Astro-Wise Image Web-Services

Astro-Wise Workshop 2008

Serving images for surveys

Use case: large survey being processed on remote compute and storage facilities with Astro-WISE

Requirement for image-services:

Easy access to and handling of from web-browser:

- individual images
- image-data lineages (e.g. calibrations) as stored in the database
- image-data sets (e.g. RGB images)
- cut-out images from individual sources or from series in Sourcelists, Associatelists

AWE-Image-data web-services

Mode of operation:

- Single AWE-Image-server is connected to multiple data-servers storing FITS-images
- Image-Operations via http://imageview.astro-wise.org/ on demand :
  - Web-browser-view of entire images,
  - cut-out sub-images as single, or series in HTML-table
- Access from multiple interfaces

Image-processing operations

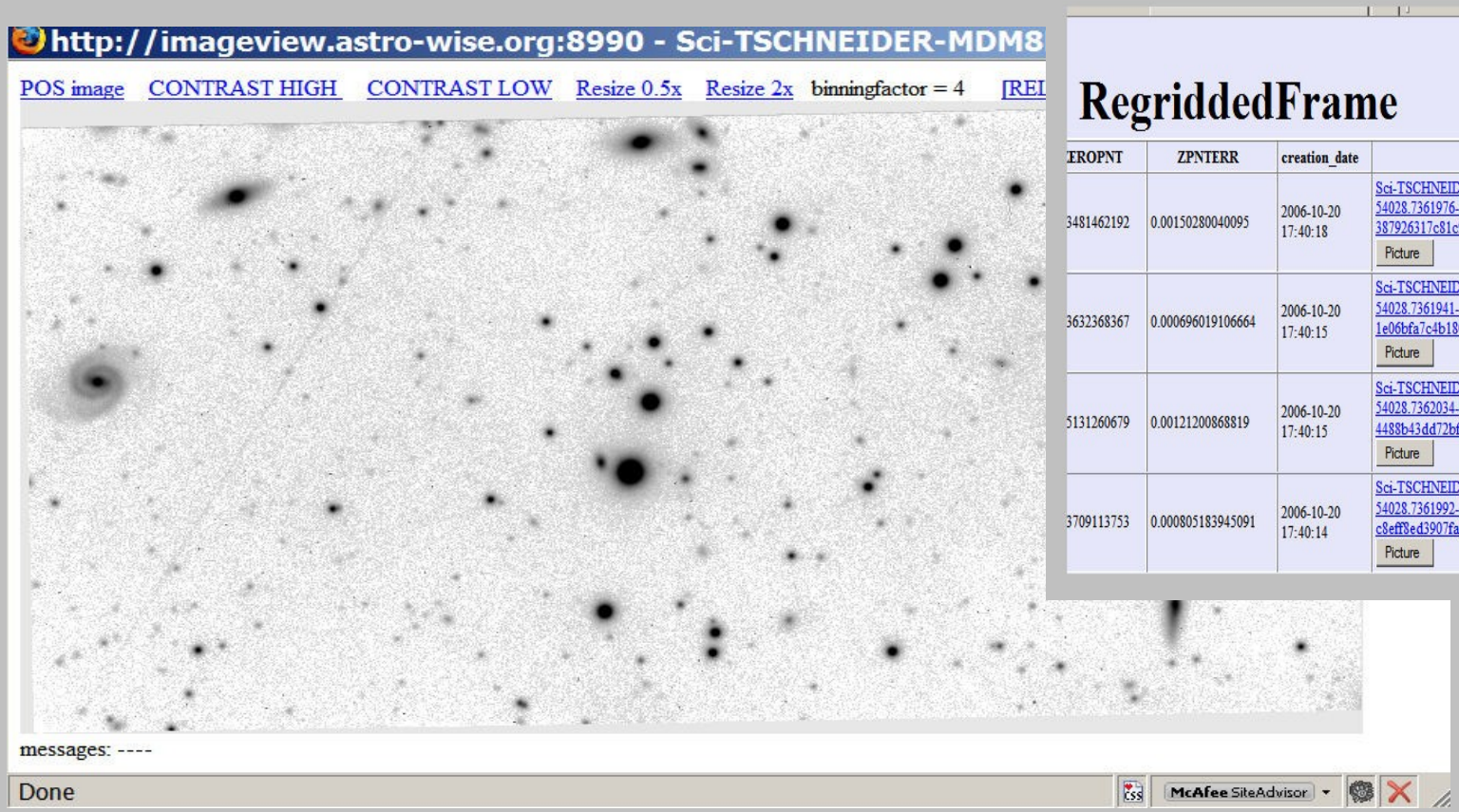
External programs are used for image-processing:

- Producing sub-images [cut-outs] (imcopy/pyFits)
- Conversion of fits-format to tif-format (stiff)
- Conversion of tif to png and jpg for web-viewing (convert)
- Compression and combination of sub-images (zip)
- Add data to fitsheader: (pyFits)

Viewing whole images

access tables in database via web-interface at http://dbview.astro-wise.org/

Call an image from a button in the table for on-demand processing:

