

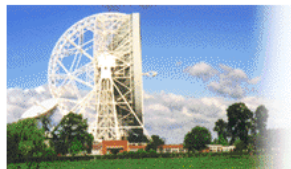
A PPARC funded project

# Accessing Wide Imaging Surveys from AstroGrid

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CCLRC  
Rutherford Appleton Laboratory



Jodrell Bank  
Observatory



# Overview

- The Virtual Observatory: what & why
- The UK VO: AstroGrid
- Accessing large imaging surveys and databases
- Example: doing science with AstroGrid

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# The Virtual Observatory (VO)

- Collection of integrated astronomical data archives and software tools that utilize computer networks to create an environment in which research can be conducted  
( <http://www.encyclopedia.com> )

*Thanks to Ohishi Masatoshi (NAOJ) for the pointer...*

# VO Goals

- Improving the quality, ease, speed and cost effectiveness of on-line astronomy
- Making comparison and integration of data from diverse sources seamless and transparent
- Removing data analysis barriers to multiwavelength analysis
- Enabling access and manipulation of large data sets

# International Collaboration

- Similar efforts now in 15 countries:
  - UK, USA, Canada, France, Germany, Italy, Holland, Japan, Australia, India, China, Russia, Hungary, South Korea, ESO, Spain
- Active collaboration among projects
  - Standards, common demos
  - International VO roadmap being developed
  - Regular telecons over 10 timezones

Formal collaboration  
**International Virtual  
Observatory Alliance  
(IVOA)**



# The need for a VO

- Data volume doubles every year
- Increase of size and multiplex capabilities of new instruments (WFCAM, VISTA, ...)
- By 2010 we will have **petabytes** of data
- Federation of the data is a must, but how?
- WWW becomes the best observatory:
  - Data on every part of the sky and every wavelength
  - The seeing is always great. Never cloudy.
  - As deep as the best instruments.

# Overview

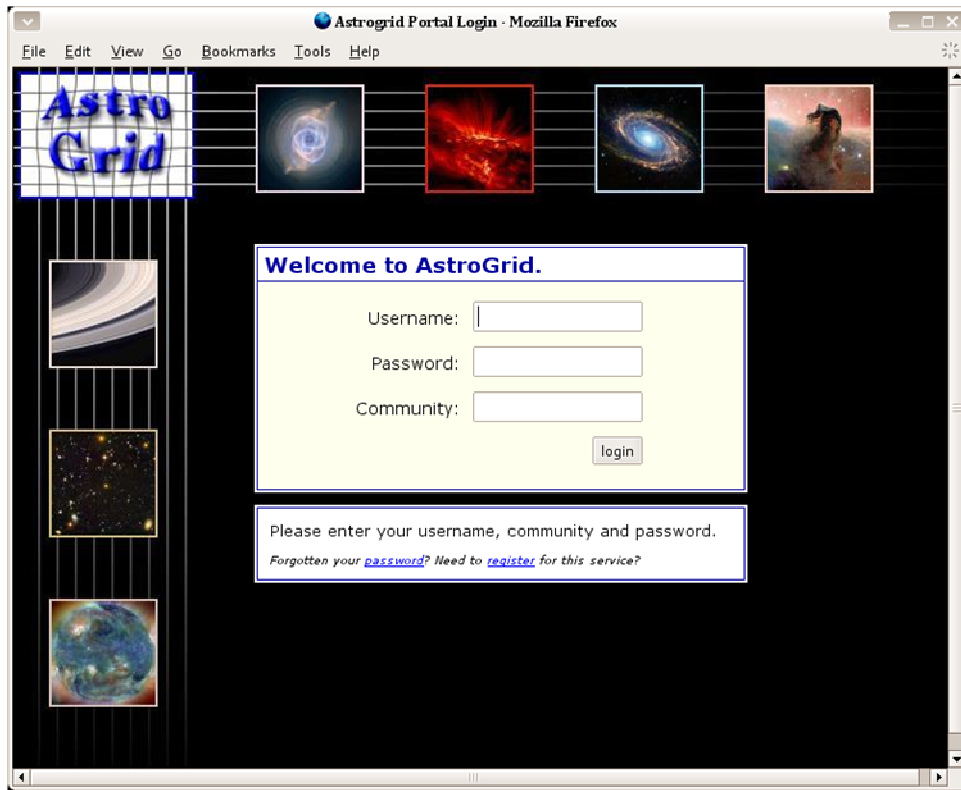
- The Virtual Observatory: what & why
- The UK VO: AstroGrid
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- Example: doing science with AstroGrid



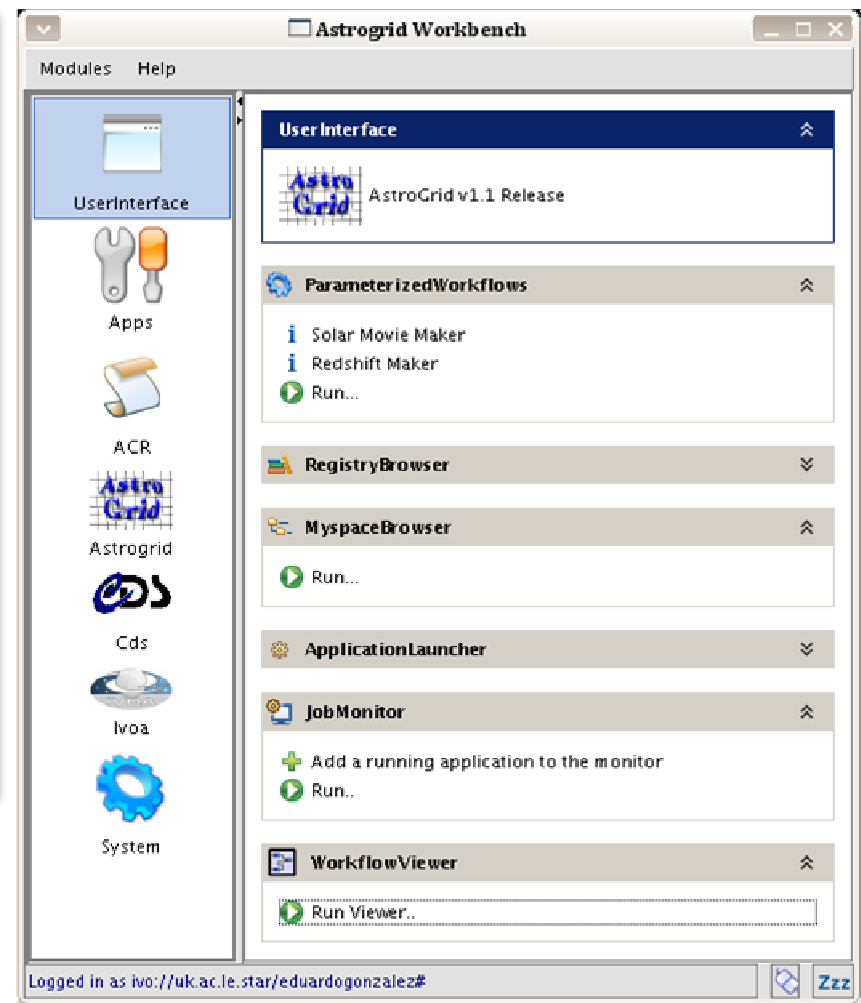
# AstroGrid: the UK VO

- Astrogrid release 1.1:
  - <http://www.astrogrid.org/release>
- Access to imaging servers (e.g. WFS, SDSS), catalogues (e.g., WFS, 2MASS, SWIRE, FIRST, Vizier)
- Wide range of tools available:
  - X-matcher, SExtractor, SWARP, HyperZ, BPZ, GALAXEV, ...

