

TOPCAT

Tool for OPerations on Catalogues And Tables

STILTS

Starlink Tables Infrastructure Library Tool Set

Jean-Baptiste Marquette - IAP
Virtual Observatory Tools and their applications workshop
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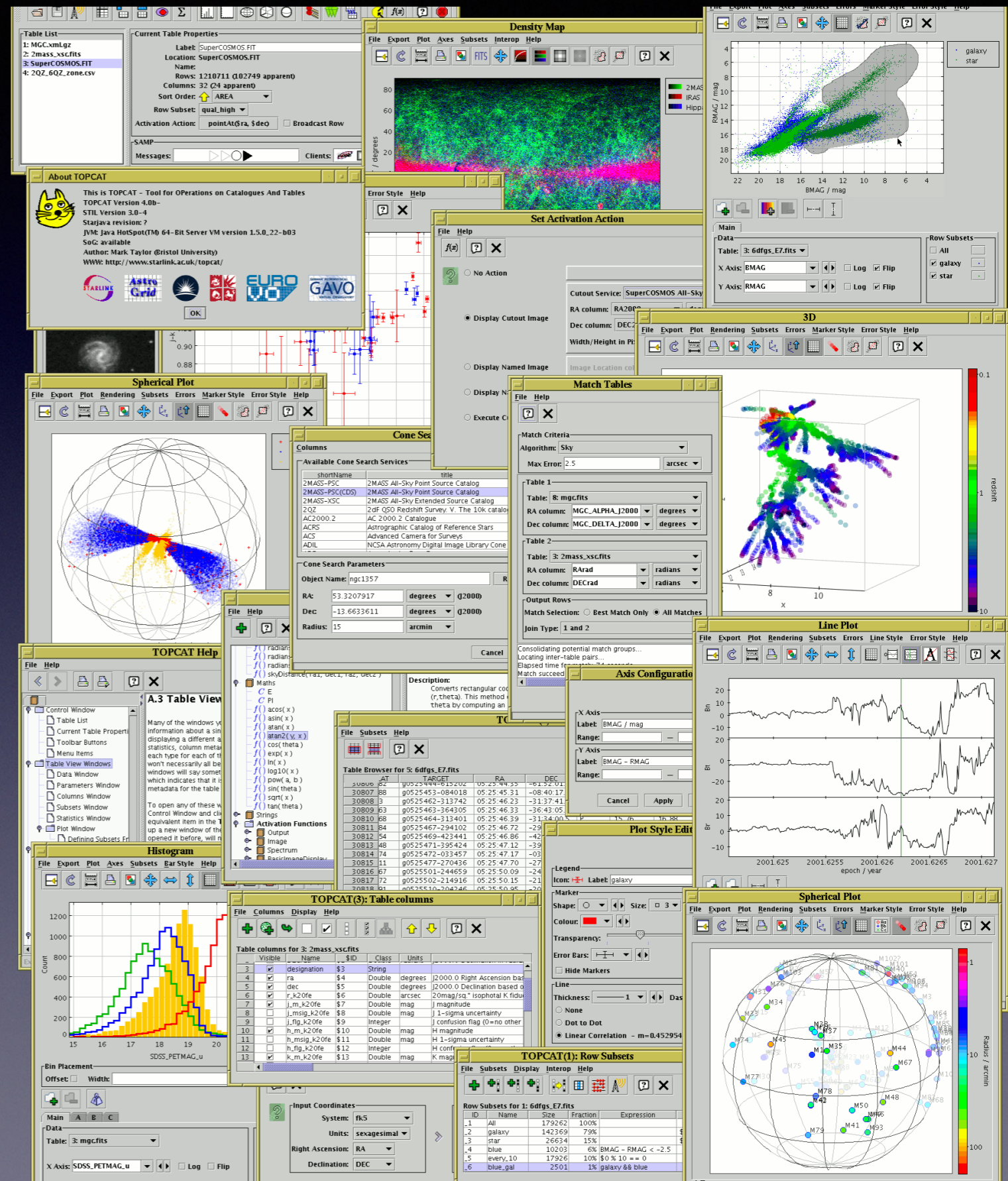
As seen from a user's side!