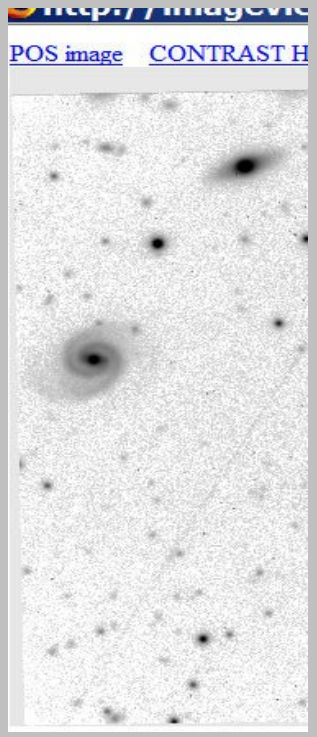


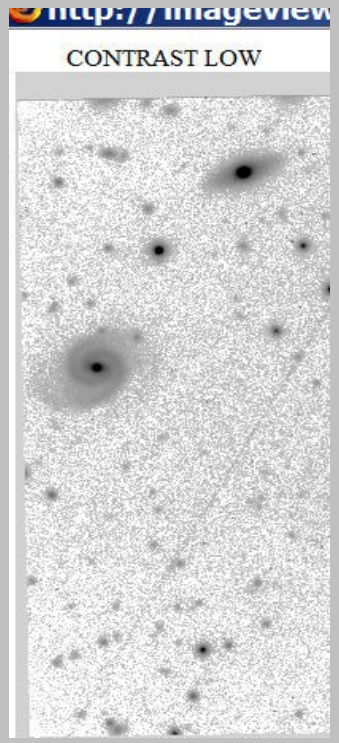
RegriddedFrame

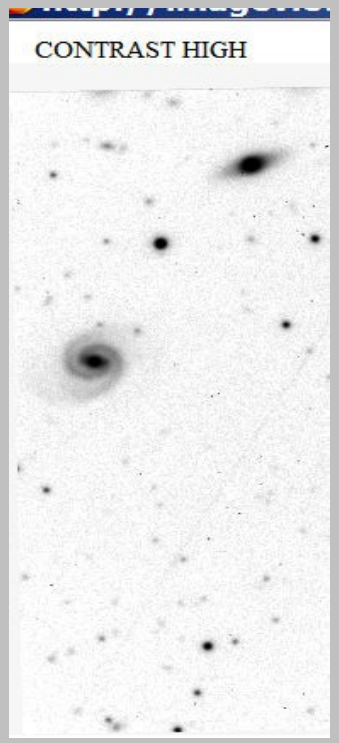
ZEROPNT	ZPNTERR	creation_date	filename	globalname
3481462192	0.00150280040095	2006-10-20 17:40:18	Sci-TSCHNEIDER-MDM8K-------R-4-Regr---Sci-54028.7361976-387926317c81c90b05986445ef19c66045a531a8.fits Picture	NULL
3632368367	0.000696019106664	2006-10-20 17:40:15	Sci-TSCHNEIDER-MDM8K-------R-5-Regr---Sci-54028.7361941-1e06bfa7c4b1801fb31b029155d45a45e8294607.fits Picture	NULL
5131260679	0.00121200868819	2006-10-20 17:40:15	Sci-TSCHNEIDER-MDM8K-------R-3-Regr---Sci-54028.7362034-4488b43dd72bf3d87be6529c005d4ee9b48f09e2.fits Picture	NULL
3709113753	0.000805183945091	2006-10-20 17:40:14	Sci-TSCHNEIDER-MDM8K-------R-6-Regr---Sci-54028.7361992-c8eff8ed3907fa696c890662ac423a715287fcfd.fits Picture	NULL