# AstroGrid: the UK VO



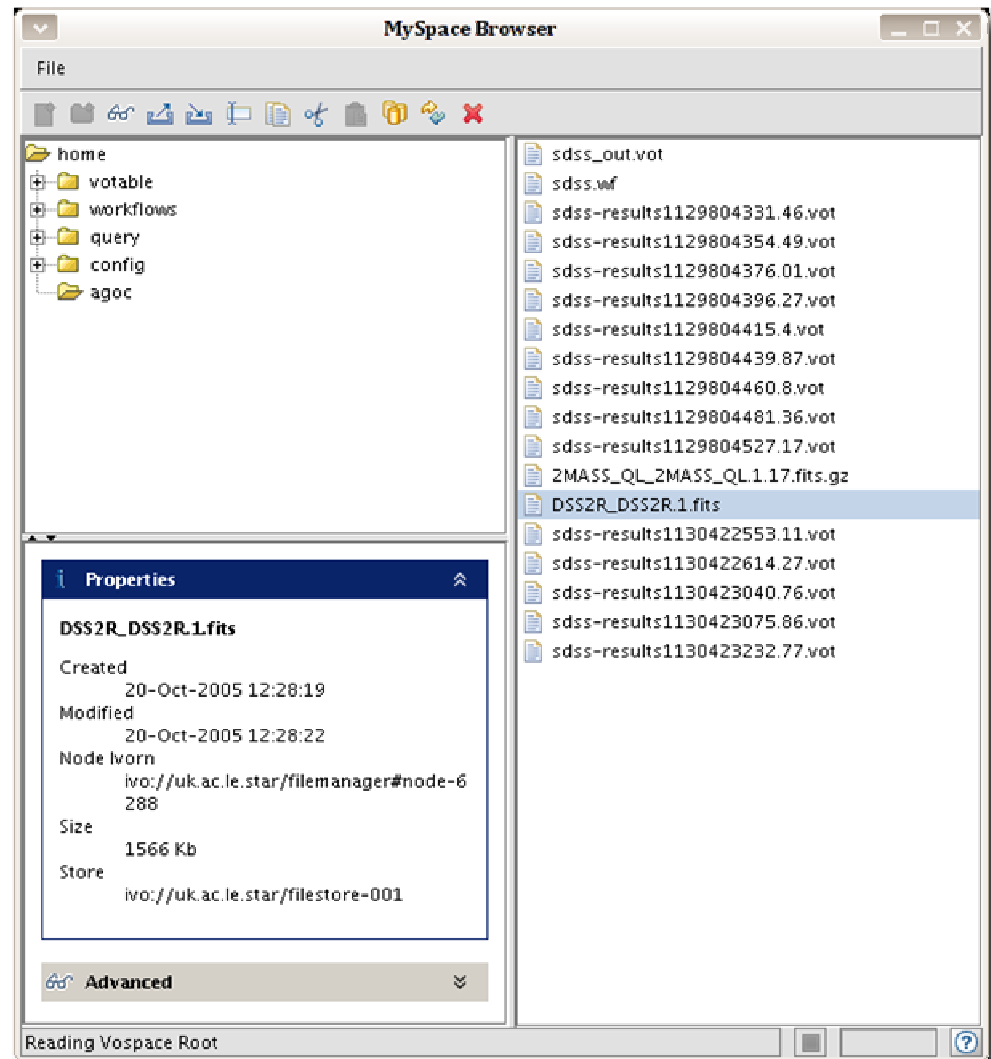
Astrogrid Portal



Astrogrid Workbench

# AstroGrid: MySpace

- Virtual disk space where you can store results, temporary files, and new things like query files and workflow files, so you can adjust and re-run jobs on a later day.
- Visible from any computer.



# Astrogrid: Workflow

- User compose a complex series of tasks which can be run on sequence or parallel (or loops)
- Jobs are run remotely and asynchronously
- Results are stored in a virtual file system
- Queries and workflows can be re-used and shared
- AstroGrid is currently the only VO project with a workflow workbench where scientific workflows can be created and run.
- Workflows are constructed via discovery of relevant data and applications from the registry

# AstroGrid: Workflow

The screenshot shows the 'Workflow Builder' application window. On the left is a 'Toolbox' containing various workflow components: Step, Flow, Sequence, If, Scope, Script, Set, Unset, For loop, Parallel loop, and While loop. The main workspace is divided into a 'Tree View' and a 'Document' view. The 'Tree View' shows a hierarchy starting with 'SIAP query to WFS' and 'Image query. Save Images to MySpace.', which are part of a 'Sequence' containing a 'Step'. The 'Document' view shows the configuration for the selected 'Step', including inputs (Position: 240.9,55.1, Size: 0.01, Format: image/fits) and outputs (ImagesTable: ivo://uk.ac.le.star/eduardogonzalez#votable/...). Below the step configuration is a 'Script' section containing a code block for saving files to MySpace.