Some facts

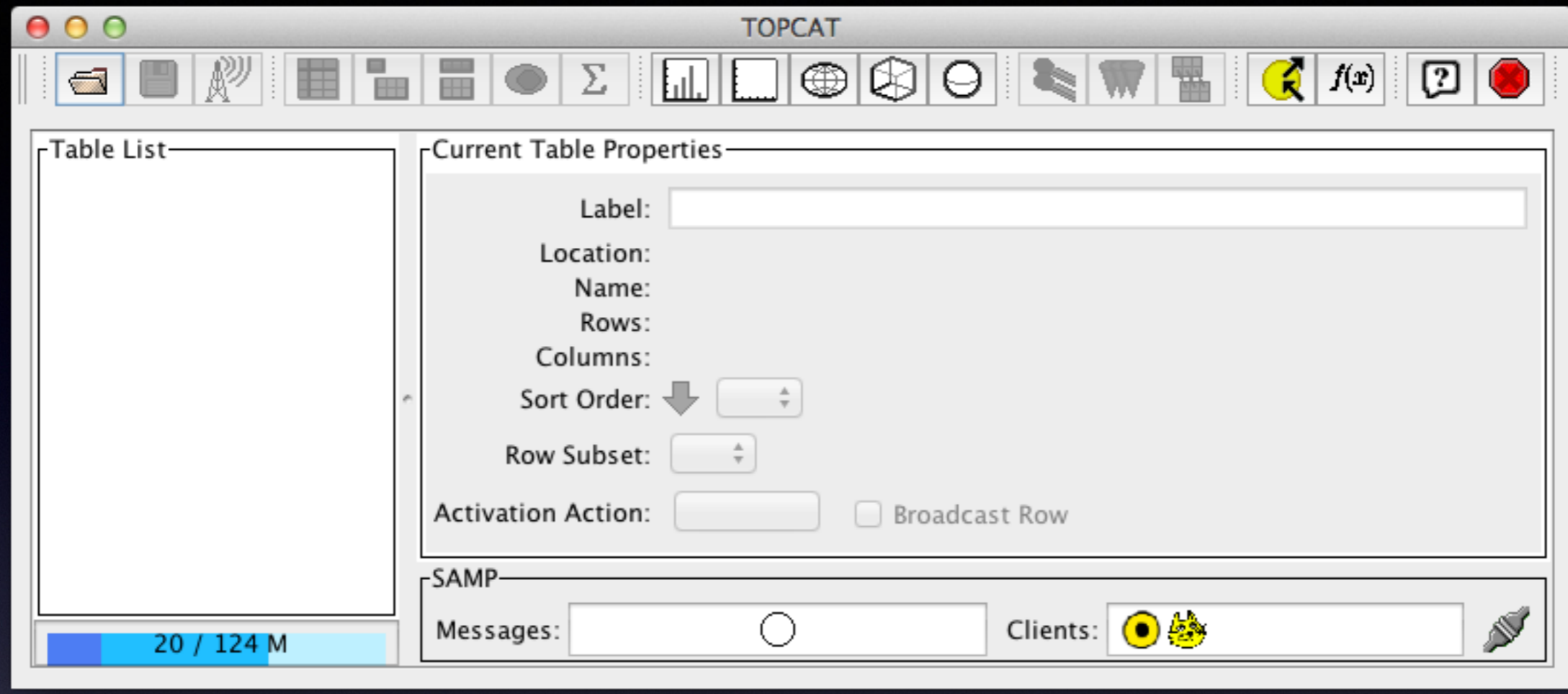
- Originally in the Starlink project, which is now at JAC:
<http://starlink.jach.hawaii.edu/starlink>
- Written in pure Java
- THE developer and expert: **Mark Taylor**
Astrophysics Group, Physics Department, Bristol University
<http://www.star.bris.ac.uk/~mbt/topcat/>
- Mailing lists for TOPCAT and friends at
<http://www.star.bris.ac.uk/~mbt/topcat-lists.html>
- Latest version: 4.1, released 7 March 2014, new-style plot windows, now recommended over the old-style ones
- Seamlessly integrated with other tools, services and datasets in the VO world and beyond

Welcome to a better world... (from Mark Taylor's web page)

- The graphical TOPCAT capabilities at a glance
- Allows interactive analysis of tabular data, both local and remote
- A great versatility in terms of formats, to be read and written: FITS, CSV, VOTable, CDF, ASCII, etc.
- Self-documented functionalities, in great details and quality
- Automatic interaction between windows, according to data manipulation
- Allows interactive sessions to be saved, for further processing
- And more...