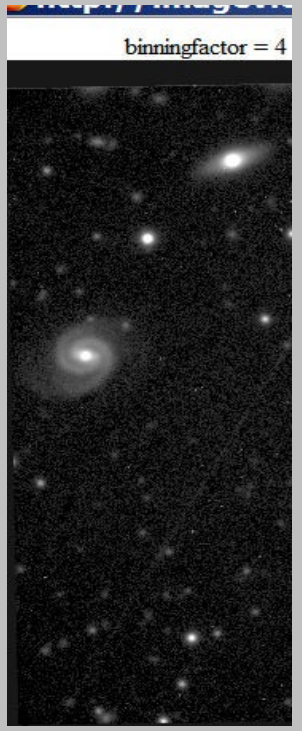
Tweak the image

Change contrast or invert color









Find main-image and related images in object-view mode

Follow the dependency-tree in objectview

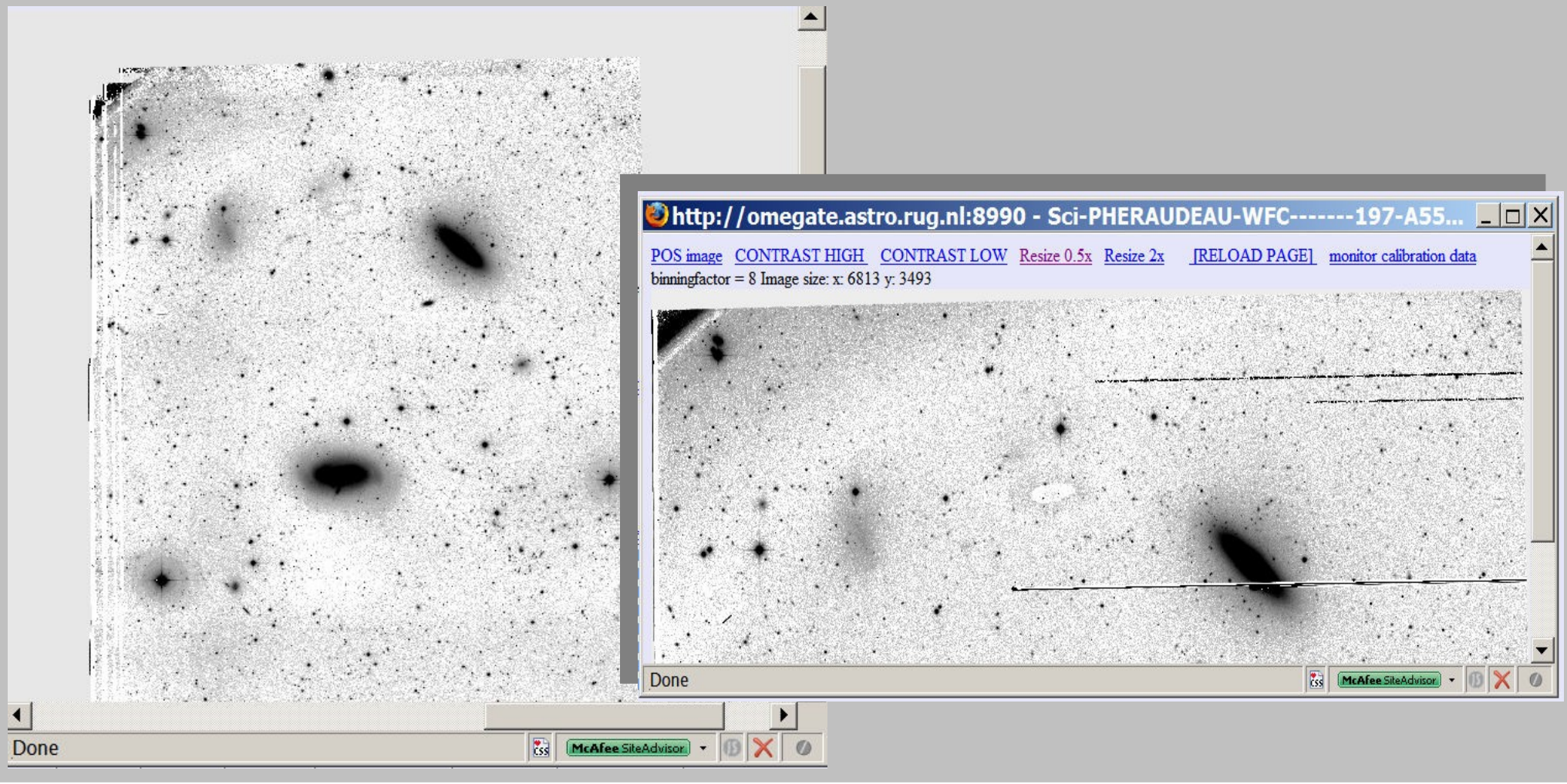
```
Main-Object : CoaddedRegriddedFrame
 |- astrom.CRVAL2          | 9.5237674
 |- astrom.CRVAL1          | 187.37622
 |- NAXIS1                 | 27003
 |- NAXIS2                 | 11754
 |- OBJECT                 | P3 Ha 300s;P3 Ha 600s
 |- ZEROPNT                | 0.0
 |- ZPNTERR                | 0.0
 |- ccds                   | (, [])
 |- creation_date          | 2006-07-31 18:06:50
 |- filename               | Sci-PHERAUDEAU-WFC-------197---Coadd---Sci-53947.7489918.fits  Picture

 |- globalname             | NULL
 |- is_valid               | 1
 |- process_status         | 1
 |- psf_radii_per_ccd      | ((, ), [])
 |- psf_radius             | 1.225652
 |- quality_flags          | 0
 | ------------>           ['regridded_frames1']
 | +astrom                   [level : 2]
 | +filter                   [level : 2]
 | +grid_target              [level : 2]
 | +instrument               [level : 2]
 | +observing_block          [level : 2]
 | +process_params           [level : 2]
 | +swarpconf                [level : 2]
 | +weight                   [level : 2]
```

regridded_frames1

DATE_OBS	FLXSCALE	NAXIS1	NAXIS2	OBJECT	ZEROPNT	ZPNTERR	creation_date	filename
2006-02-20 03:41:07	6.38038779082e-13	6813	3493	P3 Ha 600s	30.4878823117	0.2	2006-07-18 15:25:13	Sci-PHERAUDEAU-WFC-------197-A5530-3-Regr---Sci-53934.6421374.fits Picture
2006-02-21 01:39:59	6.42092088955e-13	6840	3506	P3 Ha 600s	30.4810067022	0.2	2006-07-18 15:23:57	Sci-PHERAUDEAU-WFC-------197-A5382-1-7-Regr---Sci-53934.6412786.fi Picture
2006-02-21 01:53:15	6.41068393667e-13	6839	3506	P3 Ha 600s	30.4827390861	0.2	2006-07-18 15:24:54	Sci-PHERAUDEAU-WFC-------197-A5382-1-7-Regr---Sci-53934.6419495.fi Picture
2006-02-20 03:41:07	6.38038779082e-13	3401	6806	P3 Ha 600s	30.4878823117	0.2	2006-07-18 15:20:55	Sci-PHERAUDEAU-WFC-------197-A5383-17-7-Regr---Sci-53934.6392441. Picture

Inspect frames in dependency-tree

- Part of large (27003x11754) coadded frame in background; Complete regridded frame (6813x3493) in foreground

