but these were the ones that come to mind):

- 1) Spectral analysis - I prefer XSPEC, which I find is more reliable
- 2) Removing BG flares - easier to do outside of CIAO
- 3) READOUT artifact correction for whole chip - no way to do within CIAO
- 4) Temperature mapping

112 - Fit arbitrary two dimensional models, including links between the parameters of different dimensions.

113 - X-ray light curves of zero-order and first-order detected events.

115 - just about everything, ciao is a real piece of crap

117 - I would like to be able to get goodness of fit estimates in Sherpa for statistics other than Chips.

I would like to be able to adaptively smooth large images.

118 - check if a source is a point-like.

[Back to the Survey](#)

Last modified: 20 May 2003

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Last modified: 20 May 2003

## CIAO features users liked best

[Back to the Survey](#)

- 5 - All of them!
- 9 - saving parameters; scripting capabilities
- 12 - The DM tools philosophy, prism, \*\_process\_events
- 13 - scripts to do common tasks (e.g. exposure correct and combine multiple chips/observations)
- 14 - Threads
- 15 - command line, verbosity parameters, on the most part excellent ahelp
- 19 - The datamodel is brilliant. I cannot function without it. Also, the parameter interface is good, as it allows easy scriptability of tools.
- 21 - dm filename/filtering syntax; ease of scripting the various tools.
- 23 - Acis process events allows a lot of user control. The documentation for CIAO tasks is extremely good. Dmcopy and dmlist I am likely to use several times per day.
- 24 - i like being able to apply filters on the fly, e.g., dmcopy "evt2.fits(energy=500:1500)" evt2\_io.fits
- 25 - 1) command line oriented - allows real power use when scripted.  
2) moderately powerful, if occasionally buggy, support for regions in many formats.
- 28 - tools are generally fairly flexible if one knows enough
- 30 - the dm syntax, and object oriented nature of sherpa
- 32 - Online threads, programs which apply many often-repeated tasks (i.e. acissspec, psxtract)
- 38 - Extraction tools, processing....
- 39 - ahelp
- 40 - sherpa
- 43 - event processing and filtering response tools
- 47 - The history info recorded in the file headers is very useful although difficult to read due to formatting.
- 51 - dmcopy sherpa

tg\_reprocess.new

- 54 - Unix prompt input tools that do things well that are too complex to re-invent like: dming2jpg; csmooth (haven't used it but looks good). Also from unix prompt routines which access CALDB data like: mkgarf; mkgarmf.
- 58 - command line capabilities and scriptibility;  
I intend to move over to sherpa, but am "fine where I am".
- 60 - Everyone could study how to use CIAO by reading the thread by himself/herself.
- 62 - sherpa
- 63 - I like the dm tools, especially dmcopy, dmlist, dmextract... all the basics are there, and it's easy to look at and manipulate fits files. I also like that CIAO interface a lot (command-line, that is), since it's clean, pretty easy to script, and generally well-documented.
- 64 - I like the no-nonsense dmlist commands.
- 69 - sherpa - I really like this, especially with the slang language embedded in it.
- 70 - dmcopy is very powerful.  
psxtract script is very convenient.
- 72 - coherent syntax  
extensive documentation
- 75 - data model filtering
- 80 - I haven't used anything that's very unique, but the standard plotting things are nice..
- 81 - the helpdesk is outstanding - always a quick response  
it is well designed and reliable
- 82 - Threads, Helpdesk
- 89 - ds9
- 90 - I like very much that you are still running in your native shell.  
The uniformity of the interface makes the learning curve much less steep.
- 99 - threads and ahelp
- 103 - sherpa is a good extension of xspec
- 105 - The presence of on-line detailed threads for all needs.
- 106 - The virtual filename syntax, the physical coord system, sherpa
- 107 - excellent documentation  
writing commands from unix prompt
- 108 - general reliability; sherpa; analysis threads
- 111 - \* nice data model  
\* sherpa is great
- 121 - XSPEC
- 124 - Sherpa scriptability is a win, especially being able to set up and refer to model components by name.  
Embedded scripting languages are good, so slang looks very intriguing. However, until there's better documentation on the interfaces between slang and ciao, it doesn't do me a lot of good.  
I do a lot of batch mode analysis, and sherpa seems to support that reasonably well. (features of xspec that drive me mad are the problems running it in batch mode, and the problems in scripting

it. xspec has many operations requiring user feedback in the form of 'yes', or 'no', and it is very difficult to set it up so that the appropriate responses can be fed to it.)

125 - CHIPS, Sherpa for HETG spectroscopy

[Back to the Survey](#)

Last modified: 20 May 2003

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| [Search](#)



CXC Groups



Last modified: 20 May 2003

## CIAO features that should be added or improved

[Back to the Survey](#)

- 
- 9 - more graphical interfaces to tools/plotting/imaging
  - 12 - Ability to use S-lang on `_internal_` CHIPS/Sherpa variables.  
DM access via IDL.  
DM to develop a pipe `<STDIN>/<STDOUT>` option.
  - 13 - CIAO equivalents of XMM SAS commands "xmselect" and "evigweight" would be \*extremely\* useful.
  - 14 - Lightcurve
  - 15 - psextract. I would love to see psextract rewritten to assume less and to allow users greater range in what they may provide to it, for instance multiple forms of mkarf and mkrmf.
  - 16 - Add scripting of ciao tools and better interface with other software, eg IDL. It seems rather difficult to call ciao process from IDL.
  - 18 - Faster, more reliable, less bloat
  - 19 - Sherpa speed could be greatly improved. I do all spectral fitting in xspec except where Sherpa is required, e.g. low-count spectra where Sherpa's expanded statistical methods are necessary.
  - 21 - csmooth; examples in documentation; history recording in FITS headers; sherpa documentation & tutorials; simple smoothing tool (gaussian, tophat, etc.) similar to the tool fgauss; cross-referencing between ahelp documents on the web.
  - 24 - PSF photometry!
  - 25 - 1) region syntax needs ability to specify unions, negations etc to build stock, reusable shapes (e.g. a bit like in povray) existing syntax has odd non-intuitive bits.... e.g.
 

```
+shape1
+shape2
-src1
-src2
```

 only removes src1 and src2 from the shape2, not from shape1
    - 2) dmregrid needs to handle wcs info, rotations, rebinning robustly.
    - 3) dmregrid needs to be able to rebin images to arbitrary pixel sizes based on wcs info, not just fixed integer rebinning factors.
  - 27 - efficiency in handling large arrays.