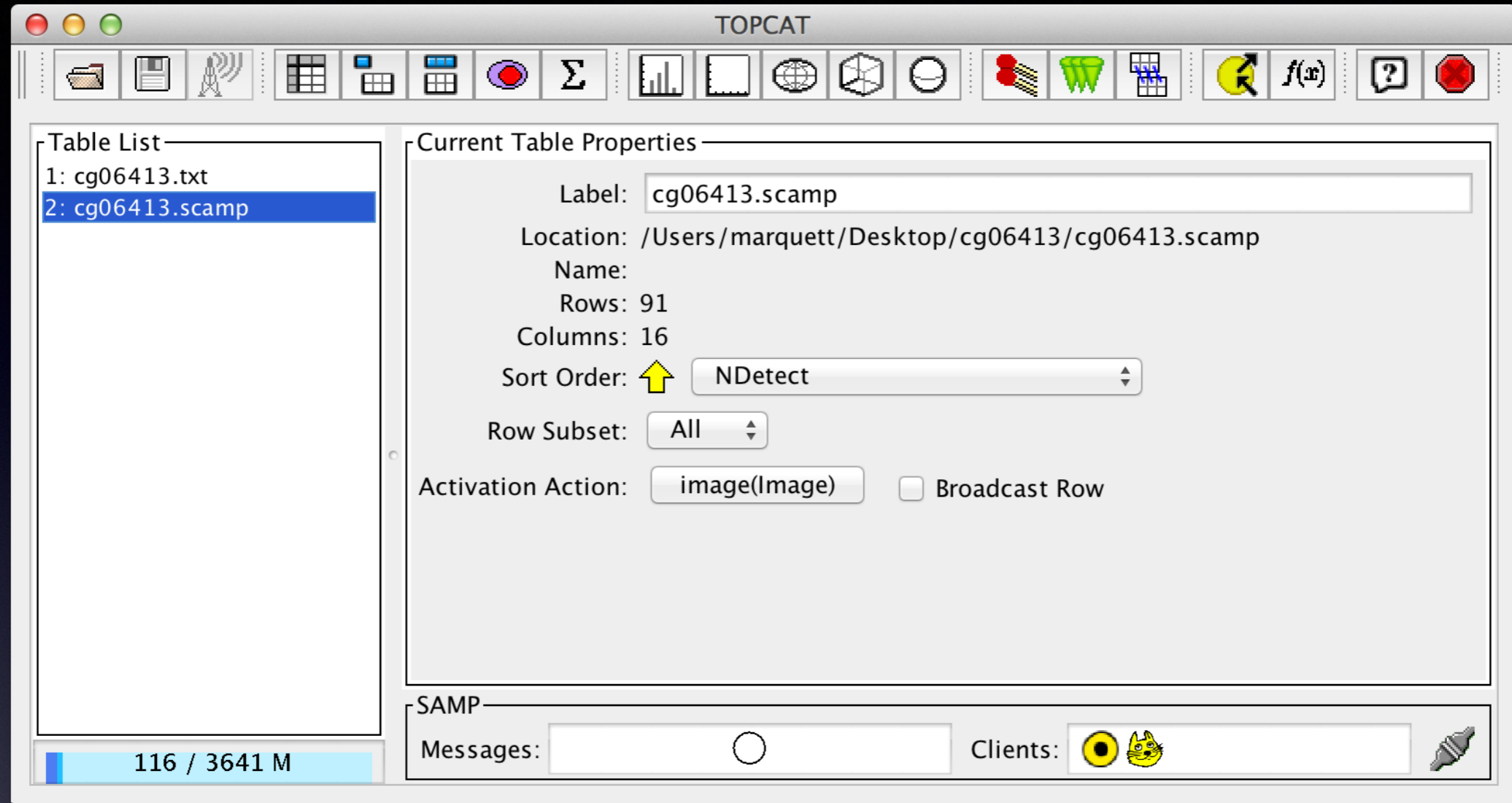


The main window



- Detar the archive workdata.tar.gz:
tar xzvf workdata.tar.gz
- cd cg06413
- contains a sample of EROS-2 data (40 images with related tables and some other files)
- your_starjava/java/bin/topcat &
 - source /star/etc/profile
 - gaia &
 - explore the different formats
 - load file cg06413.txt
 - load file cg06413.scamp

Explore the main window



- select a table
- display the contents
- display the metadata
- display the stats
- define activation action
- explore the plot functionalities
- define and use subsets
- use crossmatching