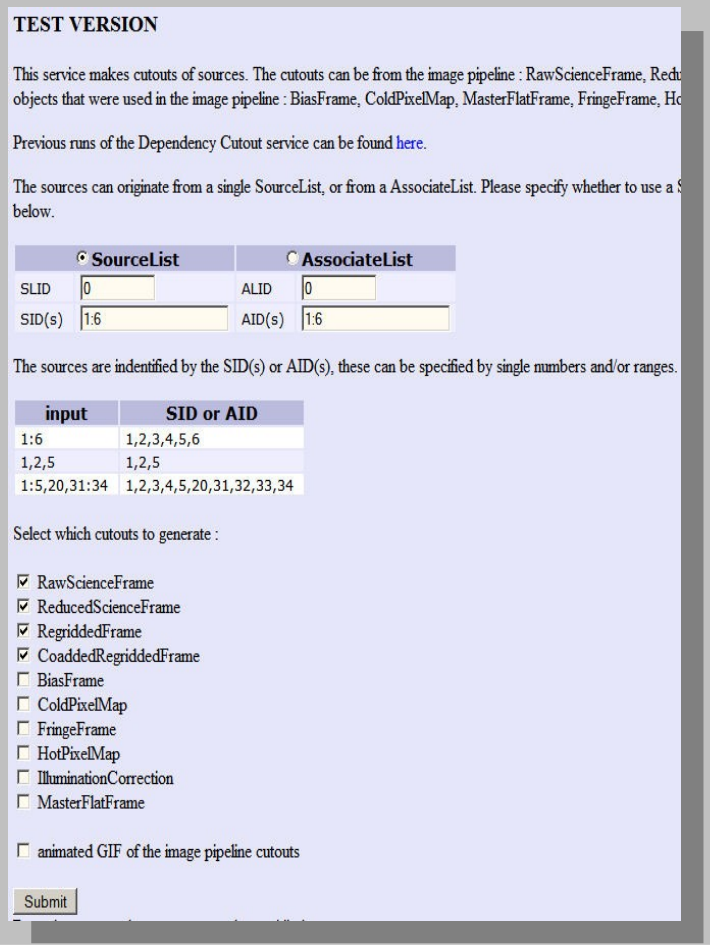


Cut-out-services

- Access for webservices via separate servers: dbviewer, RGB-image-server, dependency-cut-out-server.
- Principle: generate sub-image on-demand, if not already present
- Visualize as JPG/PNG-image by web-browser
- Large cut-outs: view RGB-images
- Small cutouts: view individual sources

RGB image-, Dependency-cut-out servers interact with image-server

Separate web-interfaces At http://process.test.astro-wise.org/RgbMaker , http://process.test.astro-wise.org/DependencyCutout