**Workflow root**

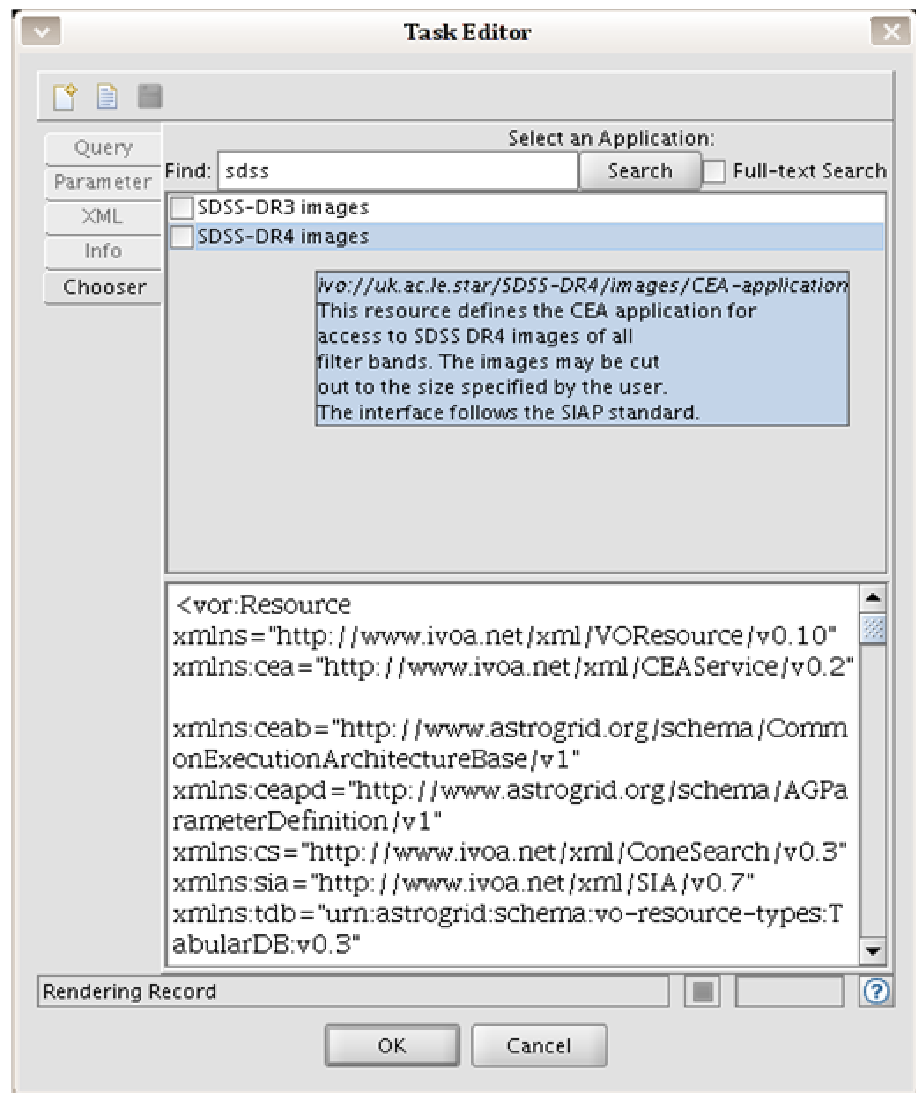
**SIAP Query step**

**Script to save files into MySpace**

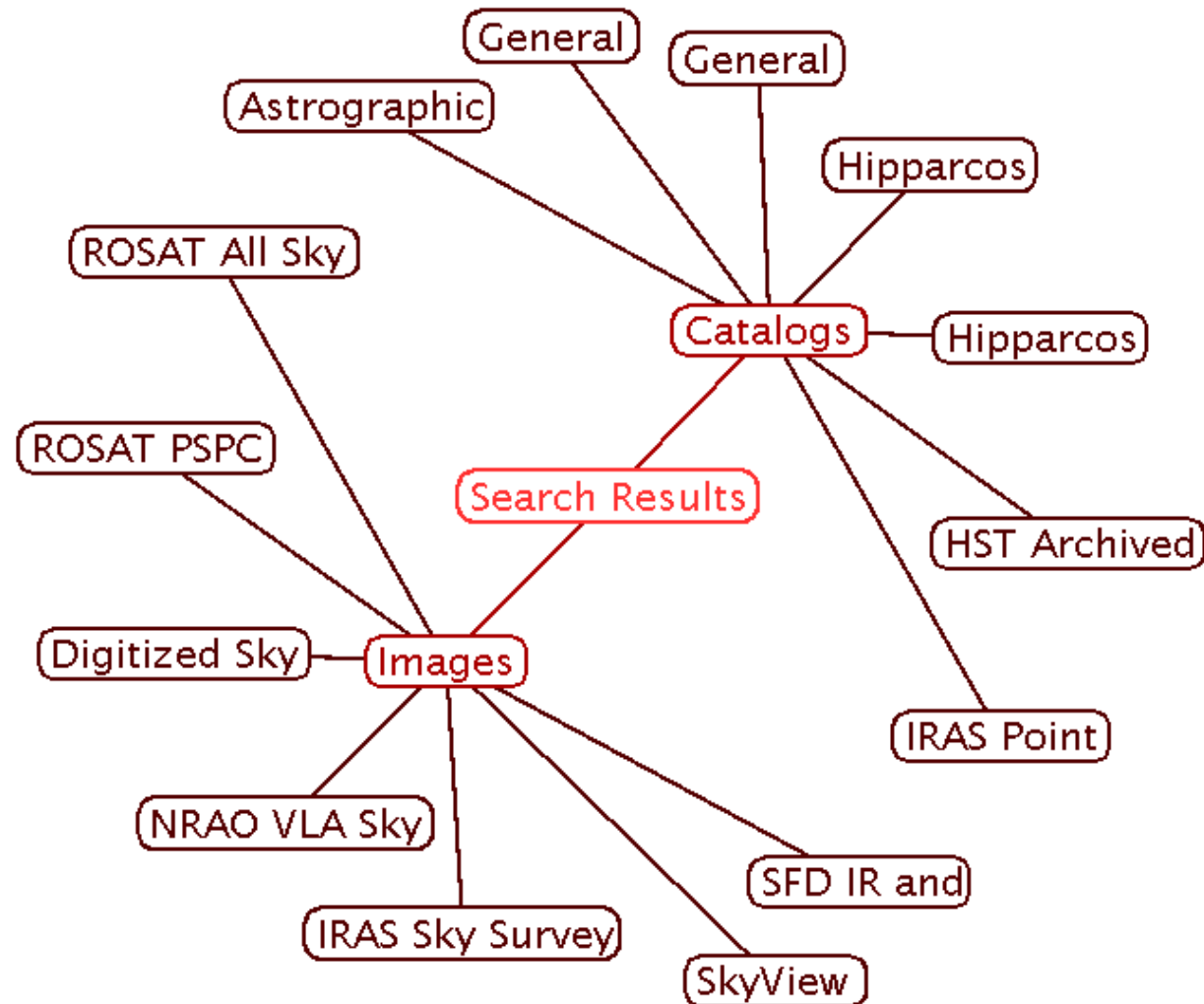
```
ev=astrogrid.ioHelper.getExternalValue(userIvorn.toString()+"#votable/siap.vot")
table = astrogrid.tableHelper.builder.makeStarTable(ev)
nameCol = (0 ... table.columnCount ).find{ table.getColumnInfo( it ).name == 'title' }
urlCol = (0 ... table.columnCount ).find{ table.getColumnInfo( it ).name == 'accref' }
table.iterator().each {
    name = it[nameCol].replaceAll(" ","-").replaceAll(",","") + ".fits"
    url = it[urlCol]
    target=userIvorn.toString() + "#votable/intwfs/" + name
    jes.info("Saving " + url + " as " + target)
    targetEv = astrogrid.ioHelper.getExternalValue(target)
    sourceEv = astrogrid.ioHelper.getExternalValue(url)
    // work-around to ensure files get uploaded to myspace correctly
    targetStream = targetEv.write()
    sourceStream = sourceEv.read()
    astrogrid.ioHelper.pipe(sourceStream,targetStream)
    targetStream.close()
}
```

# Finding Information : the Registry

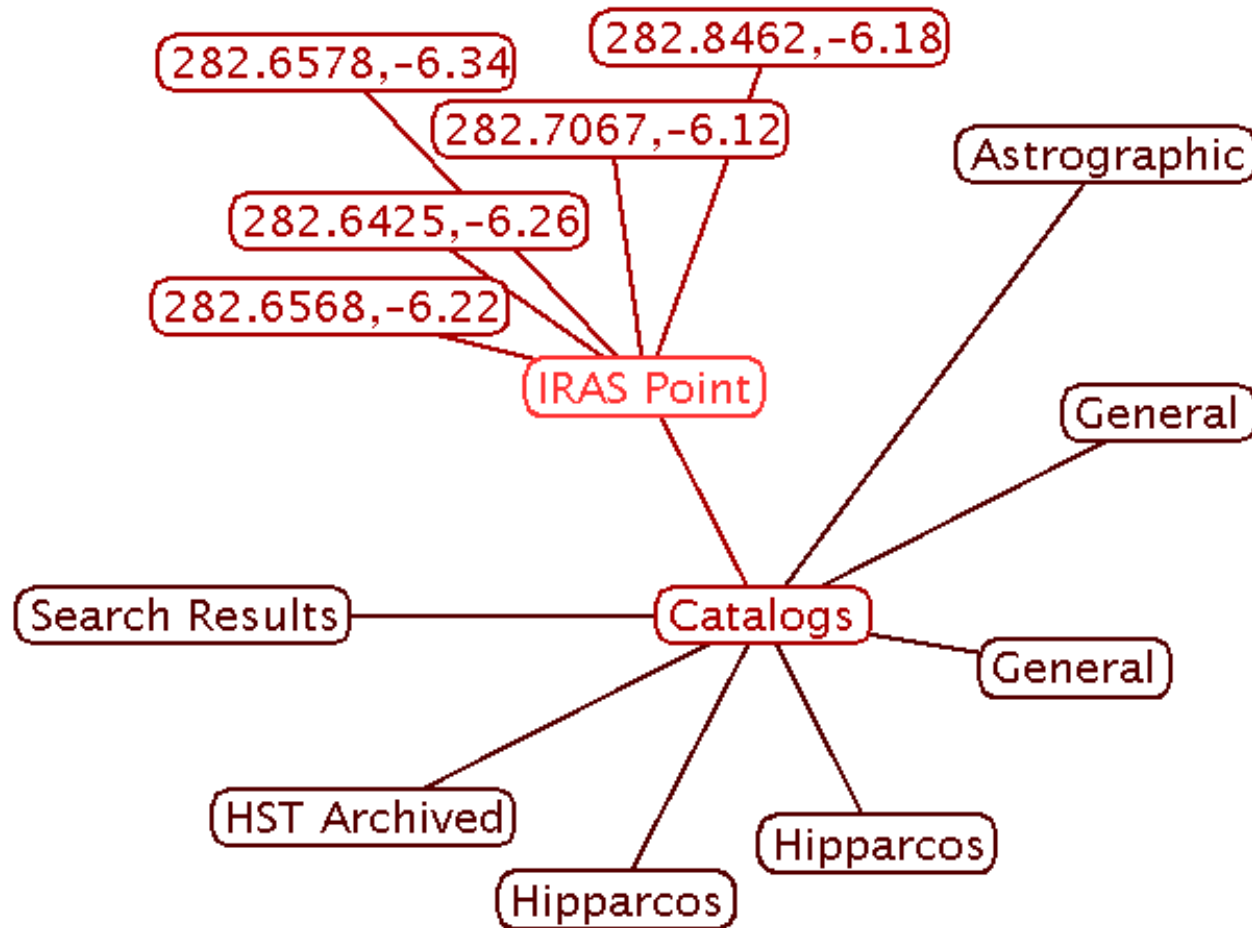
- How do you find the data you require?
- How do you decide which resource (data, application, information, disk, ...) to use?
- The registries are the yellow pages for astronomical resources
- All VO registries harvesting each other: thus querying any one returns full list of globally held resources.
- **AstroGrid access all astronomical resources**



# Finding Information: AstroScope



# Finding Information: Astroscope





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## Simple Image Access Protocol (SIAP): accessing images from Wide Field Surveys

- SIAP is a protocol for retrieving image data from a variety of astronomical image repositories through a **uniform interface**.
- The service returns a list of candidate images.
- For each candidate image an access reference URL may be used to retrieve the image.

# Simple Image Access Protocol (SIAP): accessing SDSS images ...

The screenshot shows the Workflow Builder application window. The interface includes a menu bar with 'File', a toolbar with various icons, and a left-hand sidebar with a list of workflow components: Step, Flow, Sequence, If, Else, Scope, Script, Set, Unset, For loop, Parallel loop, and While loop. The main workspace is divided into a 'Tree view' and a 'Document' view. The 'Tree view' shows a hierarchy starting with 'NewWorkflow', followed by 'Enter Description', 'Sequence', and a 'Step SDSS DR4 Image Search Result Variable siap'. The 'Document' view displays a configuration table for the selected task.