TOPCAT(1): Table Browser

Table Browser for 1: cg06413.txt

	Image	ra_min	ra_max	dec_min	dec_max	Median	Mean	Std	Contrast	Exposure	Airmass
1	cg06413tbr6i1379.fits	275,33784	275,71637	-23,05342	-22,71616	1647,	1890,31261	1378,07499	14,3206	180	2,17525
2	cg06413tbr6j2230.fits	275,35707	275,73542	-23,05139	-22,71419	4198,	4423,17345	1379,10055	11,8623	180	1,71712
3	cg06413tbr7c23162.fits	275,34931	275,72729	-23,04025	-22,70274	3039,	3169,30395	1039,45844	14,205	120	1,07973
4	cg06413tbr7d19131.fits	275,34525	275,72411	-23,0397	-22,70304	5168,	5311,43969	1112,92631	11,0279	120	1,04142
5	cg06413tbr7d23155.fits	275,34459	275,72343	-23,04041	-22,70377	14602,	14678,13299	1828,57644	14,623	120	1,06433
6	cg06413tbr7e05148.fits	275,34623	275,72505	-23,04219	-22,70552	592,	770,35921	1110,61092	10,1424	120	1,01548
7	cg06413tbr7e19130.fits	275,32836	275,70708	-23,03836	-22,70165	1768,	1929,92791	1083,45339	11,7028	120	1,01532
8	cg06413tbr7e31127.fits	275,32498	275,70389	-23,04073	-22,70415	699,	768,1632	609,95179	16,4386	120	1,17288
9	cg06413tbr7f06126.fits	275,32853	275,70738	-23,04033	-22,70366	518,	685,27433	1039,39191	12,8697	120	1,04547
10	cg06413tbr7h25103.fits	275,34321	275,7221	-23,04657	-22,71003	569,	738,38212	1053,68818	10,2512	120	1,42394
11	cg06413tbr7h2780.fits	275,34025	275,7191	-23,04541	-22,70885	512,	677,36741	1084,39713	13,4352	120	1,29176
12	cg06413tbr7i0874.fits	275,33218	275,71115	-23,04431	-22,70779	2041,	2186,62825	1016,53143	12,9407	120	1,62121
13	cg06413tbr7i1279.fits	275,33955	275,71854	-23,04642	-22,70983	6269,	6207,50337	1546,81561	12,0245	120	1,65909
14	cg06413tbr7j2451.fits	275,33524	275,71443	-23,04435	-22,7077	934,	1085,0592	984,91489	16,6039	120	2,27567
15	cg06413tbr7j2740.fits	275,33168	275,71084	-23,04446	-22,70784	1191,	1351,66743	999,04794	14,5337	120	2,09373
16	cg06413tbr7j3037.fits	275,3399	275,71904	-23,04339	-22,70675	1011,	1163,40211	968,49691	15,1071	120	2,1158
17	cg06413tbr8b1571.fits	275,35862	275,73739	-23,04829	-22,71151	1965,	2097,49693	910,97631	12,0624	120	1,89215
18	cg06413tbr8b2490.fits	275,34423	275,72295	-23,04771	-22,71091	806,	941,27996	882,37541	13,0482	120	1,48794
19	cg06413tbr8b2852.fits	275,3531	275,73179	-23,04718	-22,71039	2150,	2288,8632	990,83927	11,3366	120	1,27738

TOPCAT(1): Table Columns

Table Columns for 1: cg06413.txt

Visible	Name	\$ID	Class	Description
<input type="checkbox"/>	Index	\$0	Long	Table row index
<input checked="" type="checkbox"/>	Image	\$1	String	
<input checked="" type="checkbox"/>	ra_min	\$2	Double	
<input checked="" type="checkbox"/>	ra_max	\$3	Double	
<input checked="" type="checkbox"/>	dec_min	\$4	Double	
<input checked="" type="checkbox"/>	dec_max	\$5	Double	
<input checked="" type="checkbox"/>	Median	\$6	Float	
<input checked="" type="checkbox"/>	Mean	\$7	Double	
<input checked="" type="checkbox"/>	Std	\$8	Double	
<input checked="" type="checkbox"/>	Contrast	\$9	Float	
<input checked="" type="checkbox"/>	Exposure	\$10	Short	
<input checked="" type="checkbox"/>	Airmass	\$11	Double	