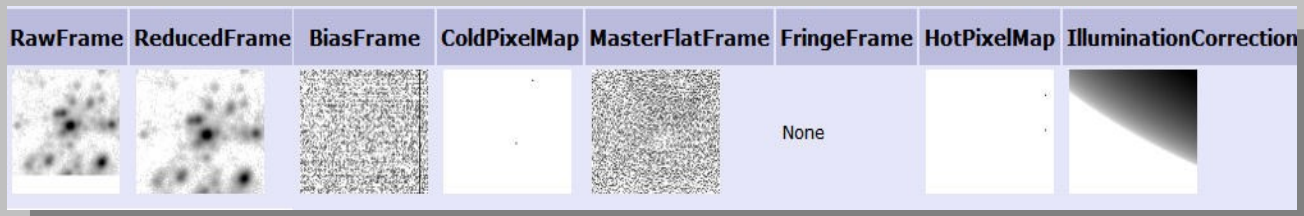


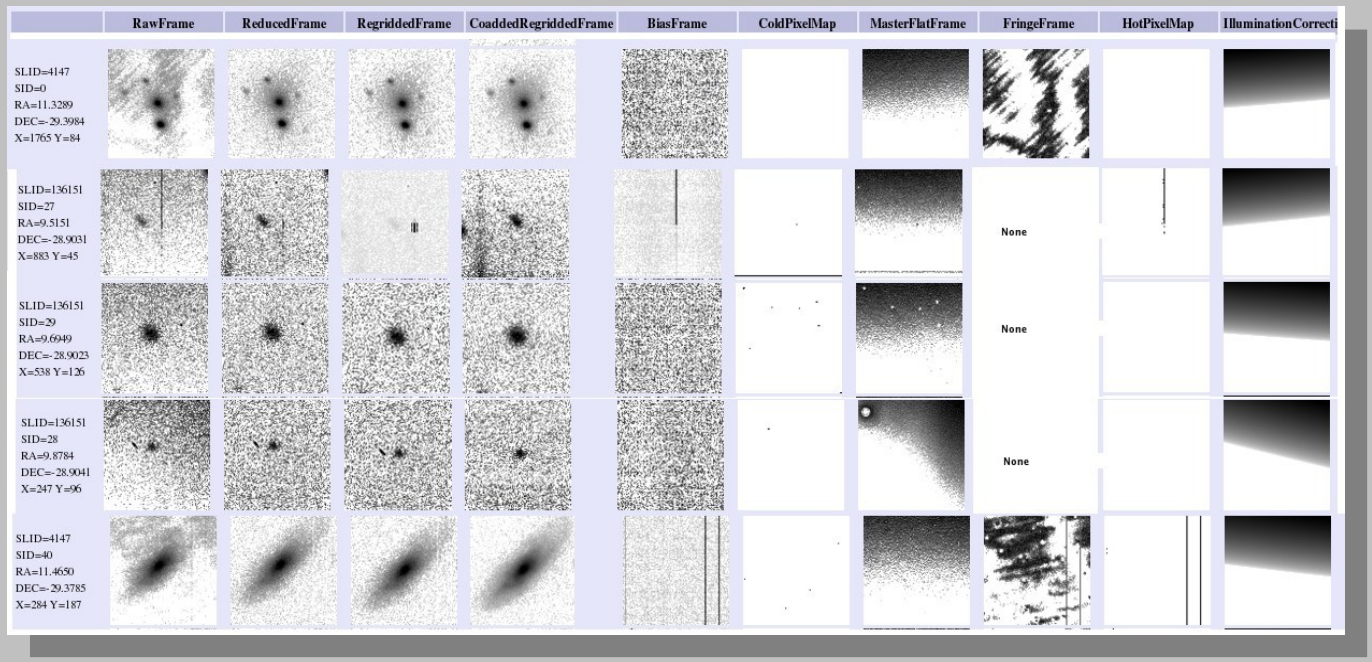
Output from RGB-cutout-server

Images are combined into a jpg-picture

Links in SourceLists-4

Alternate Links-1: To dependency-server showing cut-outs from related images





Interfacing cutout-services from tables in dbviewer

- Access image-server by HTML-links from database-tables at http://dbview.astro-wise.org
- SourceLists , AssociateList tables show links if fits-image is available
- on demand by controls from these tables:
  - fixed-sized cutouts
  - dependent cut-out-series

Links in SourceLists-1

Table has links and buttons to image-server if fitsfile is present

uplink SourceList-data to Aladin sky-atlas applet

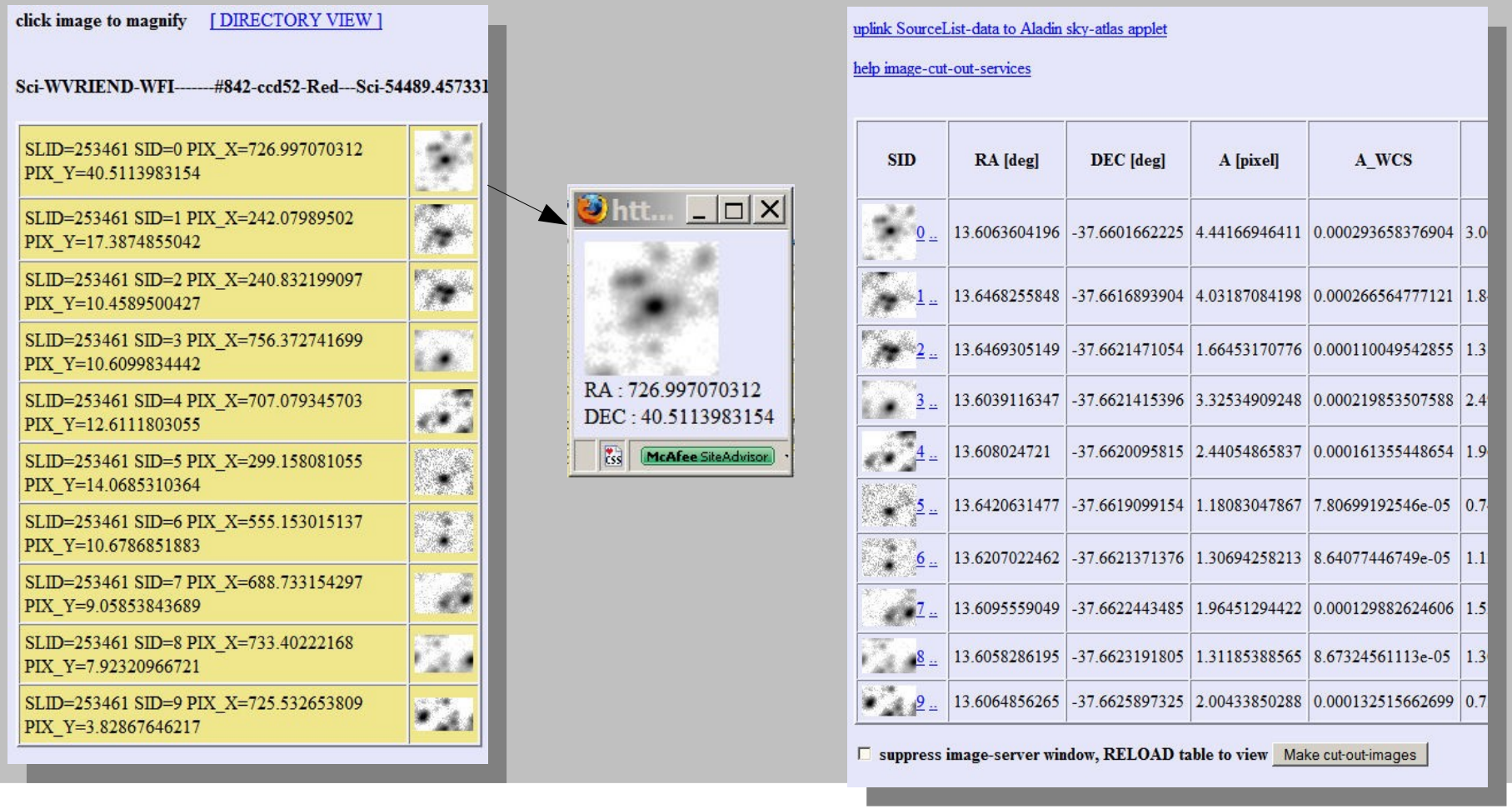
help image-cut-out-services

SID	RA [deg]	DEC [deg]	A [pixel]	A_WCS	
0 ..	13.6063604196	-37.6601662225	4.44166946411	0.000293658376904	3.06
1 ..	13.6468255848	-37.6616893904	4.03187084198	0.000266564777121	1.84
2 ..	13.6469305149	-37.6621471054	1.66453170776	0.000110049542855	1.38
3 ..	13.6039116347	-37.6621415396	3.32534909248	0.000219853507588	2.49
4 ..	13.608024721	-37.6620095815	2.44054865837	0.000161355448654	1.96
5 ..	13.6420631477	-37.6619099154	1.18083047867	7.80699192546e-05	0.74
6 ..	13.6207022462	-37.6621371376	1.30694258213	8.64077446749e-05	1.13
7 ..	13.6095559049	-37.6622443485	1.96451294422	0.000129882624606	1.53
8 ..	13.6058286195	-37.6623191805	1.31185388565	8.67324561113e-05	1.30
9 ..	13.6064856265	-37.6625897325	2.00433850288	0.000132515662699	0.75