- 28 - more stability in the parameters between releases to make scripting easier
- 29 - It's not so much CIAO but a better description of the data products would be helpful. The threads get the job done but they leave one wondering what's going on.
- 30 - better looking graphs via chips
- 31 - GUI to review and manage parameter files
  - Easy scripting
  - Less opaque customization (S-Lang is fairly obscure compared to IDL)
- 32 - More control over plot features in CHIPS (axis labels, linewidths, etc., for publication quality plots)
- 35 - XMM-Newton delivers response matrices appropriate to the given observation. That would be very nice.
  - Timing tools need to be improved.
- 38 - LETG-ACIS response matrix generation fails often and inexplicably.
- 38 - spectral analysis tools
- 39 - Finding source position in zeroth order image for piled-up HETG observation.  
Handling CC mode data
- 40 - timing analysis and tools about HRC+LETG and maybe it can be more user friendly
- 43 - phased light curves
  - more slang modules for interactive, customizable analysis, such as region functions, math libraries.
  - filtering guides (e.g. for bright sources, can any standard filtering parameters be relaxed to get more exposure?)
- 47 - Scripting of spectral fitting could be improved although will be better with slang. Fitting of confused sources could be documented/explained better. Deprojection of extended sources.
- 51 - the one thing I'd like to be able to do in sherpa is to read in data from an ascii data file and specify which lines of the data file I would like to read in. I know you can specify which columns of the data file to read in, but it would be nice to read in specific lines, rather than all the lines of the data file.
- 53 - error messages
- 56 - I would like to see csmooth worked on so that it is applicable to the exposure map in a sensible manner.
- 57 - Identifying discrete sources above an arbitrary sigma value
- 58 - I'd like a Darwin (OS X) port. I purchased a linux box specifically to perform chandra analysis, though I already own and work on a dual processor 64.
- 59 - improved 1D plotting and contouring
- 60 - Sometimes when I am analysing the data using CIAO, the tools in CIAO are just like black box, I do not know how the tools work.
- 62 - sherpa
- 63 - Right now, region handling is a little shaky. There are not enough examples on-line or in the help files which explain, for

example, how to give CIAO regions in RA, Dec format (need a "d" at the end of the numbers!!)

64 - Would like more scripts and/or software support for large-scale projects that use large off-axis angles and very different observing environments, modes. That is, observations that are not single pointings of on-axis point sources.

80 - The ability to export plots to .jpg format

81 - fitting and modelling tools to support analysis of photoionized plasma

82 - S3 CTI correction

More precise PSF library for mkpsf. I don't care how big it is (one could probably degrade the resolution by x2). CHART + WARP is too complicated and doesn't cut it for making PSFs for hundreds of sources.

More up to date version of CSMOOTH (preferably one that more effectively incorporates exposure maps).

83 - it might be technical but I like how ftools can handle the gzipped data especially it can create a gzipped output file in the following manner  
fselect input.fits.gz output.fits.gz "energy < 2000"

inclusion of the subpixel\_resolution software

84 - ease of installation

89 - vtpdetect

90 - It's not always clear which parameters (in, e.g., dmgroup) are actually being looked at when a task is run.

Additional examples in some of the help documentation would be useful for some of the more configurable tasks (e.g., dmgroup).

99 - ALL threads reviewed by a scientist to ensure that they are useable and accurate.

103 - make user (table) models in sherpa much easier to implement. there should be a better image interface than ds9 with, e.g., RGB (three-channel) image display.

104 - Well, the help should be given at a level to be useful to first time users. I can't even convert the flux to a useful unit, as there is no help for such "trivial" concerns on the CIAO/chandra webpage.

105 - All aspects of data analysis that I need are sufficiently well supported and documented.

106 - I'd like to see monte-carlo goodness of fit estimates introduced into sherpa for Cash statistic. I'd also like better support for using a 1D psf as an instrument model when fitting a radial profile to extended emission. I'd also like to see a temperature profile model, that uses psf info and deprojection introduced.

Oh and it would be good to have a source detection method that worked in several energy bands, using the correct psf at each position and energy, and gave estimates of whether sources are extended

108 - sherpa - more flexibility  
more scripts to do repetitive processing tasks

109 - csmooth: bugs need to be fixed, needs to properly smooth exposure and background to match data

118 - source spatial analysis

119 - The timing analysis section is poorly implemented. It would be useful to have more XRONOS-like tools.

121 - XSPEC

124 - Better access to internals.

Better documentation of interfaces. Can sherpa an ciao functionality be put into libraries with documented interfaces? I seldom use the slang capabilities because of the lack of documentation, particularly the relation between slang and the tools. The features look interesting, but I can't make much use of it until I know what the slang/ciao/sherpa interfaces actually are.

Better access to internal data. (I understand this improves a lot with ciao 3) I want to be able to grab the results of a projection and manipulate it outside sherpa. I want to be able to automate things, so I need to be able to extract much of the sherpa state (fit parameters, fit parameter errors, ...) easily. The MDL files are a start, but they only capture a small part of the state needed.

There seems to be virtually no support for mosaicing. I would like to be able to combine datasets for larger regions. The available tools basically allow re-projection to a given tangent plane, but that's about it.