		Inputs	
Position	243.5, 54.5	<input type="checkbox"/>	
Size	0.1	<input type="checkbox"/>	
Format	ALL	<input type="checkbox"/>	
Filter passband	*	<input type="checkbox"/>	
		Outputs	
ImagesTable	OUTPUT	<input type="checkbox"/>	

# Simple Image Access Protocol (SIAP): ... and WFCAM images ...

The screenshot shows the Workflow Builder interface with two steps defined in a sequence:

- Step SDSS DR4 Image Search Result Variable siap**
  - SIAP query
  - Task: `uk.ac.le.star/SDSS-DR4/images/CEA-application`
  - Inputs:
    - Position: 243.5, 54.5
    - Size: 0.1
    - Format: ALL
    - Filter passband: \*
  - Outputs:
    - ImagesTable: OUTPUT
- Step WFCAM Image Search Result Variable siap2**
  - Task: `uk.ac.cam.ast/WFCAM/images/CEA-application`
  - Inputs:
    - Position: 243.5,54.5
    - Size: 0.1
    - Format: ALL
  - Outputs:
    - ImagesTable: OUTPUT2

# Simple Image Access Protocol (SIAP): ... and WFS images

The screenshot displays the Workflow Builder application window. The interface includes a menu bar (File), a toolbar with icons for file operations and execution, and a left-hand sidebar with a tree view of workflow components. The main workspace is divided into a 'Tree view' on the left and a 'Document' view on the right. The 'Tree view' shows a sequence of three steps: 'Step SDSS DR4 Image Search Result Variable siap', 'Step WFCAM Image Search Result Variable siap2', and 'Step WFS Image search Result Variable siap3'. The 'Document' view displays the configuration for the selected 'Step WFS Image search Result Variable siap3'. This configuration includes a task name, a table of input parameters (Position, Size, Format, Filter passband), and a table of output parameters (ImagesTable).

**Workflow Builder**

File

Tree View Document

Tree view

NewWorkflow  
Enter Description

Sequence

Step SDSS DR4 Image Search Result Variable siap  
SIAP query

Task uk.ac.le.star/SDSS-DR4/images/CEA-application	
Inputs	
Position	243.5, 54.5
Size	0.1
Format	ALL
Filter passband	*
Outputs	
ImagesTable	OUTPUT

Step WFCAM Image Search Result Variable siap2

Task uk.ac.cam.ast/WFCAM/images/CEA-application	
Inputs	
Position	243.5,54.5
Size	0.1
Format	ALL
Outputs	
ImagesTable	OUTPUT2

Step WFS Image search Result Variable siap3

Task uk.ac.cam.ast/INT-WFS/images/CEA-application	
Inputs	
Position	243.5,54.5
Size	0.1
Format	ALL
Outputs	
ImagesTable	OUTPUT3





Starlink TOPCAT

File TableViews Windows Joins Help

Table List  
1: wfcam.vot

Current Table Properties  
 Label: wfcam.vot  
 Location: /home/eddie/Desk  
 Name: DQC  
 Rows: 10  
 Columns: 19  
 Sort Order: ↑  
 Row Subset: All  
 Activation Action: image(url)

File Subsets Help

Table Browser for 1: wfcam.vot

	title	instrum...	mjdateobs	ra
1	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
2	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
3	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
4	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
5	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
6	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
7	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
8	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
9	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204
10	w20050413_01918_sf_st	WFCAM	53473.48696	242.98204

url(1) - jsky24804.tmp

File View Go Graphics Catalog

Open Back Forward Cut Levels Catalogs Grid

1/4x 1813, 1742 521.0 :11:21.554, +54:18:13.64 J2000

54.28377	DXS ElaisN1 EN01 0_0 J	2	(0)	image/fits	U/UKIDSS
54.28377	DXS ElaisN1 EN01 0_0 J	2	(0)	image/fits	U/UKIDSS
54.28377	DXS ElaisN1 EN01 0_0 J	2	(0)	image/fits	U/UKIDSS

# Catalogue Query

The screenshot shows the 'Query Editor' window in Mozilla Firefox. The interface includes a menu bar (File, Edit, View, Go, Bookmarks, Tools, Help) and a navigation bar with buttons for Home, MySpace, Resources, Queries, Workflows, and Jobs. The main area is titled 'Data Query Builder (in (s)ADQL)' and contains a text box with the following ADQL query:

```
SELECT * FROM swire1_en1_cat_irac24_28oct04 AS T1
WHERE T1.flux_ap_36 >10 AND T1.flux_ap_24 > 10.
```

Below the query editor are buttons for 'Load from MySpace', 'Select a Table', and 'Save to MySpace'. A vertical scrollbar on the right of the query editor shows line numbers from 5 to 50. Below the query editor are 'Examples: Example 1 Example 2 Example 3 Example 4 (solar) Example 5 (solar)'. At the bottom of the main area is a section titled 'ADQL Helpers' containing a grid of functions and operators such as 'from', 'top', '(', '/', '>', 'sin', 'asin', 'abs', 'as', 'table', ')', '=', '>=', 'cos', 'acos', 'ceiling', 'where', 'name', '+', '<>', 'and', 'tan', 'atan', 'floor', 'select', 'alias', '-', '<', 'or', 'cot', 'atan2', 'exp', 'region', 'circle', '^', '<=', 'not', 'log', 'log10', 'power', 'square', 'sqrt', 'min', 'avg', 'max', 'sigma', 'sum', 'order', 'orderby', 'direction', 'asc', 'desc', 'distinct', 'pi', 'degrees', 'radians', 'xmatch', 'like', 'notlike'.

On the right side of the interface, there is a 'Table' section for 'swire1\_en1\_cat\_irac24\_28'. It shows the table name, the FROM clause, and the alias 'AS: T1'. Below this is a 'CLICK & PASTE' button and a table of column names:

object	cntr
ra	dec
tile	flux_ap_36
uncf_ap_36	flux_ap_45
uncf_ap_45	flux_ap_58
uncf_ap_58	flux_ap_80
uncf_ap_80	flux_ap_24
uncf_ap_24	stell_36
stell_45	stell_58
stell_80	stell_24
ra_opt	dec_opt
ap_m_u	msig_u
ap_m_g	msig_g
ap_m_r	msig_r
ap_m_i	msig_i

ADQL Query

Table Column Information

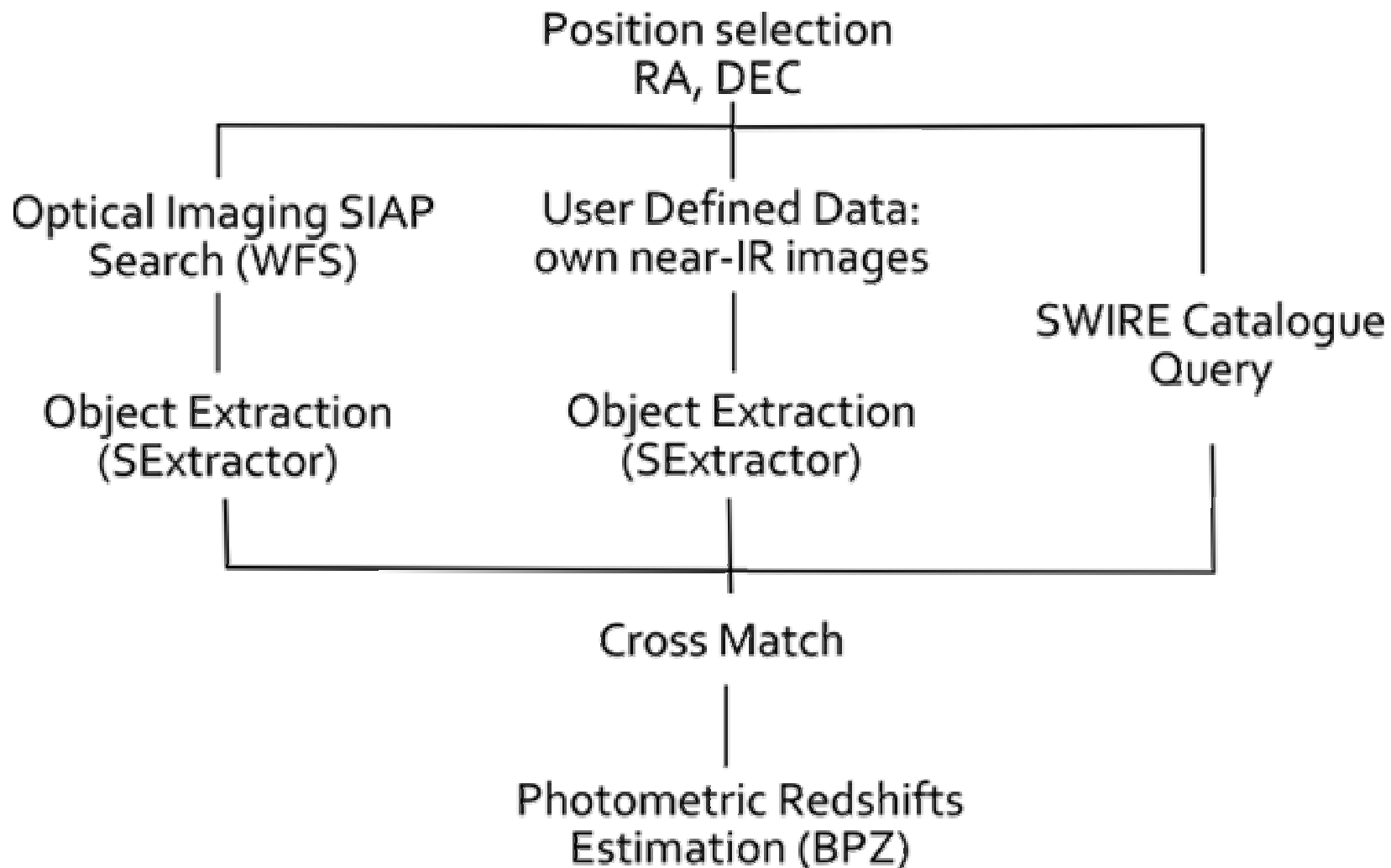
ADQL Helpers



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# Defining a workflow



# Extracting Objects

for loop  
(different filters  
and Chips)