☐ **suppress image-server window, RELOAD table to view** Make cut-out-images

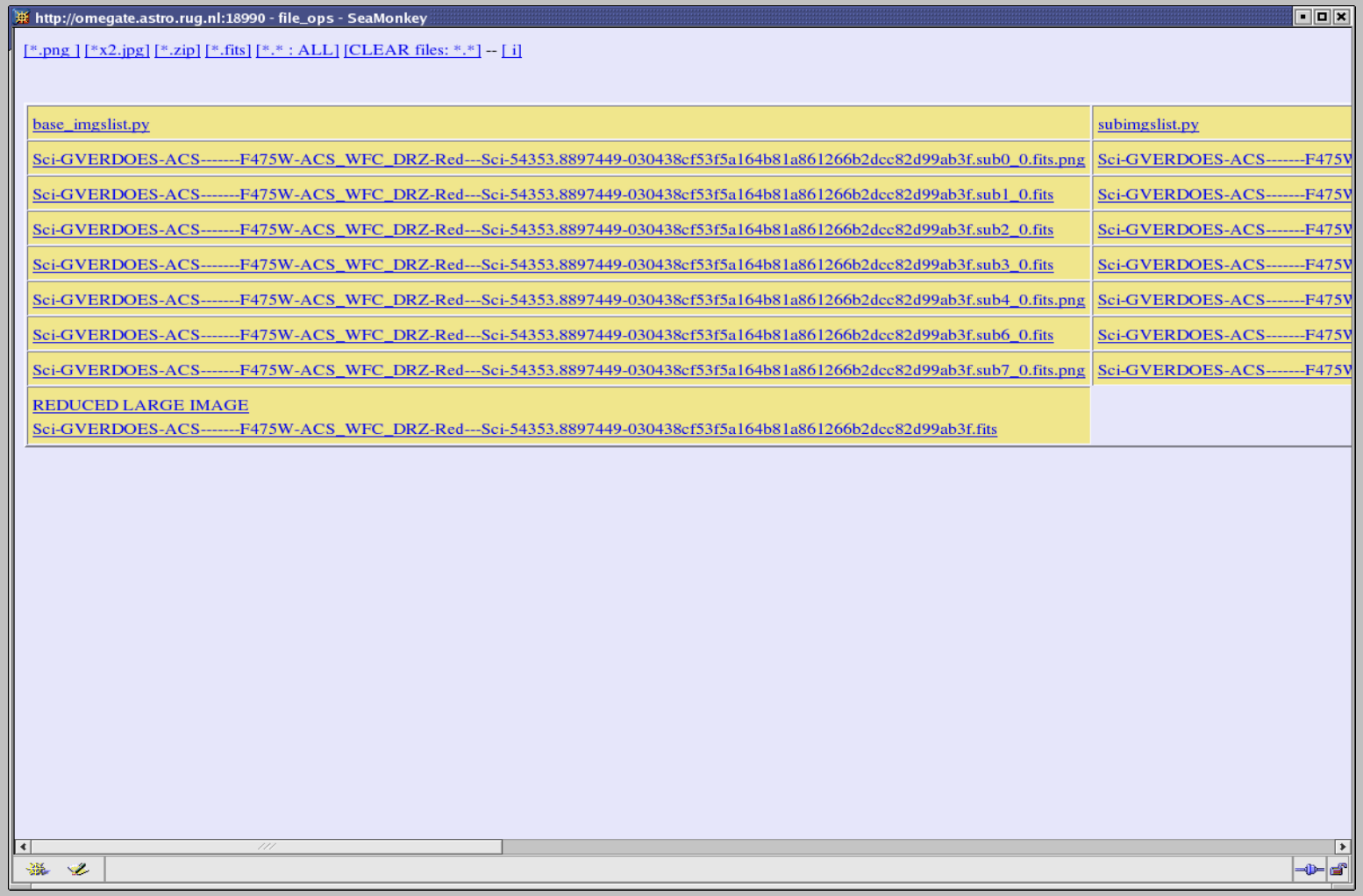
Links in SourceLists-2

- Cut-outs appear in image-server-interface, allowing free-floating popup enlargements
- Cut-outs may be shown in Sourcelist-table after reloading



Links in SourceLists-3

Access-menu to cut-outs-directory for inspection and download



Links in SourceLists-5

- Alternate links-2: Export source-locations to Aladin sky-atlas to view location and distribution of cut-outs
- Communicate with VO-programs using Aladin's built-in “Plastic” -protocol