I need a way of doing algebra on images. For example, I want to be able to construct an error image from a counts image. Where do I turn for a tool to take the square root of an image? (I'm going to have to roll my own.)

An instance where this is needed is to try out csmooth. I look at csmoothed images and at unsmoothed images, and I just don't believe csmooth. So far, I haven't been able to find a technical reference on the algorithm. If I have a bright diffuse object, it seems to me that the relevant quantity is the significance compared to background counting statistics, not the "local background"; for a bright diffuse source, the "local background" is comparable to the source intensity, so csmooth will oversmooth (I conjecture). I wanted to test this using the options to provide a background map and error map, but got stalled because of the problems of generating an error map.

125 - Sherpa should be made more general. At present Sherpa does not support for arrays of AREASCAL and BACKSALE while XSPEC does. XMM-Newton RGS data cannot be analyzed with Sherpa.

[Back to the Survey](#)

Last modified: 20 May 2003

[Chandra Science](#) | [Chandra Home](#) | [Astronomy links](#) | [iCXC \(CXC only\)](#)

| [Search](#)



Last modified: 20 May 2003

## CIAO features users liked the least

### [Back to the Survey](#)

- 9 - Long parameter inputs
- 14 - hidden parameters
- 18 - Slow, SEGVS happen occasionally, require lots of memory
- 19 - The inability to run multiple instances of the same tool at the same time, even on different machines, without complicated setup (using local parameter files, etc). It is extremely time consuming to, for example, extract spectra for 2000 sources one at a time on a single machine while other available machines sit idle.
- 24 - I don't know. I don't really use the ones I don't like.
- 28 - syntax is nonintuitive and awkward
- 29 - some of the low-level tools (dmlist,dmcopy) are much less intuitive than their ftools counterparts. Also, something like xselect would be nice.
- 33 - Many tools require an unreasonable amount of memory and cpu time.
- 35 - Grating threads are not very straightforward.
- 38 - sherpa - absolutely useless....
- 39 - Very frequent updating of CIAO, When is it going to be stable ?
- 43 - sherpa's inscrutable, context-sensitive commands chips extreme verbosity for simple tasks. slow (any equivalent, e.g., fselect vs dmcopy, is faster). hybrid syntax (slang and command line) large code size; large parameter sets, frequency of segv's
- 47 - Execution speed. Various tool instabilities. Obscure error messages.
- 60 - Sometimes it is not convenient to download the thread, the website is very slow.
- 62 - chips - there are already plenty of plotting packages in the world - why adding another one.
- 63 - Some of the tools are just too slow. I think you know which ones I'm talking about :-).
- 64 - I don't use the spectral analysis tools. I prefer XSPEC. Also, it would be helpful if the photometry and/or positions from wavdetect

were more reliable.

- 69 - csmooth - its slow and is too much of a 'black box' program. I've started using my own adaptive smoothing programs.
  - 71 - parameter files
  - 72 - syntax/parameter name changes when changing version of ciao (i.e. change from param "ccd" to "chip" in merge\_all, or [dm]pslextract now using aoffs, now asols, now expmaps..)
  - 75 - speed (especially sherpa, csmooth), stability
  - 82 - that command line inputs change between versions, often breaking dozens of scripts that little time/effort is being devoted to PSF library enhancement.
  - 83 - I want it to become more faster
  - 90 - It is annoying that if one forgets an "=" sign when using pset, that other parameters get screwed up.
  - 99 - Sherpa manual a disaster to read -finding things difficult, written poorly, at times incomprehensible.
  - 100 - examples in ahelp are often trivial need links to other ahelp tasks that explain how to get the files needed by this one
  - 105 - Sherpa. I found it difficult to use and I gave up.
  - 108 - complicated to do any preprocessing because of many arguments for each tool etc. Many can be scripted - like psextract
  - 111 - new features, where it is not clear if it is very important to use them and to redo the full analysis
  - 115 - the way I can waste huge amounts of time puzzling over syntax or obscure documentation, without gaining any understanding of how anything works
  - 121 - sherpa
  - 124 - Speed. Speed. Speed. Sherpa and many of the tools are excruciatingly slow. One reason I fall back to Funtools and Ftools is to get better throughput. For example, converting a script over to using funcalc instead of dmcalc provided a big performance improvement. I was using funimage instead of dmcopy for awhile, and I'm thinking of going back to funimage. (The main downside is having to fix up the various header keywords.)
- I always use funtools if they will do the task (e.g., I always use funhead to examine the FITS headers.)
- The ~/cxcds.param is a royal pain. I often have multiple analyses going on. The only key to keep from elaborating myself is to work hard to ensure that everyone has their own local param. A large motivation for wrapping everything in scripts is to allow me to have the script set up the (huge) ciao environment, and set up a local uparm.
- Periodically I find myself deleting the contents of ~/cxcds.param and then write-protecting it.

### [Back to the Survey](#)

Last modified: 20 May 2003



CXC Groups



Last modified: 20 May 2003

## Features that make other packages easier to use than CIAO

[Back to the Survey](#)

- 9 - don't know
- 12 - IDL is much easier, because we have access to the data variables and the analyses are much more customizable.
- 19 - I'm not sure any of the systems are easier than CIAO, but that doesn't mean CIAO is necessarily easy to use. I think there is a danger in making complicated analysis software too easy. Scripts such as psextract which remove most (if not all) of the technical detail (and therefore knowledge of the system) from the user can promote bad science. People should be willing to put forth the effort to learn how the system works.
- 23 - Most CIAO analysis systems are much more user-friendly than non-CIAO X-ray analysis systems, e.g. ISIS, pwdetect, PROS. I think the CIAO documentation is really first-rate. One exception is XSPEC, which is a bit easier to use than Sherpa, although Sherpa is pretty well-documented and offers (in most areas) greater functionality.
- 27 - I use gratings; at this point there is no choice but use CIAO (until FTOOLS teams finish their prototype on grating analysis tool with ftools). So I am not sure if I can compare CIAO logically with anything.
- 28 - TARA has a gui-based interface which allows free-form data exploration starting with the level 1 events file. It's a very easy tool for first look at the data file.
- 31 - IRAF - somewhat easier because of parameter file management review and frequently used scripting (i.e. it's easy to borrow someone else's script and adapt, not that they're robust or anything)
- IDL - a lot more programmable, but fewer "tasks"
- 34 - S-Lang/ISIS: It is easy to write functions to perform the types of analysis specific to my research.
- 38 - It boils down to again spectral analysis: XSPEC for CCD analysis is reliable and easier to use, maybe because we were used to it for so many years
- ISIS seems the way to go for grating analysis. It takes some to get into it, but once that step is done it seems to be most reliable, accurate and thus promising. It would be good to see this system develop further.