SExtractor in  
action

The screenshot shows the Workflow Builder interface with a workflow tree and a detailed view of a step.

**Workflow Tree:**

- Script WFS DQC query
- Script
- For / in \${ccdno}
- Sequence
- For / in \${[0,1,2,3,4]}
- Sequence
- Script
- Step sex\_COPY
- Script scriptx
- Script

**Step sex\_COPY Configuration:**

Taskorg.astrogrid/SEExtractor Interface	
Inputs	
Parameter File	http://apm14.ast.cam.ac.uk/local/... <input checked="" type="checkbox"/>
Configuration File	http://apm14.ast.cam.ac.uk/local/... <input checked="" type="checkbox"/>
Seeing	1.2 <input type="checkbox"/>
Detection Image	\${fileno[i]+j} <input checked="" type="checkbox"/>
Input image band	\${band[i]} <input type="checkbox"/>
detection filter	http://apm14.ast.cam.ac.uk/local/... <input checked="" type="checkbox"/>
magnitude zero-point	\${magzpt[i]} <input type="checkbox"/>
Measurement Image	\${fileno[i]+j} <input checked="" type="checkbox"/>
Analysis Threshold	1.5 <input type="checkbox"/>
Outputs	
Derived output catalo...	\${(userIvorn)}#votable/sex_\${band[...]} <input checked="" type="checkbox"/>

**Script scriptx Code:**

```
source = astrogrid.ioHelper.getExternalValue(userIvorn.toString()+"#votable/sex_"+band[i]+"_"+j+".vot")
target = astrogrid.ioHelper.getExternalValue(userIvorn.toString()+"#votable/sex_"+band[i]+"_"+j+".vot")
table = astrogrid.tableHelper.builder.makeStarTable(source)
astrogrid.tableHelper.writeTable(target,table,"votable")
```

# Photometric Redshifts

BPZ step

The screenshot displays the Workflow Builder application window. The interface includes a menu bar (File), a toolbar with icons for file operations and execution, and a left-hand sidebar containing a list of workflow components: Step, Flow, Sequence, If, Scope, Script, Set, Unset, For loop, Parallel loop, and While loop. The main workspace is divided into a 'Tree view' on the left and a 'Document' view on the right. The 'Tree view' shows a hierarchical structure starting with an 'If' step containing the condition `Integer.valueOf(do_bpz) == 1`. This 'If' step has a 'Then' branch containing a 'Sequence' of two steps: a 'Script' step with the command `jes.info("Running Bpz : "+userIvorn.toString()+"#votable/zphot_bpz_"+j+".vot")` and a 'Step' step. The 'Step' step is expanded to show the configuration for the 'Taskorg.astrogrid/BPZ Interface'. This configuration includes several input fields with checkboxes and a section for outputs. The 'Script' step in the 'Then' branch contains the following code:

```
//source = astrogrid.ioHelper.getExternalValue(userIvorn.toString()+"#votable/zphot_bpz_"+j+".vot")
//target = astrogrid.ioHelper.getExternalValue(userIvorn.toString()+"#votable/zphot_bpz_"+j+".vot")
//table = astrogrid.tableHelper.builder.makeStarTable(source)
//astrogrid.tableHelper.writeTable(target,table,"votable")
jes.info("")
```

The 'Else' branch of the 'If' step is also visible, containing a 'Sequence' of two 'Script' steps.

# Job submission

The screenshot shows the 'Jobs Monitor' application window. At the top, there is a 'Job' label and a toolbar with icons for refresh, save, delete, and help. A 'Refresh Rate' slider is set to 3. Below the toolbar are tabs for 'Workflows' and 'Applications'. The main area contains a table with the following columns: Name, Start, Finish, Status, and JobURN. The table lists various jobs, including 'TimeMovieMaker', 'AstroGrid Redshift Mak...', 'WFCAM', and 'SWARP', with their respective start and finish times and status (COMPLETED or ERROR). The JobURN for all jobs is 'jes:galahad.star.le.ac.uk...'. A 'Result' dialog box is overlaid on the bottom left of the Jobs Monitor window.

Name	Start	Finish	Status	JobURN
TimeMovieMaker	Mon Jul 11 10:01:47 BS...	Mon Jul 11 13:25:15 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Mak...	Mon Jul 11 11:24:52 BS...	Mon Jul 11 12:51:14 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
WFCAM	Wed Aug 24 11:11:56 B...	Wed Aug 24 11:12:44 B...	ERROR	jes:galahad.star.le.ac.uk...
WFCAM	Wed Aug 24 15:30:03 B...	Wed Aug 24 15:33:20 B...	ERROR	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Mak...	Thu Jul 28 12:38:31 BST...	Thu Jul 28 12:39:42 BST...	ERROR	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Mak...	Fri Sep 02 15:33:57 BST...	Fri Sep 02 16:37:51 BST...	COMPLETED	jes:galahad.star.le.ac.uk...
TimeMovieMaker	Sun Sep 04 15:24:53 BS...	Sun Sep 04 15:28:30 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
bpz	Mon Sep 05 09:55:48 BS...	Mon Sep 05 10:01:34 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
SWARP	Mon Sep 05 10:37:44 BS...	Mon Sep 05 10:43:06 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
newworkflow	Mon Sep 05 14:16:55 BS...	Mon Sep 05 14:23:56 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Mak...	Wed Sep 07 12:10:34 BS...	Wed Sep 07 13:19:24 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Mak...	Thu Sep 08 12:04:05 BS...	Thu Sep 08 13:03:54 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Maker	Fri Sep 16 11:25:07 BST...	Fri Sep 16 11:35:08 BST...	COMPLETED	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Maker	Mon Oct 03 10:43:17 BS...	Mon Oct 03 11:43:14 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
TimeMovieMaker	Mon Oct 03 11:48:25 BS...	Mon Oct 03 11:52:19 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
AstroGrid Redshift Mak...	Mon Oct 03 13:48:22 BS...	Mon Oct 03 14:49:14 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
	Mon Oct 03 15:58:05 BS...	Mon Oct 03 15:58:17 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
	Mon Oct 03 16:56:11 BS...	Mon Oct 03 17:13:18 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
aker	Tue Oct 04 15:50:12 BS...	Tue Oct 04 16:54:14 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
aker	Tue Oct 04 10:20:48 BS...	Tue Oct 04 11:28:12 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
	Tue Oct 04 17:01:39 BS...	Tue Oct 04 17:02:13 BS...	COMPLETED	jes:galahad.star.le.ac.uk...
aker	Wed Oct 05 10:34:59 BS...	Wed Oct 05 11:48:45 BS...	COMPLETED	jes:galahad.star.le.ac.uk...