TOPCAT(1): Row Statistics

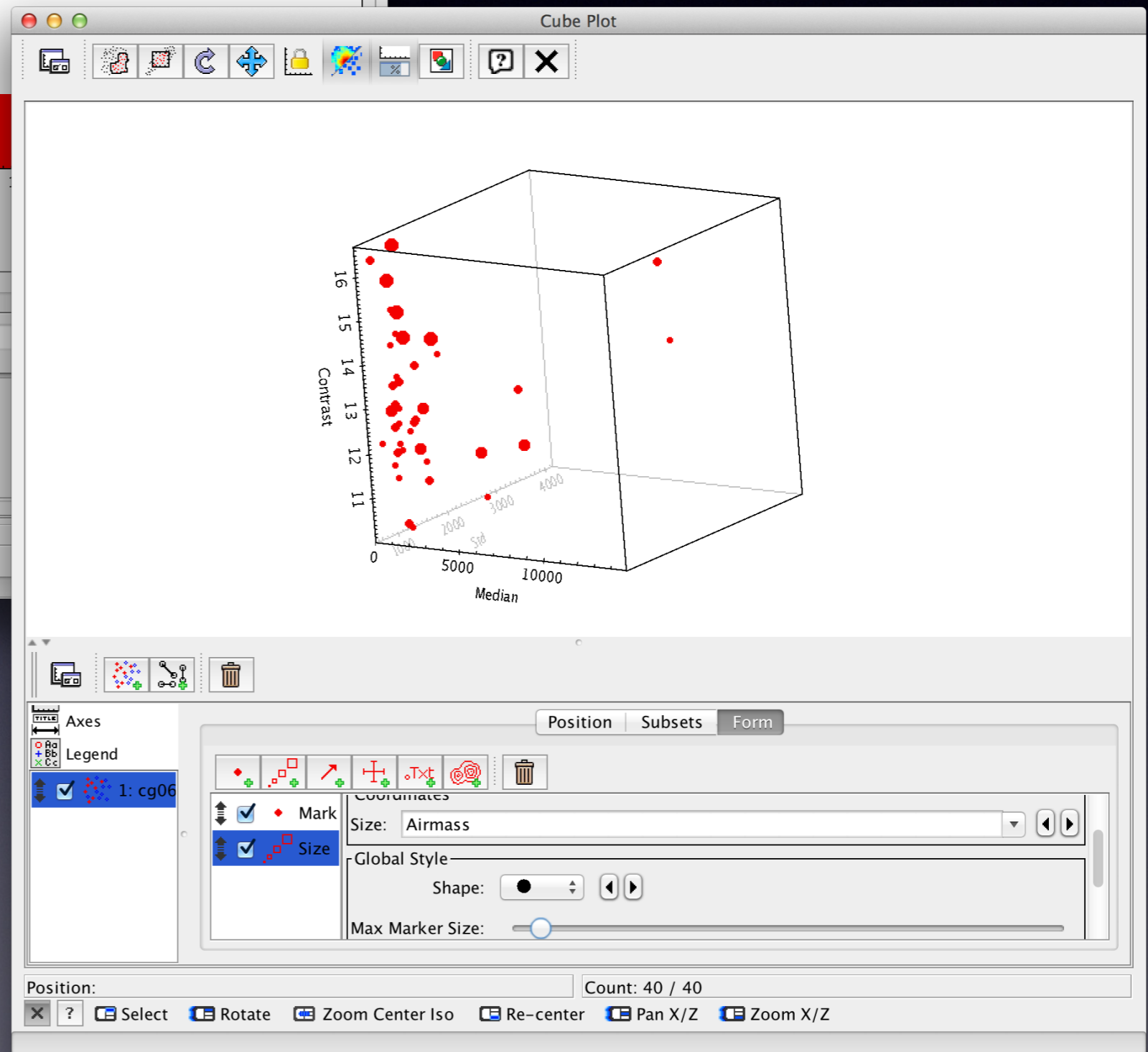
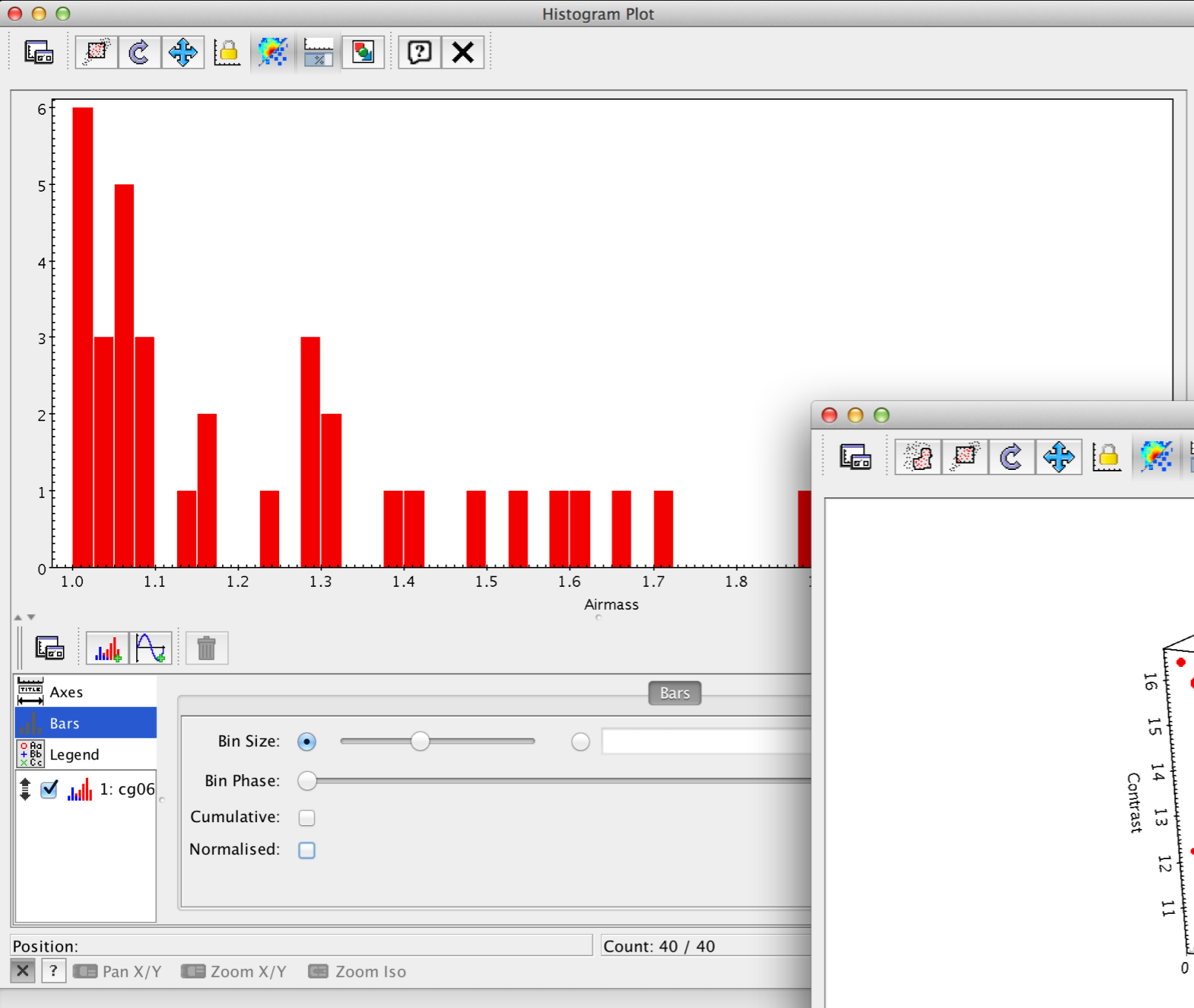
Row Statistics for 1: cg06413.txt