Sherpa seems less reliable, many times I cannot figure out what it is really doing or simply doesn't work. After a while plain frustration takes over. Don't its advantage to the others.

- 39 - Xselect, probably because it handles simpler telescopes.
- 43 - ISIS: fully s-lang based; it is programmable, extensible, uniform, efficient. It provides both high-level functions useful for grating spectroscopy, and low-level ability for fine control and customization. More rapid turnaround for fixes, enhancements. Good manual, with intro examples and detailed reference guide. Small source code base, relatively easy to build. All free components.
- IDL is also more flexible than ciao, and has a large function library, but has syntax ambiguities, command-line syntax differs from procedures. I sometimes use IDL for plotting, or to run pre-existing applications not yet converted to ISIS. IDL's primary strength now is in the large suite of multidimensional visualization functions.
- 47 - IRAF is easier to use for isophotal fitting of extended sources. ISIS is easier to use for repetitive fitting tasks.
- 51 - IRAF: I think IRAF is a little bit easier for me because of the way things are organized into different packages.
- Also, IRAF is simpler and probably does not do all the things CIAO can do. For instance, I'd never be able to process a level 1 evt file in CIAO without looking up the specific threads, but when I used IRAF, I rarely had to look up instructions because it seemed more obvious how to use it.
- 53 - AIPS
- 54 - IDL and S-Lang/ISIS: I can read in the data and then write programs or scripts to do to the data exactly what I want and with clear visibility of what I've done (not hidden in someone's black box.)
- 58 - none
- 62 - IRAF - has an easy interpace to edit the task parameters  
SAS - has a nicer GUI and uses grace for plotting
- 65 - xanadu. just because i am more used to it.
- 75 - idl is easier to use because you have much better control over the data and much more flexibility because of long history of user contributed libraries and tools
- 77 - \* the scripting capabilities of IBIS are much more advanced than those of CIAO
- \* for spectral fitting, it makes much more sense to continue to develop and expand XSPEC rather than throwing tons of resources to developing another system
- \* the same is true for many of the ftools capabilities - it just doesn't make sense to redevelop many of the available tools from scratch (incidentally, XMM made the same mistake)
- 82 - XSPEC (it is simple to use and I already know it)  
IDL (more powerful and versatile in some instances)  
TARA (quicklook functionality is great)TARA
- 83 - one good feature of ftools is the style of the arguments e.g. & and ||
- 84 - IDL, more flexibility, less of a blackbox, consistent interface/behavior.

- 90 - It isn't harder or easier than other packages. It's all a matter of familiarity at this point, I think. I'm much more familiar with IRAF, IRAF/pros and AIPS, so those tasks are easier to use.
- 99 - arms and legs above the SAS, but for people who know IDL and/or XSPEC there is not much incentive to learn CIAO also, except for the simplest tools like firstlook and psextract.
- 102 - It happens that some tasks are "updated" while others are not. I remember once I had to run one part of a thread with an old version of ciao and the following part with a newer version because there was some incompatibility. It's not difficult, it's annoying.
- 103 - IDL. IDL scripts can be examined a modified. IDL vectors and structures work very well with the FITS file format. Much easier to understand processing in IDL and do new things with data.
- 105 - I find XSPEC easier, but this could be the result of "traditional" use.
- 107 - spectral analysis is easier with xspec. sherpa is somehow cryptic and it seems to me that there is no tutorial around.
- 108 - IDL; transparent access to data at a low level.
- 111 - sherpa is nicer than xspec, dmlist is more comprehensive than fdump
- 112 - Mathematica. It is an integrated system, with a coherent logic. It is well verified via millions of users. It is stable. It is extensible.
- 115 - everything that I'm aware of
- 119 - the HEASOFT package is somewhat easier (although it may be less complete) because of its structure made of large programs with many commands rather than single command tools with many options. On the other hand CIAO is definitely easier than IRAF/PROS, even if they share the same kind of user interface (CIAO is more stable and flexible)
- 121 - None
- 124 - \*All\* astronomical software is aggravating to use, although in different ways. I use ciao until I have a task which breaks. I switch to xspec or funtools for that task until something else breaks. I go back and see if ciao does any better now, ...

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[Back to the Survey](#)

Last modified: 20 May 2003

[Chandra Science](#) | [Chandra Home](#) | [Astronomy links](#) | [iCXC \(CXC only\)](#)

| [Search](#)



CXC Groups



Last modified: 20 May 2003

## CIAO documentation features that users liked best

[Back to the Survey](#)

- 9 - threads
- 12 - ahelp and the threads.
- 13 - The threads are fantastic
- 23 - The threads are really spectacular.
- 27 - again, what CIAO documentation?
- 28 - Threads and ahelp files are usually fine.
- 30 - the universality of ahelp
- 32 - The threads are incredibly useful.
- 38 - It has to be the threads and ahelp -- once they are correct of course, which many times does not seem to be the case
- 39 - Almost everything is there in the document.
- 40 - analysis threads
- 43 - ahelp files are good for details when you already know what to run (though the see also seems to list too much)
- multiple formats/ sometimes I like to browse, sometimes I like to print and markup (so the pdf version is a nice feature)
- 47 - The threads are very useful for unfamiliar tasks.
- 49 - Ahelp pages on any ciao command.
- 51 - data products guide
- 58 - ahelp's ease of access, apropos capability, uniformity.
- 59 - Threads!
- 60 - It is easy to obtain the documentation.
- 63 - The threads are really nice.
- 64 - I like the ease of getting to tool description quickly in ahelp. I wish there were about 4 times as many examples included in the ahelp,

and more thorough descriptions of each parameter (including multiple examples of possible values).