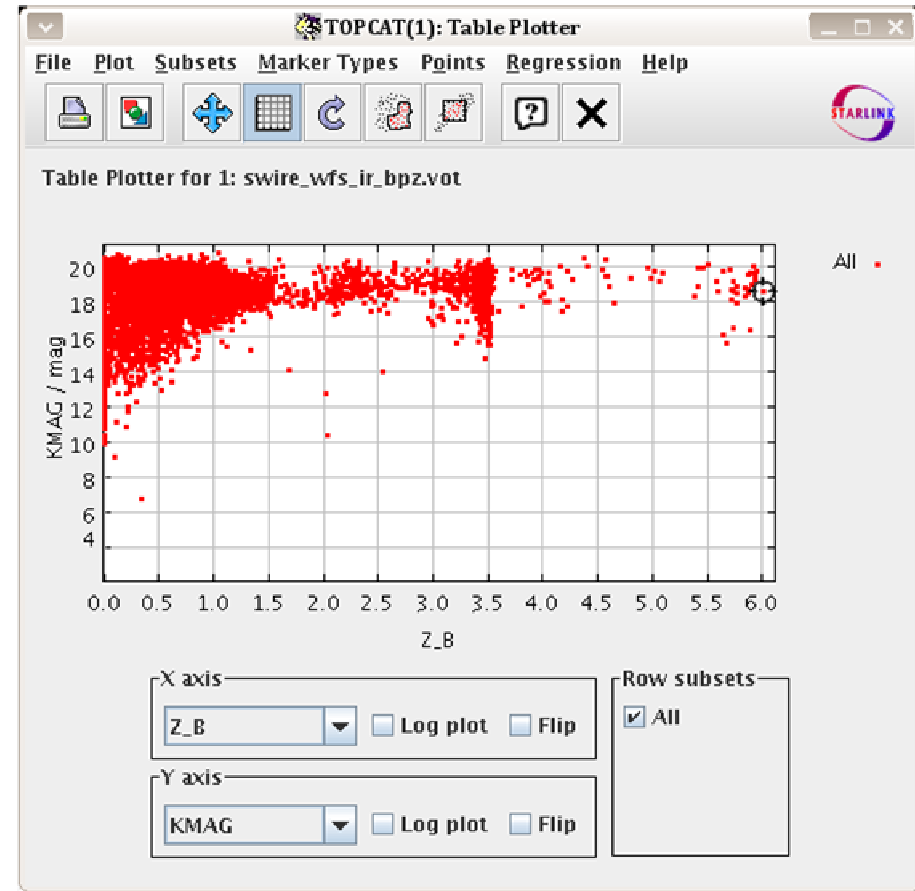
**Result**

Workflow Submitted Job ID is  
jes:galahad.star.le.ac.uk/143.210.36.238/eduardogonzalez@uk.ac.le.star/3180

Ok

# Looking at the candidates

- The redshift distribution shows very few objects at  $z \sim 5-6$ .
- Unsurprisingly most of those are **point-like** in the images and are best fitted by a **QSO template SED**.
- Using TOPCAT the selection in the graph highlights the row in the table and displays image.



<http://www.starlink.ac.uk/topcat>

# Looking at the candidates

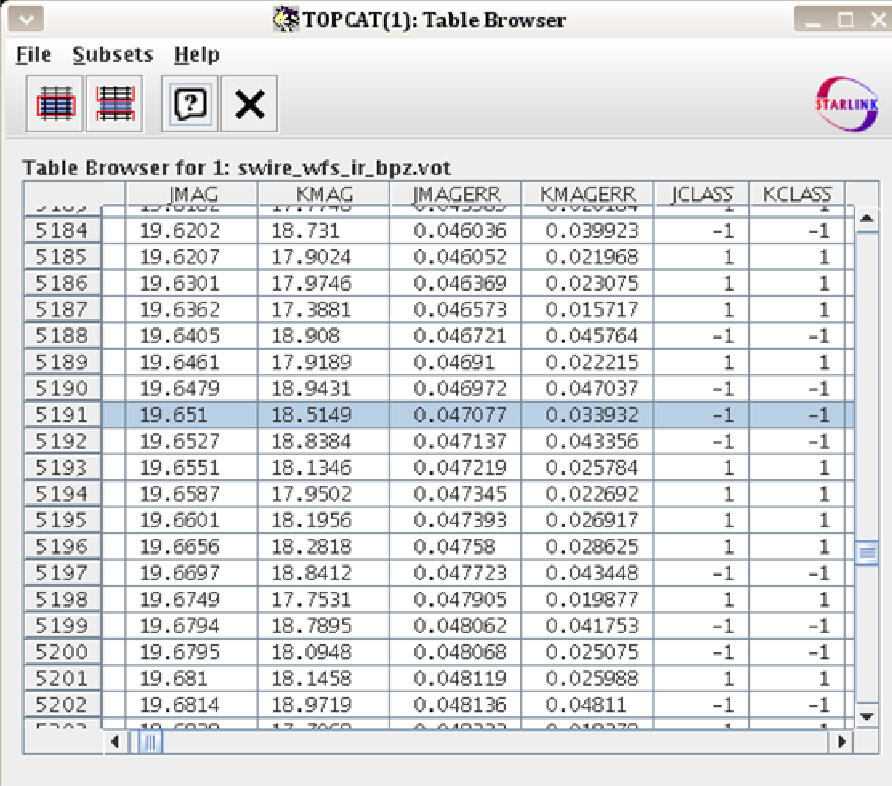


Table Browser for 1: swire\_wfs\_ir\_bpz.vot

ID	JMAG	KMAG	JMAGERR	KMAGERR	JCLASS	KCLASS
5184	19.6202	18.731	0.046036	0.039923	-1	-1
5185	19.6207	17.9024	0.046052	0.021968	1	1
5186	19.6301	17.9746	0.046369	0.023075	1	1
5187	19.6362	17.3881	0.046573	0.015717	1	1
5188	19.6405	18.908	0.046721	0.045764	-1	-1
5189	19.6461	17.9189	0.04691	0.022215	1	1
5190	19.6479	18.9431	0.046972	0.047037	-1	-1
5191	19.651	18.5149	0.047077	0.033932	-1	-1
5192	19.6527	18.8384	0.047137	0.043356	-1	-1
5193	19.6551	18.1346	0.047219	0.025784	1	1
5194	19.6587	17.9502	0.047345	0.022692	1	1
5195	19.6601	18.1956	0.047393	0.026917	1	1
5196	19.6656	18.2818	0.04758	0.028625	1	1
5197	19.6697	18.8412	0.047723	0.043448	-1	-1
5198	19.6749	17.7531	0.047905	0.019877	1	1
5199	19.6794	18.7895	0.048062	0.041753	-1	-1
5200	19.6795	18.0948	0.048068	0.025075	-1	-1
5201	19.681	18.1458	0.048119	0.025988	1	1
5202	19.6814	18.9719	0.048136	0.04811	-1	-1