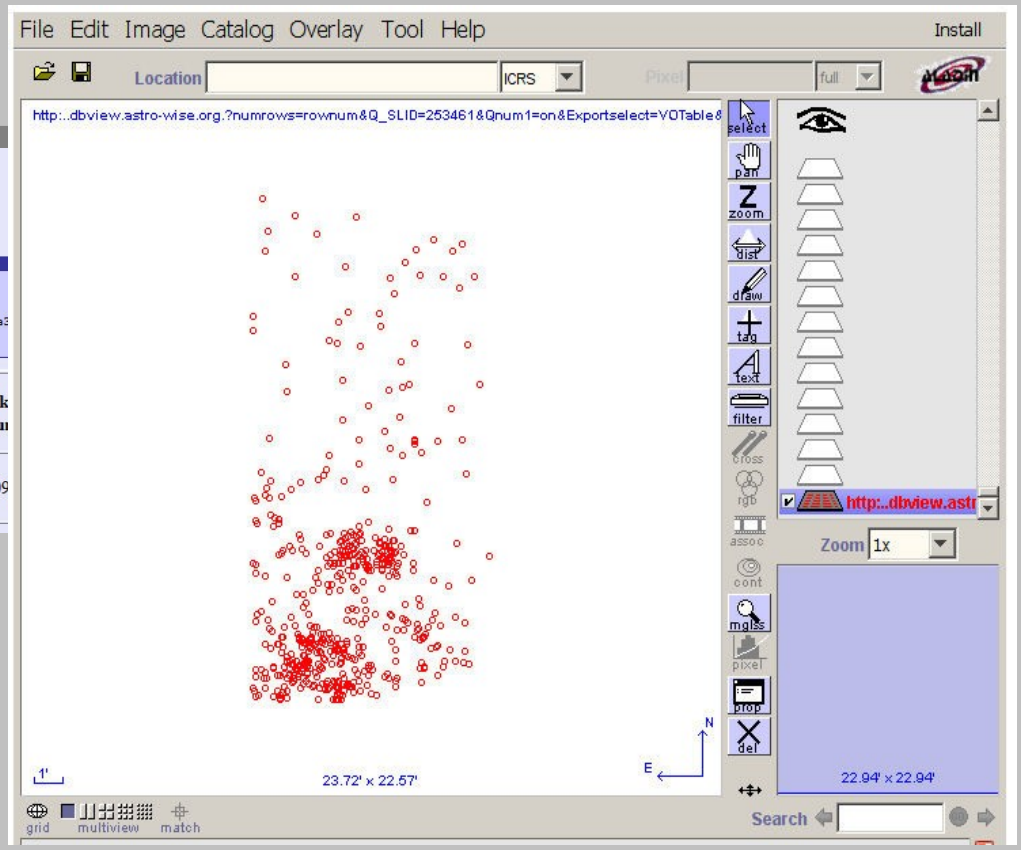
Total number of rows selected : 515 from project-context : ALL

uplink SourceList-data to Aladin sky-atlas applet

help image-cut-out-services

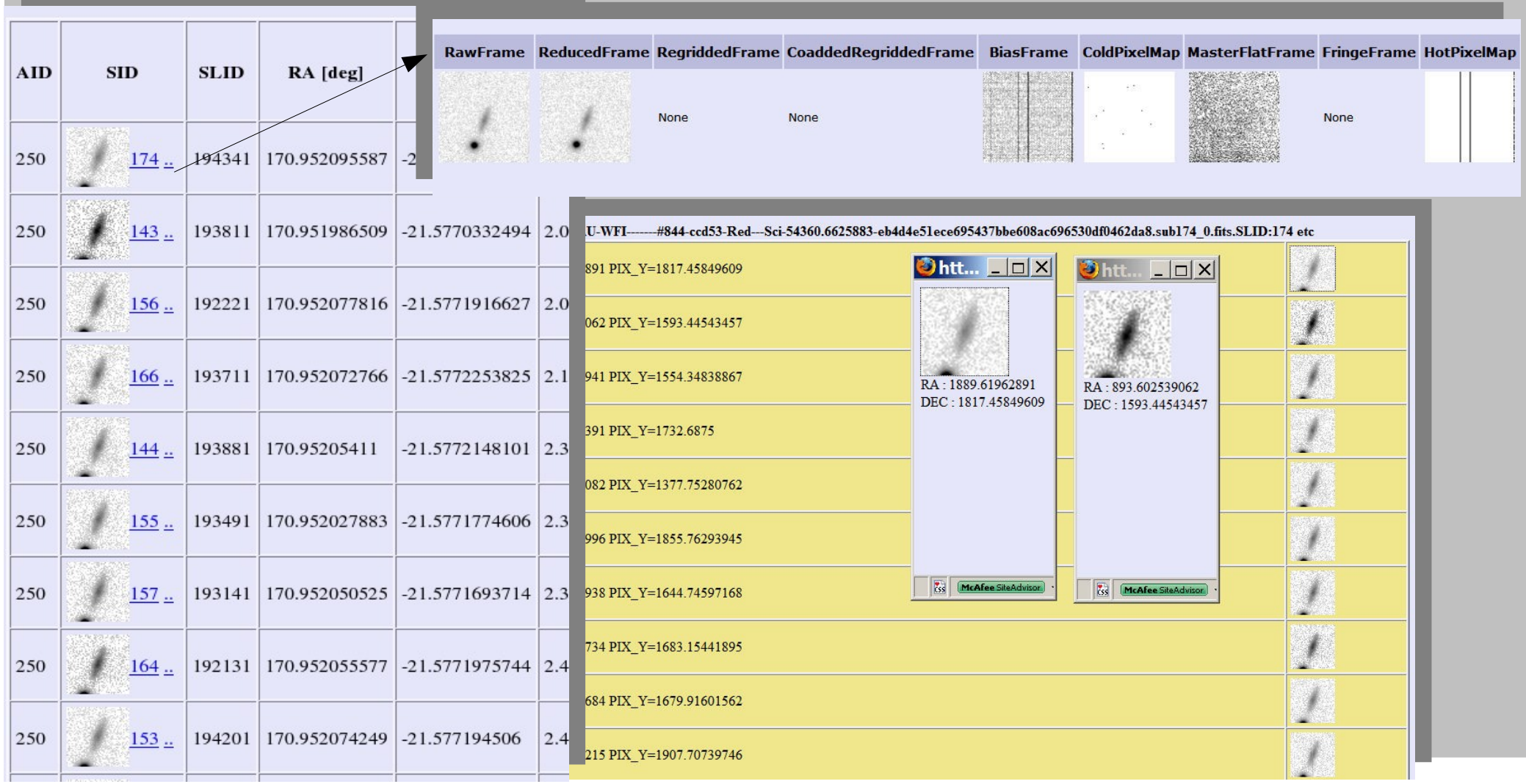
Export to Aladin-sky-atlas
1- Click link to load present table-data to Aladin-sky-atlas (without row-number-restriction)
2- to access the fits-image via Aladin LOAD, SERVER SELECTOR and FILE menu:
load cut-out or whole image from local directory or get whole image from
http://ds.astro.rug.astro-wise.org:8000/Sci-WVRIEND-WFI-------%23842-ccd52-Red---Sci-54489.4573311-6390ab97a3
NB images: memory-restrictions of Aladin as browser-applet may limit the workable size.
NB tables: use Aladin v.4 communication-button to interact with other VO applications [radio-dish pictogram]