- 67 - The Threads web page is very useful to get started in CIAO-based Chandra data analysis.
- 69 - The threads are very useful, and what I have looked at most often after the ahelp pages. I suspect I would have used the Analysis Guide a lot more had it existed when I first started working on chandra data.
- 70 - Threads.
- 75 - threads for common user tasks
- 80 - The manuals on the website, particularly the threads since they are very succinct
- 81 - threads are the most effective documentation component
- 82 - Threads
- 83 - threads
- 84 - examples
- 89 - Threads
- 90 - ahelp seems to be very complete.
- 99 - threads and ahelp, as mentioned above.
- 103 - ahelp is still the best way to get info.
- 105 - The presence of examples, the remainder to related problems and/or analysis aspects.
- 106 - The threads
- 108 - threads
- 113 - Threads
- 115 - none of them
- 119 - very well organized for on-line use  
I like the threads section
- 121 - ahelp
- 124 - Threads are OK, but they need more real-world examples. They often do a simple example (which is good, gets you started) but then don't do any more realistic examples. For example: lightcurve filtering (1 chip). Real world example: I have an AGIS observation with 6 chips: how do I lightcurve filter on each chip separately and recombine the results?  
  
Similarly for dealing with sky background: how do I construct sky background datasets for all the chips, merge everything back into a single event list, and have all the GTIs etc. set up correctly? I think there need to be many more examples like the step-by-step multi-chip exposure map thread. Lots more examples of how to do it with more than one of whatever it is.
- 125 - Threads
- 126 - The threads are quite good.

[Back to the Survey](#)





Last modified: 20 May 2003

## ClAO documentation features which are missing or need improvement

[Back to the Survey](#)

- 9 - technical discussions
- 12 - ahelp pages usually need more content, such as brief descriptions of how the tools work, citations to ApJ (or other) papers on which tasks are based, etc.  
Online thread URLs have a nasty habit of changing. This can get very annoying!
- 13 - Not easy to find good detailed descriptions of standard products
- 15 - providing more examples under the ahelp pages of some of the more complex uses of certain commands.
- 18 - The web pages are too hard to follow -- to many hyperlinks. A simple linear thread would be better.
- 19 - Further expansion of the threads. For example, why do all the threads use PI bins instead of PHA?
- 21 - The "bugs" link at the bottom of every ahelp web page should go to the bugs list for THAT TOOL, rather than to the list of all tools.  
The cross-referencing between threads is often useful, but is sometimes just confusing, particularly when the cross-references send you several documents deep. In cases like that, it would be nice if the threads could be a bit more self-contained.
- 22 - Documentation which describes what the scripts do, and what's called by the script would be useful.
- 23 - Some aspects of the current state of calibration are well-hidden to the user, specifically the areas where calibration is extremely uncertain are not as well-defined as they could be.
- 24 - The threads should offer much more explanation of the choices used.
- 28 - If I don't use CIAO for a while, I always forget the exact syntax for doing certain things (e.g. filtering on a spatial region). It always takes me a while to find different examples if it again. It would be helpful to have this information linked within every thread where it's relevant.
- 32 - The manual/online help could use a little more technical info; for instance, exactly how does sherpa go about subtracting the background, or simultaneously fitting BG and source; how does it deal

with pixels on the boundary of a region defined in ds9; etc.

- 35 - More examples of analysis chains need to be given, particularly for grating spectroscopy.
- 39 - More warning regarding change of CIAO version while using same data
- 43 - brief usage messages, as common in linux w/ --help more top-down "ABC" guides, rather than "bottom-up" add-ons to web pages, which tend to fragment reading.
- 44 - \*Printable\* ABC Guides desperately needed. Threads are great once you know what you're doing, but a terrible way to learn. There needs to be something that you can print and read on the john. There's a certain cavalier attitude on the threads. All references to the 3 ms readout time of CC mode should be expunged. It's 2.85 ms, and thinking "Oh, that's close enough to 3, so let's just put 3 in 90% of the threads" really isn't good enough.
- 47 - The main thing missing in almost all the threads are discussions of the various assumptions and limitations that go into the analysis. Perhaps an expert user class of documentation needs to be considered. The threads seem to address the needs of the novice user fairly well already. Time to move beyond the lowest common denominator service level.
- 49 - More understandable examples on ahelp pages.
- 53 - threads! - Would like to know the general principles, and flowchart of SDP. Please don't ask me to treat X-ray analysis as a black box..
- 59 - Information on calibration and potential problems with interpretation of the results.
- 60 - The documentation about script is not provided.
- 63 - The online ahelp pages take too many clicks to get to, and could easily do with more examples. More examples=better, always!!
- 64 - Please include more (and more diverse) examples in the ahelp.
- 69 - It would be nice to have a bit more information on the background dataset files in the CALDB, e.g. which datasets can be used with VF mode reprocessing on. As far as I can tell there is not much documentation on this and some of the header keywords in the files are misleading (e.g. header claims VF mode but the necessary columns are not there to use with a VF cleaned dataset).  
I also find the helpdesk search interface to be somewhat awkward. I find it very slow to use, and I often have to search to lots of irrelevant queries before finding anything usefull (which is annoying given that each one can take a long time to load).
- 75 - accuracy of threads (particularly hrc); lack of printable "cookbook" to browse
- 81 - more examples of correct analysis are needed, mainly as threads. Maybe authors of good papers could be invited to write a thread explaining how (and why) they did various procedures in their analysis
- 82 - Some details of programs are poorly documented or difficult to find.
- 83 - It is hard to find the older versions of the documents e.g. threads for CIAO ver 2.2
- 84 - exceptions
- 90 - It is difficult when you have an idea of what you want to do, but don't know what task, thread, etc. will do it. Typing in keywords like "bin" doesn't produce output as useful as it could be.