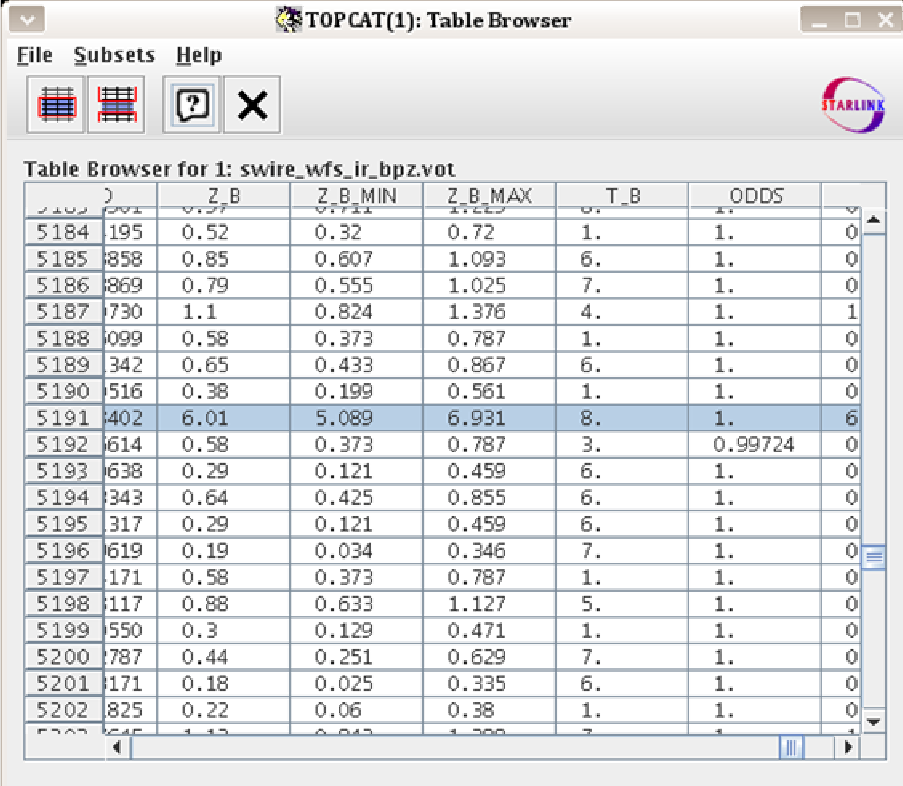


Table Browser for 1: swire\_wfs\_ir\_bpz.vot

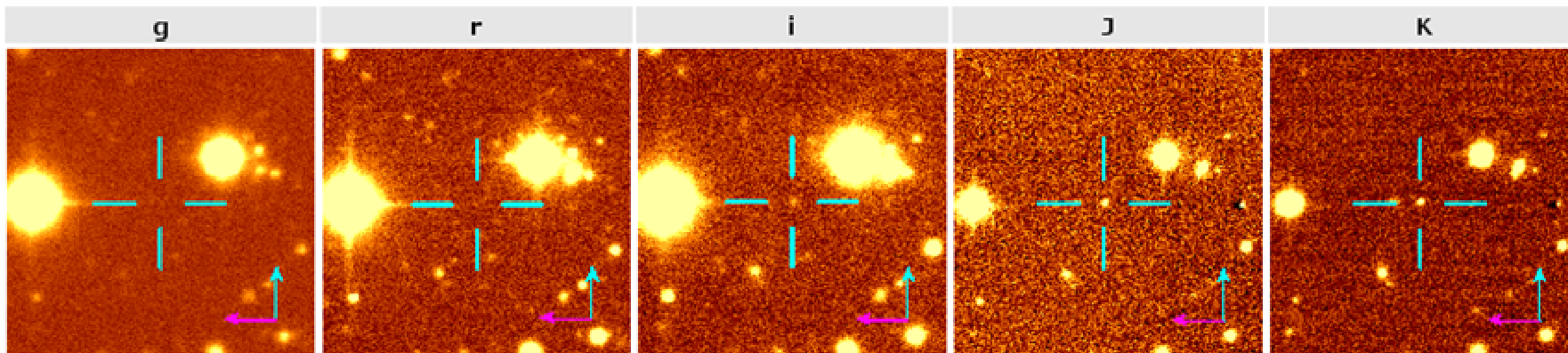
ID	Z_B	Z_B_MIN	Z_B_MAX	T_B	ODDS		
5184	195	0.52	0.32	0.72	1.	1.	0
5185	858	0.85	0.607	1.093	6.	1.	0
5186	869	0.79	0.555	1.025	7.	1.	0
5187	730	1.1	0.824	1.376	4.	1.	1
5188	099	0.58	0.373	0.787	1.	1.	0
5189	342	0.65	0.433	0.867	6.	1.	0
5190	516	0.38	0.199	0.561	1.	1.	0
5191	402	6.01	5.089	6.931	8.	1.	6
5192	614	0.58	0.373	0.787	3.	0.99724	0
5193	638	0.29	0.121	0.459	6.	1.	0
5194	343	0.64	0.425	0.855	6.	1.	0
5195	317	0.29	0.121	0.459	6.	1.	0
5196	619	0.19	0.034	0.346	7.	1.	0
5197	171	0.58	0.373	0.787	1.	1.	0
5198	117	0.88	0.633	1.127	5.	1.	0
5199	550	0.3	0.129	0.471	1.	1.	0
5200	787	0.44	0.251	0.629	7.	1.	0
5201	171	0.18	0.025	0.335	6.	1.	0
5202	825	0.22	0.06	0.38	1.	1.	0

The selection of one point in the previous magnitude vs photoz diagram triggers a selection of the correspondent row in the table.

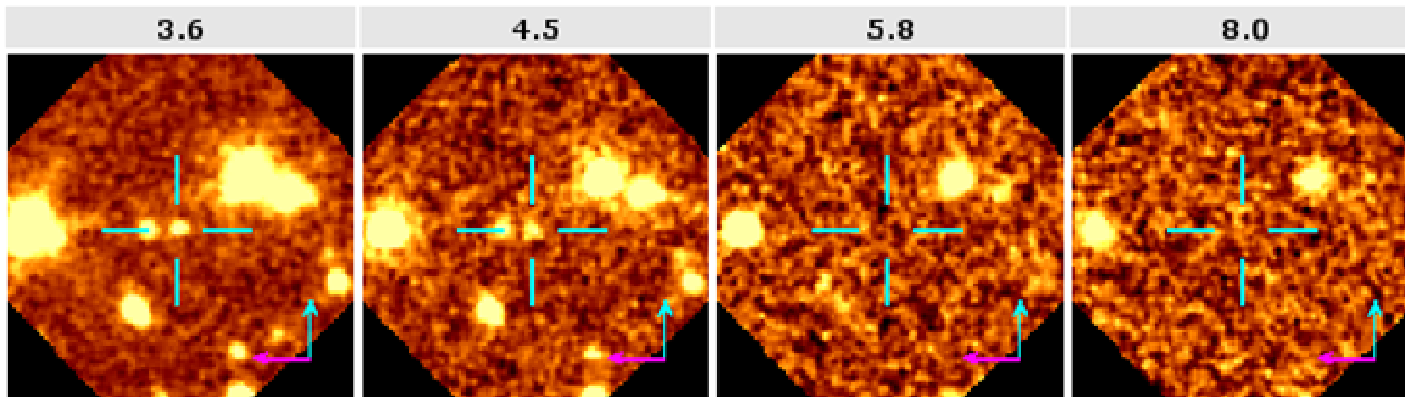
But also triggers a custom action... in this case a URL showing the postage stamps...