Name	Mean	SD	Minimum	Maximum	nGood
Image			cg06413tbr6i1379.fits	cg06413tbr8e19109.fits	40
ra_min	275,335	0,012169	275,30174	275,35862	40
ra_max	275,714	0,012143	275,68043	275,73739	40
dec_min	-23,0448	0,003377	-23,05342	-23,03836	40
dec_max	-22,708	0,003327	-22,71616	-22,70165	40
Median	2016,45	2712,79	512,	14602,	40
Mean	2184,5	2767,48	660,5109	14678,13299	40
Std	1093,24	520,69	609,95179	4073,90002	40
Contrast	13,1265	1,55175	10,1424	16,6039	40
Exposure	120	120	120	180	40
Airmass	1,00843	2,27567	1,00843	2,27567	40

TOPCAT(1): Row Subsets

Row Subsets for 1: cg06413.txt

ID	Name	Size	Fraction
_1	All	40	100%



Axes

Bars

Legend

- 1: cg06

Bin Size:

Bin Phase:

Cumulative:

Normalised:

Position **Subsets** **Form**

Legend

- 1: cg06

Mark

Size

Coordinates

Size: Airmass

Global Style

Shape:

Max Marker Size:

Set Activation Action

f(x) ? X

No Action

Display Cutout Image

View URL as Image

View URL as Spectrum

View URL as Web Page

Transmit Row

Transmit Coordinates

Execute Custom Code

Cutout Service: SuperCOSMOS All-Sky Blue

RA column: ra_min degrees

Dec column: dec_min degrees

Width/Height in Pixels: 100 (0.67 arcsec)

Image Location column: Image

Image Format: FITS

Image Viewer: SoG (internal)

Spectrum Location column:

Spectrum Viewer: All Clients

Web Page Location column:

Browser Type: basic browser

Target Application: All Clients

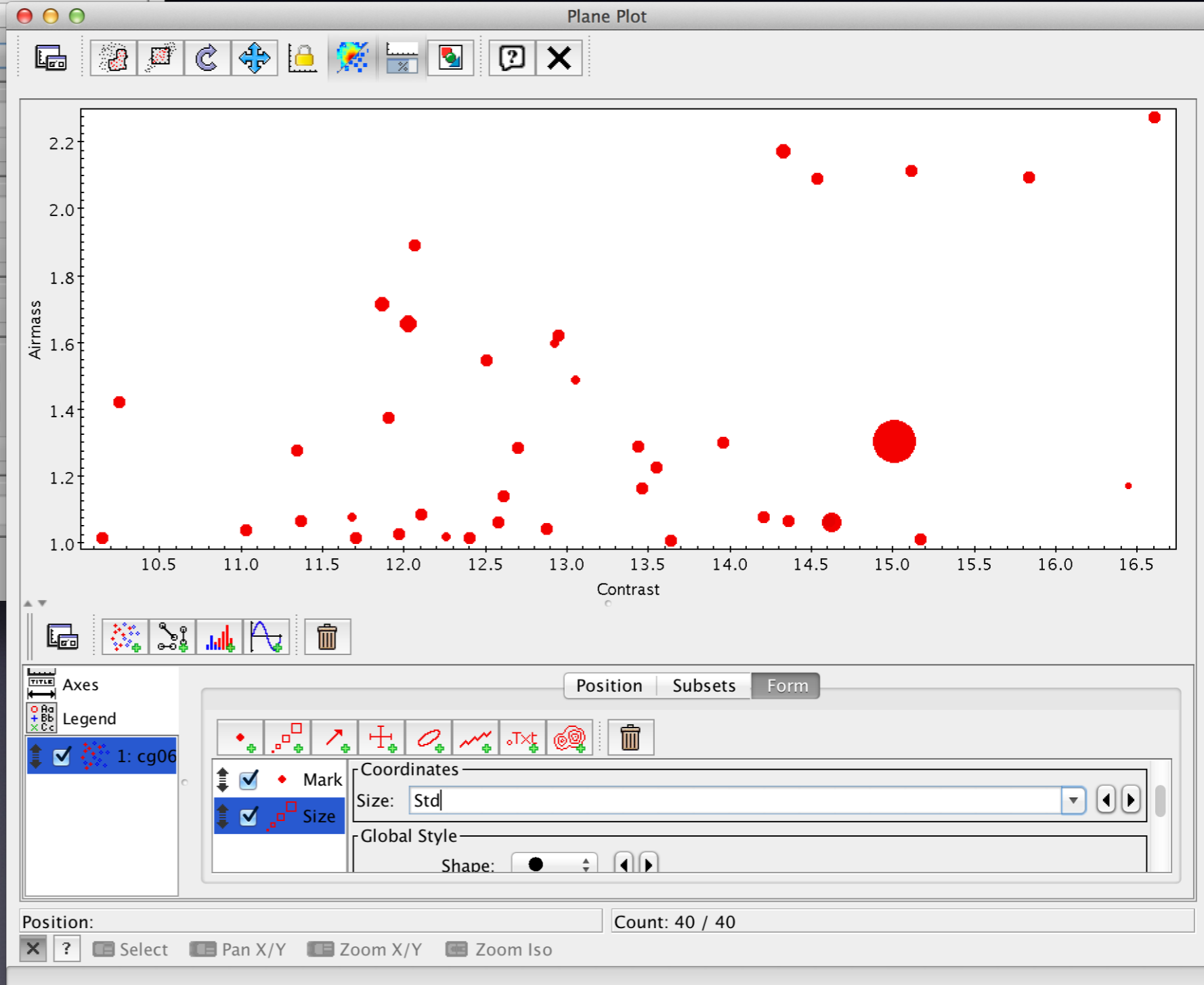
RA Column: ra_min

Dec Column: dec_min

Target Application: All Clients

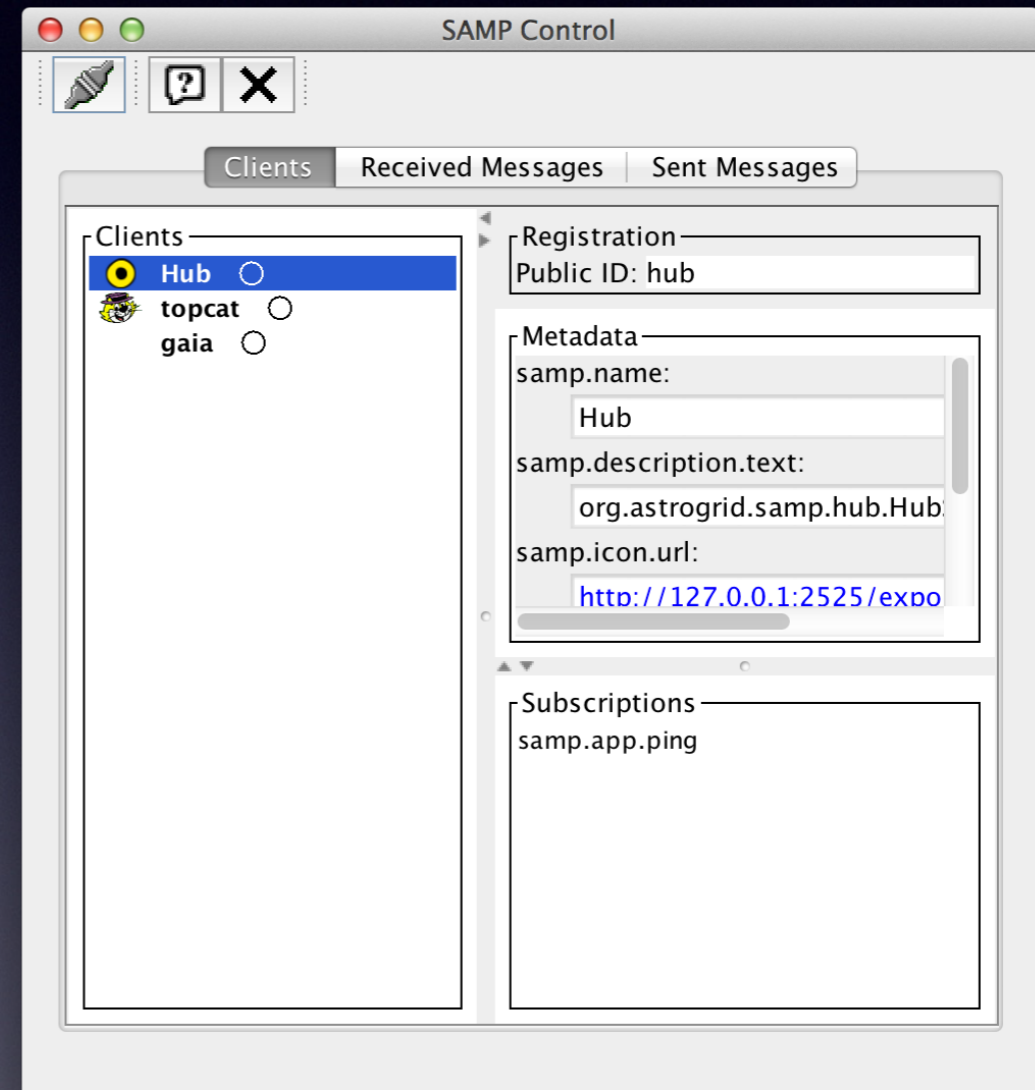
Executable Expression:

OK Cancel



The SAMP mechanism

- Simple Applications Messaging Protocol
- all tools communicate with a central "Hub" process
- Let's try with GAIA (or Aladin, or ds9)



Multiple Cone Search

Available Cone Search Services

Registry:

Keywords:

Match Fields: Short Name Title Subjects ID Publisher Description

Accept Resource Lists

Short Name	Title	Subjects	Identifier	Publisher	Contact
II/213	OGLE Galactic Bulge periodic variables (Udalski+ 1996)	Photometry, Stars:variable	ivo://CDS.VizieR/II/213	CDS	CDS supp
J/A+A/362/215	IJKs photometry of Galactic bulge variables (Schultheis+, 2000)	Stars:variable	ivo://CDS.VizieR/J/A+A/362/215	CDS	CDS supp
J/A+A/443/143	Mira Variables in the OGLE Bulge fields (Groenewegen+, 2005)	Photometry, Stars:variable	ivo://CDS.VizieR/J/A+A/443/143	CDS	CDS supp
J/AcA/60/261	New bright periodic variables toward Galactic Bulge (Nataf+, 2010)	Stars, Stars:variable	ivo://CDS.VizieR/J/AcA/60/261	CDS	CDS supp
J/MNRAS/364/117	OGLE2 Mira variables in the Galactic bulge (Matsunaga+, 2005)	Photometry, Stars:variable	ivo://CDS.VizieR/J/MNRAS/364/117	CDS	CDS supp

AccessURL	Description	Version
http://vizier.u-strasbg.fr/viz-bin/votable/-A?-source=J...		

Multiple Cone Search Parameters

Cone Search URL:

Input Table:

RA column: (J2000)

Dec column: (J2000)

Search Radius column:

Verbosity:

Output Mode:

Parallelism: Error Handling:

STILTS: « the command-line counterpart of TOPCAT »», Mark Taylor says

- format conversion
- crossmatching
- plotting
- column calculation and rearrangement
- row selections
- and more...

STILTS: some case studies

- tcopy:
stilts tcopy in=test.cat ifmt=votable out=test.tst ofmt=tst
head -25 test.tst
- tpipe:
stilts tpipe cmd='stats name mean stdev minimum maximum
skew kurtosis ngood' ifmt=votable in=test.cat ofmt=ascii
out=test.stats
more test.stats
- tcat:
stilts tcat in=@cgxml.list ifmt=votable icmd='select
"XY_Contrast>13.0"' out=cggood.txt ofmt=ascii
wc -l cggood.txt

A script (commented live)

```
#!/bin/sh

# Builds a list of certain objects of potential interest
source /star/etc/profile

Obj=$1
CutMag=$2
CutColor=$3

DirEROS=/Volumes/pepperland/erosdata
DirCat=$DirEROS/catalogs
DirSPB=$DirEROS/catalogs-spb

DirObj=$DirCat/$Obj
for Champ in $DirObj/*
do
    ChampRoot=$(basename $Champ)
    DirSPBChamp=$DirSPB/$Obj/$ChampRoot
    mkdir -p $DirSPBChamp
    for Cat in $Champ/*.cat
    do
        CatRoot=$(basename $Cat .cat)
        echo buildSPB : $CatRoot processing...
        CatOut=$DirSPBChamp/$CatRoot.cat
        stilts tpipe in=$Cat ifmt=ascii cmd='select "MagB<='$CutMag' && MagB-MagR<='$CutColor"'; keepcols
"erosid MagR ErrMR MagB ErrMB" \
            out=$CatOut ofmt=ascii
    done
done
done
```


And now,
this is your turn...