Even by somewhat familiar person as myself, some of the dictionary explanations are far too technical. While that technical detail needs to be there, there should also be a very basic laymans explanation.

- 99 - careful review of threads and ahelps by scientists.
- 102 - More up-to date informations. There seems to be a long lag between a "corridor rumor" on a problem/correction and the official announcement.
- We should not have to ask a question to get a (late) answer that says "Oh, this is a well known problem" when this "known problem" is nowhere described...
- 103 - the threads need to evolve to include more complex data analysis situations.
- 105 - I do not know.
- 106 - I'd like to see a more detailed thread on extracting and fitting radial profiles, including the use of an exposure map, and comparing profiles of a source with the psf to see if it is extended.
- 108 - more examples of common cases
- 111 - information on importance of corrections, e.g. CTI corrections...
- 113 - Consequences for data analysis of improvements in calibration
- 119 - add more threads, also on "basic" topics.  
Maybe it could be useful to collect them in a "how-to handbook"
- 124 - Scripts are often poorly documented ( I mean the script code itself). There is little indication of what the steps are, and why things are being done. Also, scripts do not replace the need for step-by-step threads for what the script is doing. I don't want a black box. I want to know precisely what it is doing to my data. So, in general, I usually end up looking at the script, figuring out what it's up to, and writing my own with documentation of the steps, additional logging information, substituting tools with funtools or ftools, etc.
- 126 - The help pages often lack information explaining all of the options for each keyword in the call sequence.

[Back to the Survey](#)

Last modified: 20 May 2003

[Chandra Science](#) | [Chandra Home](#) | [Astronomy links](#) | [iCXC \(CXC only\)](#)

| [Search](#)



CXC Groups



Last modified: 20 May 2003

## Can you make publication quality images in a journal's desired format?

[Back to the Survey](#)

- 9 - Yes
- 13 - Yes
- 14 - CMYK PS files capability missing with IDL
- 19 - Yes, though dming2jpg should produce higher quality postscript (and, ideally, encapsulated postscript).
- 20 - Only using wip
- 21 - Mostly, I haven't yet found a tool I'm completely happy with for creating 1-D CMYK plots, DS9's output often needs to be heavily edited in order to get axes & contours to come out right, and in order to add a color scale bar when necessary.
- 22 - Yes
- 23 - Yes.
- 24 - Yes.
- 25 - Not quite - dming2jpg lacks acceptable axis labeling. Should also output postscript in CMYK (not just RGB).  
Chips is good, back lacks a broad range of symbols.
- 27 - I don't do imaging.
- 28 - Yes.
- 30 - Yes
- 31 - Yes - I love ds9 for this purpose!!!
- 32 - yes
- 35 - I'm not an imaging person.
- 37 - Eventually. Not with Ciao.
- 38 - yes, but not with CIAO tools
- 39 - yes

- 43 - yes. (except for the silly cmvk business) I'm not sure what "imaging" entails; I do mostly line/scatter plots (spectra). Sometimes I need 2D intensity images. Between IDL and isis/ppplot, I can get what I need.
- 44 - There's a bit of a distinction between what I need for analysis, and what I want for publication. In that sense, something like CHIPS is a bit of a mushy middle ground. Yes, the XSPEC plotting is kind of ugly, but it's good enough to understand and think about. When it comes time for the final "publication product", I then usually go to IDL. I usually don't see the need for the middle ground of CHIPS.
- 47 - Not in CIAO. I use IDL for this task.
- 49 - Yes. IDL works best for that.
- 52 - Images with ds9, plots with IDL.
- 53 - With lots of effort, yes.  
Would like much better handle on resolution.
- 58 - Yes.
- 59 - ds9 can create great images! but i cannot create appropriate 2d contours with chips
- 60 - yes.
- 62 - Yes - using ds9.
- 63 - Depends- dming2jpg certainly can produce good images, and then I use xv or gimp to finish them up. As for plotting, I prefer IDL to make the final thing.
- 64 - YES
- 65 - yes
- 67 - It is still difficult to provide color drawings for ApJ in a format they can use readily. The cmvk output of ds9 was insufficient last time I tried.
- 70 - Yes. I often use "wip" http://bima.astro.umd.edu/wip/manual/wip.html and occasionally IDL
- 71 - Need more examples
- 72 - yes
- 75 - using idl i can; ds9 is not capable of producing really camera ready publication quality images
- 77 - yes, it is not a problem to make publication quality images with IDL
- 80 - no journal entries as of yet, but image specifications are always modifiable, though it may require a 3rd party app
- 81 - only just
- 82 - HAHahaha. NO. Journals always want four color images, while most programs only allow three color output.
- 83 - no
- 89 - yes, but I think contour plots with ds9 should be improved
- 90 - I haven't tried that yet, and probably won't need to. (I'm doing mostly analysis of point sources.)
- 100 - is CMYK postscript supported yet?