# WFS + IR

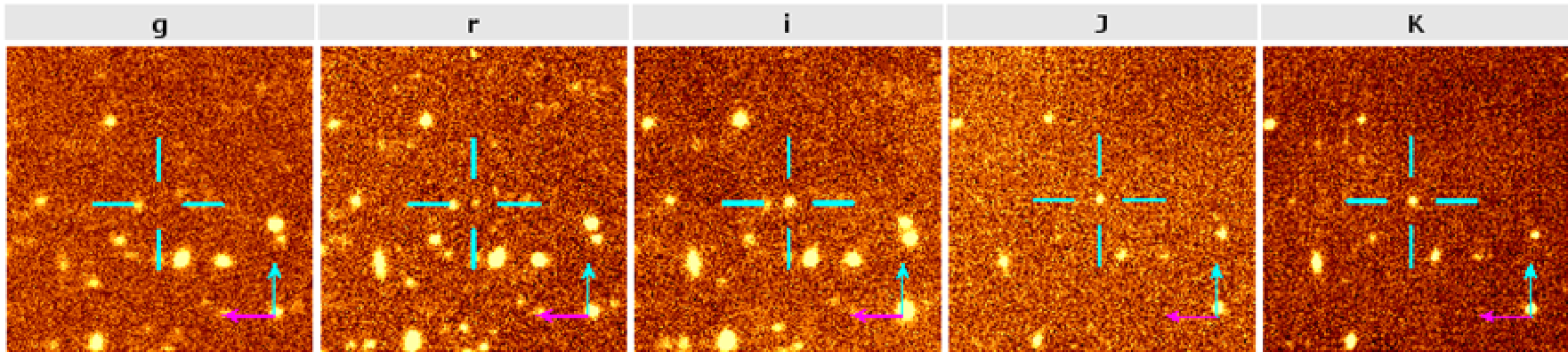


# IRAC

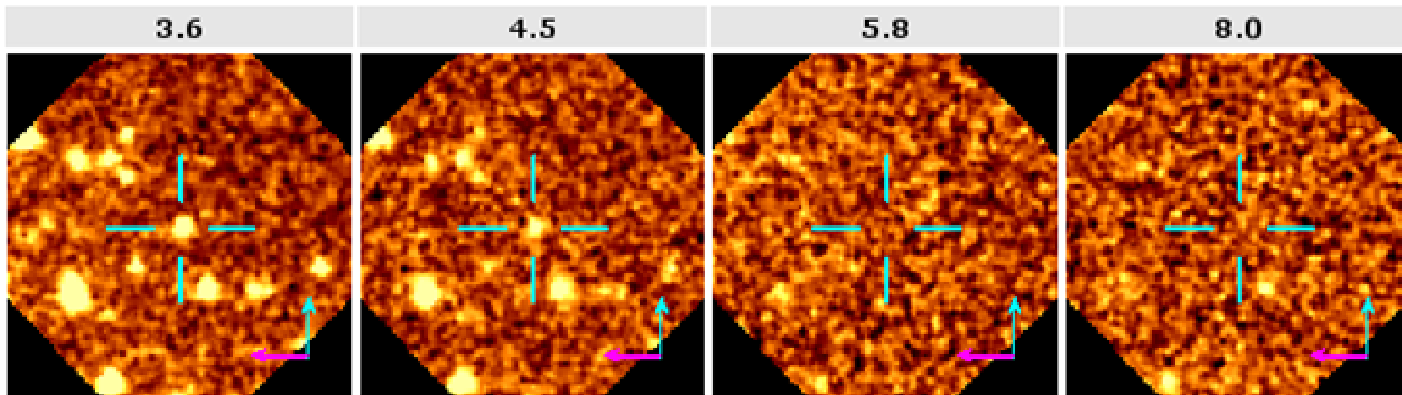




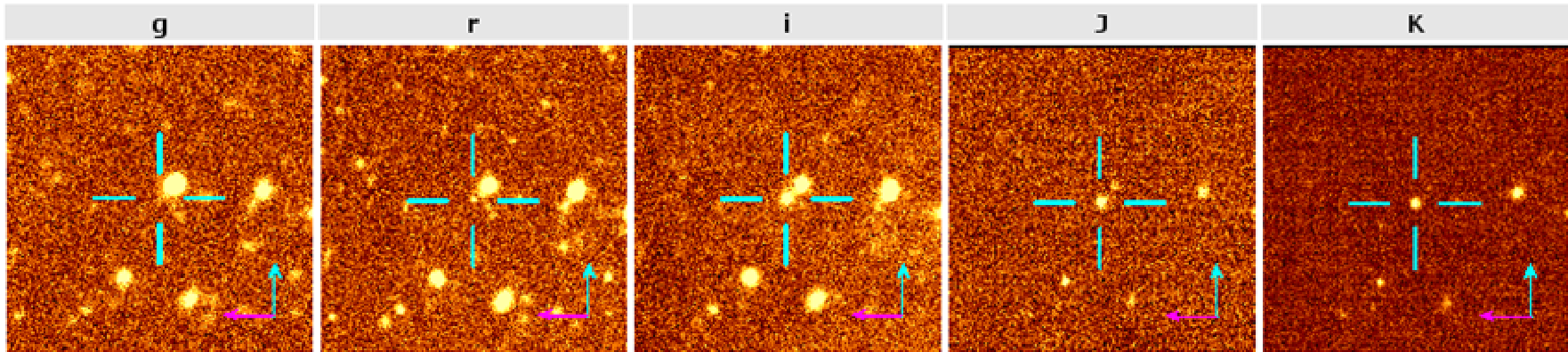
# WFS + IR



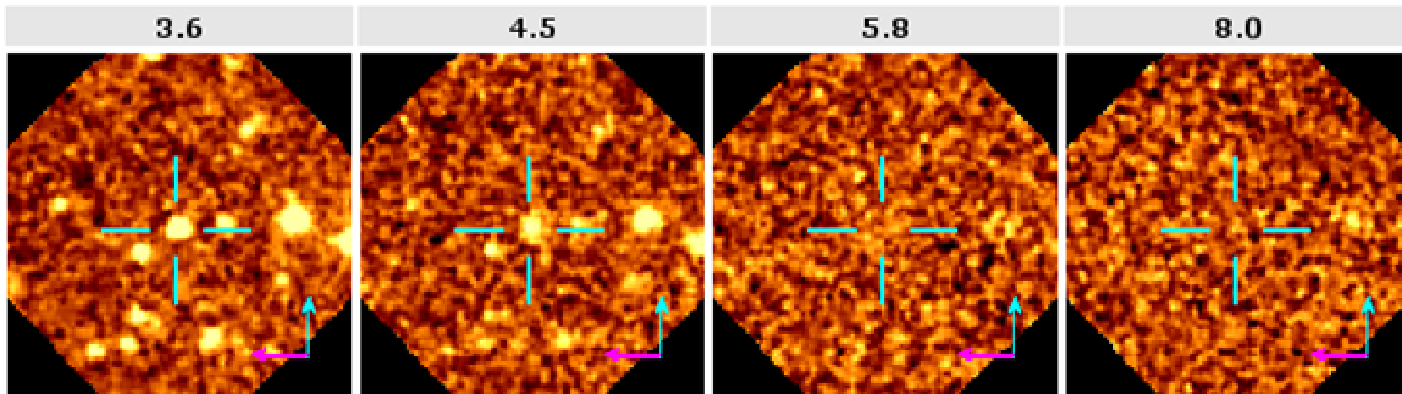
# IRAC



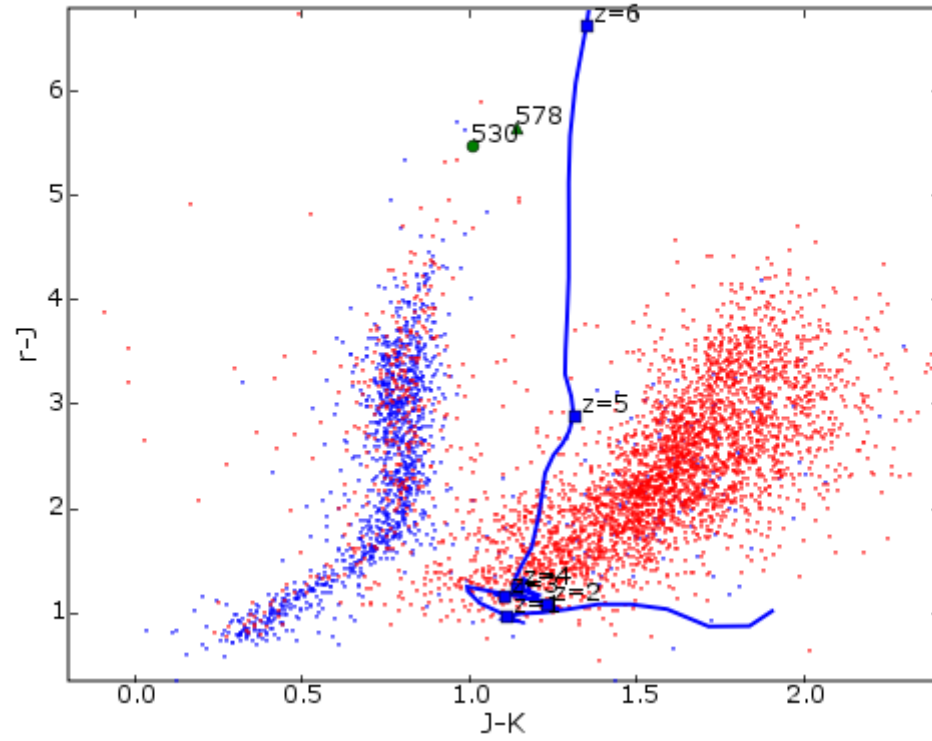
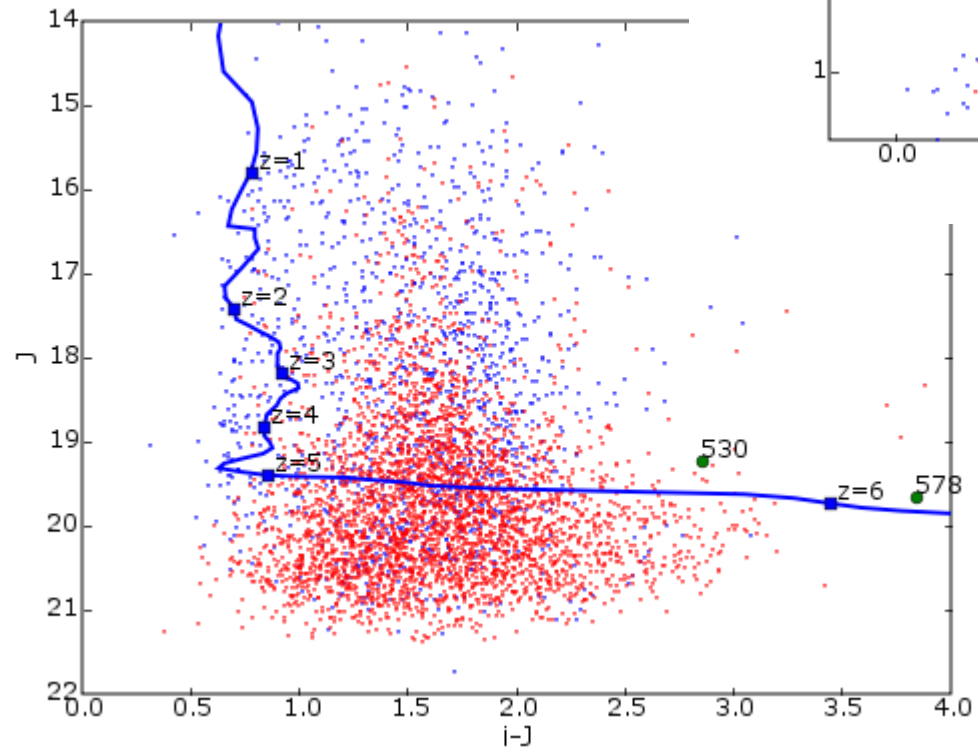
# WFS + IR



# IRAC



# QSO SED Tracks



# Summary

- The VO and tools developed as part of it are opening a new analysis methodology in the era of “data expansion”.
- AstroGrid is an active member of the VO and already delivers a functional system capable of accessing and analysing a wide range of survey data.
- Anybody is welcome to try the system and submit their feedback ( <http://www.astrogrid.org> )