SID	RA [deg]	DEC [deg]	A [pixel]	A_WCS	B [pixel]	B_WCS	Back [cou
0 ..	13.6063604196	-37.6601662225	4.44166946411	0.000293658376904	3.0658416748	0.000202696333872	182.3809



Links in AssociateLists-1

Get cutout-images from associated source-lists (ALID=97961): compare related sets by AID



AID	SID	SLID	RA [deg]	
250	174 ..	194341	170.952095587	-2
250	143 ..	193811	170.951986509	-21.5770332494
250	156 ..	192221	170.952077816	-21.5771916627
250	166 ..	193711	170.952072766	-21.5772253825
250	144 ..	193881	170.95205411	-21.5772148101
250	155 ..	193491	170.952027883	-21.5771774606
250	157 ..	193141	170.952050525	-21.5771693714
250	164 ..	192131	170.952055577	-21.5771975744
250	153 ..	194201	170.952074249	-21.577194506

RawFrame	ReducedFrame	RegriddedFrame	CoaddedRegriddedFrame	BiasFrame	ColdPixelMap	MasterFlatFrame	FringeFrame	HotPixelMap
		None	None				None	

U-WFI-------#844-ccd53-Red---Sci-54360.6625883-eb4d4e51ece695437bbe608ac696530df0462da8.sub174_0.fits.SLID:174 etc

891 PIX_Y=1817.45849609

062 PIX_Y=1593.44543457

941 PIX_Y=1554.34838867

391 PIX_Y=1732.6875

082 PIX_Y=1377.75280762

996 PIX_Y=1855.76293945

938 PIX_Y=1644.74597168

734 PIX_Y=1683.15441895

684 PIX_Y=1679.91601562

215 PIX_Y=1907.70739746

htt...

RA : 1889.61962891
DEC : 1817.45849609

McAfee SiteAdvisor

htt...

RA : 893.602539062
DEC : 1593.44543457

McAfee SiteAdvisor

Links in AssociateLists-2

More examples of related series (marked by AID)

different epochs (ALID 3306)

AID	SID	SLID	RA [deg]	DEC [deg]	
0	4868 ..	20463	201.38334928	-43.1696512075	2.7
0	5476 ..	20496	201.383378567	-43.1696431829	2.4
0	5207 ..	20286	201.383372468	-43.1696435266	2.7
0	4772 ..	20253	201.383362373	-43.1696454142	2.2
0	5112 ..	20352	201.38337013	-43.1696348793	2.4
0	2802 ..	20234	201.383404329	-43.1696296584	3.8
0	7509 ..	20422	201.383406254	-43.1696273291	2.5
0	5213 ..	20533	201.383378018	-43.1696330713	2.7
0	4606 ..	20320	201.383368484	-43.1696535446	2.5
0	5271 ..	20587	201.38341795	-43.1696349251	2.3

different filters (ALID 64471)

AID	SID	SLID	RA [deg]	DEC [deg]	
0	26 ..	135801	10.5160903384	-28.9063052094	1.93
0	26 ..	135591	10.851568552	-28.9025545112	2.57
0	1 ..	135611	11.0233793185	-28.9073823568	4.76
1	1 ..	135801	10.6902055414	-28.9062582895	2.47
1	2 ..	135611	10.941408324	-28.9110374686	6.48
1	1 ..	135591	10.6902517643	-28.9062926261	4.05
2	23 ..	135801	10.6646641242	-28.9071070595	3.65
2	35 ..	135591	10.9298555855	-28.8998316828	0.95
2	3 ..	135611	10.9610869014	-28.9126911772	5.32
3	40 ..	135801	10.8284716796	-28.9045897778	2.95

options

Options for more control:

- log/ speed issues:
  -select cutout-operation by py-fits (data-servers) or imcopy (image-server)
  -show speed of operations of individual steps
  -access log of image-operations
- Setting size and format: use image-client from python- or AWE- prompt instead of browser (see previous workshop).

Next steps: customizing interfaces

Individual tables can be fitted with alternative links, for instance:

- GalfitModel: Links to models
- SourceList: Multiple links to tables, pictures, graphical interfaces

Conclusion

- Image-services for ASTRO-WISE are provided from multiple interfaces
- viewing fits-files in web-browser-compatible format allows working with large images
- Image-services accessed from web-interfaced database-tables and -trees enable efficient support for large surveys