- 101 - no
- 103 - yes, in IDL.
- 105 - Yes.
- 106 - yes, but it can be very fiddly
- 108 - Yes, in IDL
- 111 - ds9 is nice but could be improved
- 112 - Yes. ds9 is excellent.
- 113 - never tried with CIAO, I use IDL because it provides the best flexibility
- 118 - yes
- 120 - yes
- 121 - Yes
- 124 - Not for color figures. There are few tools available for manipulating CMYK images and generating CMYK postscript.
- 125 - yes

[Back to the Survey](#)

Last modified: 20 May 2003

[Chandra Science](#) | [Chandra Home](#) | [Astronomy links](#) | [iCXC \(CXC only\)](#)

| [Search](#)



CXC Groups



Last modified: 20 May 2003

## Image display features which are missing

### [Back to the Survey](#)

- 9 - detailed control of marking image
- 13 - Nothing.
- 14 - none
- 20 - Select a region of an image to be displayed (rather than the whole image) so that several tiled images match each other on the same scale and coordinate range.
- 21 - In DS9: an option to print the color scale bar; axis labels that print in the right place; an option to restrict the part of the image in which the contours are printed, e.g. only print them if they're inside the axes.
- 22 - The ability to be able to easily crop an image to a desired region, without having to resort back to using dmcopy on the command line.
- 23 - DS9 has some problems with opening ROSAT or HST images, seems a WCS problem. (This may be a user error?) This is responsible for my occasionally using SAOimage.
- 24 - I'd really like to be able to overlay images to make a "true" color image in ds9. In fact, it'd be nice to be able to do it on the fly. I.e. it'd read in the event list and then I could tell it to display 0.5 to 2 keV in red with a log scale, etc., and define multiple filters like that, it would be all I need, and I'd have no use for Photostop.
- 25 - CMVK - as above.
- Ability to make accurate overlays, e.g. greyscale of one image and contoured image of a totally different image.
- 28 - DS9 is not flexible enough for publication quality images - customizing a display is awkward. In IDL, I always spend a lot of time getting the stretch right.
- 30 - overlaying contours from a different image
- 31 - I really like ds9 these days. I would like to see the ability to put multiple contour images (positive and negative contours, for example) overlaid on a single image.
- 32 - none that i can think of
- 35 - I'm not an imaging person.

- 37 - most of the times, it's my fault for not getting colors right.
- 38 - More interactive data analysis capabilities, i.e not only displaying an eventlist, but on screen selecting a source, get the appropriate pha, arf, rmf and other stats if desired. Something like that.
- 39 - I do not do imaging
- 47 - The ability to easily display true-color images where the RGB channels are associated with different images from various bands.
- 58 - ds9: Images are often truncated in what appears to be an arbitrary size.  
ds9: cannot read the standard src2.fits source positions from Chandra to put up some indicator of the found sources, detect-cell, and background region.
- 64 - It would be nice to be able to easily overlay region files on color-weighted jpeg images.
- 67 - Conversion from FITS to jpeg or png. I still use a Mac OS grab utility. I use IDL for analysis and then write FITS for ds9 to display.
- 70 - The ability to produce a publication quality postscript output. An easy way to combine images (e.g. contours from one image overlaid on another).
- 72 - ds9: ability to save a "view" -- i.e., to save what files with what binnings and zooms I'm viewing now, in order to be able to recover in a subsequent session  
ds9: I had troubles with a remote ds9 running remotely on a sun with 24bit display, and opening its window on a linux pc with 16bit display: colours were messed.
- 75 - in idl i can do pretty much anything; i tried ds9 but it's lack of true color and the ability to overlay complex graphics and annotations was too frustrating
- 77 - none, IDL and ds9 are all I need
- 81 - hard to adjust grid display; hard to adjust labels on plots
- 82 - ds9 - 1) the ability to assign regionfile grouping and then turn them on/off, delete them, modify them, etc.  
2) put the "wcs match" item on the button menu (it is used SO much).
- 3) the ability to seamlessly read in region files with different settings (physical coords, image coords, celestial) without having to change the input format each time (isn't this what the regionfile header is supposed to be for?).
- 83 - masking of the image
- 84 - shift, rotate and regrid.
- 90 - The documentation on using ds9 in conjunction with ciao could be improved. The documentation borders on being far too much irrelevant detail scatter throughout. The details are good, but a better overview of its use with ciao and Chandra data analysis would be helpful.
- 101 - display coordinates in a user-defined way
- 102 - Instant smoothing of an image.  
Nice quality outputs (like with Karma-kview)
- 103 - None!
- 105 - None.

106 - When you load contours from one image onto another image in ds9, they often extend outside the borders of the image, unless you match their sizes to begin with. There should be an option to remove contours outside the image. Also, you should be able to save an image that has some particular scaling, min and max cutoffs, and contrast applied to it within ds9 as a single file that preserves this information, and also keeps your coordinate grid, contours, regions etc.

111 - \* ds9 is great, but could be improved: macro execution would help a lot adding text and arrows more options to position axis labels

112 - colorbar control and display. not well documented.

113 - easy translation between different formats (e.g. JPEG <--> PS)

119 - The ability to cut fits images (or event files) using region files

124 - More complete XPA access (DS9). Extending rebinning and smoothing to image data in addition to event lists.

[Back to the Survey](#)

Last modified: 20 May 2003

[Chandra Science](#) | [Chandra Home](#) | [Astronomy links](#) | [iCXC \(CXC only\)](#)

| [Search](#)



CXC Groups



Last modified: 20 May 2003

## Image display features users like the most

[Back to the Survey](#)

- 9 - overlaying images
- 13 - karma produces publication quality images with minimum of mucking around
- 14 - color tables
- 22 - Its intuitive interface and ease of use.
- 23 - Ds9's flexibility and range are stunning.
- 24 - ds9 has pretty easily navigable menus
- 25 - ds9 does to wcs-matching and region display well.
- 28 - DS9 - easy to use
- IDL - makes high-quality images
- 30 - binning on the fly
- 31 - The align by WCS feature in ds9. It's wunderbar.
- 32 - compatability with CIAO, ease of use
- 35 - I'm not an imaging person.
- 38 - Flexibility, format conversions
- 43 - isis/psplot: integrated line,scatter, image in same device. highly scriptable, at high and low level.
- 58 - CAN take a ciao produced source position. Downloads DSS images directly into the frame! Should do the same for 2MASS -- which is much more useful than DSS to me.
- 63 - ds9 does everything I want it to :-).
- 67 - Many analysis tools exist in IDL for image analysis. Matching images using WCS is simple and contouring looks pretty good in ds9.
- 70 - Very quick and easy to use.
- 72 - ds9: evtfile binning
- 77 - the programmability of IDL
- 80 - it's small and efficient

- 81 - multiple panes: able to fit xspec models; able to integrate with atomb
- 82 - ds9 - WCS matching user scaling
- 83 - masking of the data
- 84 - multiple frames
- 90 - ds9 is very configurable, but I prefer the control that I have with the AIPS TV, although I have not used the AIPS TV in my Chandra data analysis.
- 101 - match frames
- 102 - Possible to include analysis packages. Easy overlay of images and coordinates transformations. Easy way to go from regions to extracting spectra. Ds9 rocks!!!
- 103 - IDL is programmable, flexible and transparent from data to the exact Postscript font I want for an ApJ figure.
- 105 - Funtools capabilities included in ds9.
- 106 - the funtools and zhtools interfaces
- 108 - transparent and flexible access to data at a low level; control.
- 109 - I love ds9 -- it has too many great features to list here!!
- 111 - overlay with contours
- 112 - visibility. Speed.
- 119 - Lots of functions and options
- 124 - Ease of use. XPA!!! (DS9).
- 126 - The ability to lay x-ray contours over, say, optical FITS images. The ability to convert between coordinate systems.

[Back to the Survey](#)

Last modified: 20 May 2003

[Chandra Science](#) | [Chandra Home](#) | [Astronomy links](#) | [iCXC \(CXC only\)](#)

| [Search](#)



CXC Groups



Last modified: 20 May 2003

## Reasons for using one particular image display application

[Back to the Survey](#)

- 9 - Issues above
- 13 - ds9 can read in event lists directly; karma can only handle images.
- 18 - ds9 crashes when viewing a level 1.5 file.
- 21 - DS9 is best for images, IDL for 1-D plots, Illustrator for editing postscript files, etc.
- 22 - Gaia is better at contouring, in my opinion than ds9, so I use Gaia for contouring. I work with both radio and X-ray wavebands, so it's easier for me to use aipsview when I'm working with AIPS and ds9 when I'm working with CIAO tools.
- 23 - Aladin is the standard Vizier tool for accessing the DSS.
- 25 - To make up for the various idiosyncratic deficiencies of each particular system.
- 27 - To take this opportunity, I would like to note that a small but appreciable percentage of population in the U.S. alone is color-blind. Therefore, color-coding usage in any survey should not be performed (such as below).
- 28 - I use ds9 most regularly to look at images, but I use IDL to make publication-quality images.
- 31 - If I'm working in IDL, I don't know how to display "live" to ds9, so I use IDL image display, which is sort of clunky.
- 35 - I'm not an imaging person.
- 38 - there is none that does everything, right?
- 43 - isis/ppplot: integrated with analysis s/w. provides most needed capability most of the time.  
ds9 occasionally for interactive display control, better support for binned images. User for inspection, not for output or scripts. But annoying segv's on grating data require use of other programs.
- IDL: large suite of visualization functions; surface, volume; 3D projections, w/ contour or image overlays.  
xv: to scroll through a collection of output in gif or jpeg format, or to edit (small) colormaps.

- 47 - DS9 is good for quick looks but that's about it. For fine scale work and publication quality output, I use IDL because it provides the level of control necessary.
- 52 - ds9 works super for immediate image display of my FITS images/evt lists. IDL makes pretty plots, especially with help from routines in PINTOFALE.
- 62 - Each image display is good for different image format: ds9 is best for FITS, fv is best to view images headers, xv is best to view images not in FITS format
- 63 - Some are interfaced with the web (Aladin), and some handle image manipulation well (xv).
- 67 - See above. One is used for analysis, the other for "qualitative" work such as preparing a picture with good colors and contrast.
- 70 - ds9 is great to view the image, select regions, etc. (i.e. everything for scientific analysis) but WIP or IDL are used to produce publication quality postscript file
- 77 - use the best tool for the job, instead of trying to do everything with one monolithic system (which is exactly why I like the ibis, idl, and ftools way better than the xmmas or ciao)
- 81 - to do various tasks (eg make a cartoon diagram or figure; display spectra and models
- 82 - Difficult to make journal quality images. IDL whips the pants off DS9 when one wants to add axis labels, fonts, etc.
- 83 - over-laying the images
- 84 - none can do everything I need it to do.
- 90 - Different displays handle different types of data better. The AIPS TV is wonderful for radio analysis, but I'd never attempt to use it for pixelized X-ray analysis. I really only use ds9 for my X-ray analysis now.
- 102 - Life is diverse. Our needs are as well. It is NOT necessary to have a software which does EVERYTHING. I'd rather have a software which works even on a limited number of problems that a monolith of code supposed to solve all the problems but which does not work...
- 103 - ds9 has many astronomical features which are indispensable, ds9 or something like it should be improved to allow more user interaction with data.
- 106 - I use ds9 generally, but I use gaia if I need to fix the astrometry of an image.
- 107 - I use also IDL because you can act on the evt file and immediately visualize the effect.
- 111 - paw allows custom image manipulation (with fortran subroutines)
- 112 - compatibility with working environment. ds9 is limited to fits files.
- 113 - POW is launched by fv  
xv is best suited to deal with GIF, JPEG, and other compressed formats
- 119 - Better ability to see directly into fits files (FV)  
Need to support user-personalized software (IDL)
- 121 - compare the optical and X-ray images
- 124 - Every display system has its deficiencies. DS9 is pretty good, though.
- 126 - The CMXK images that come out of ds9 are sometimes horrendously ugly color schemes.