

# VO Science Applications

Mark Allen

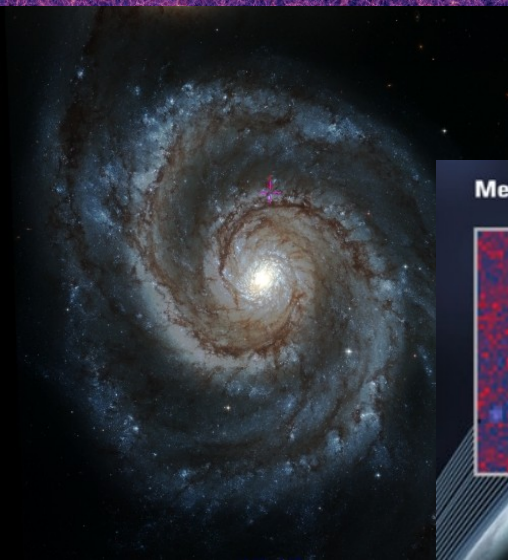
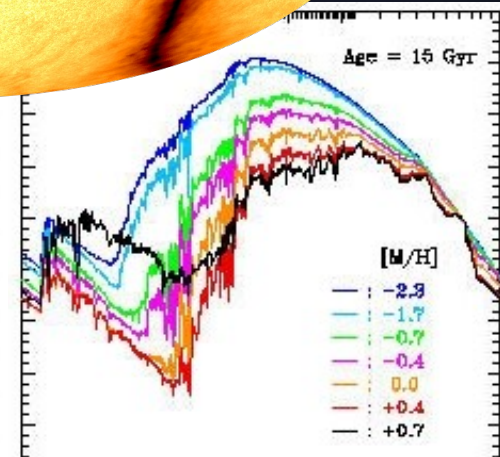
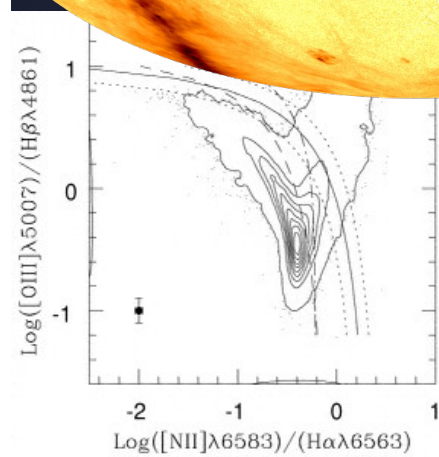
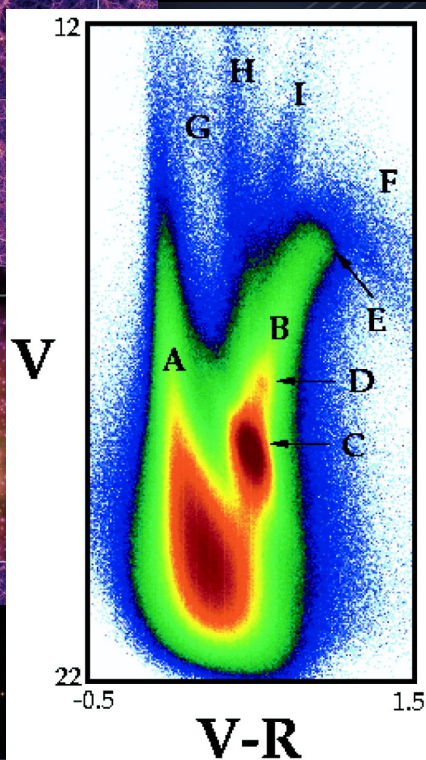
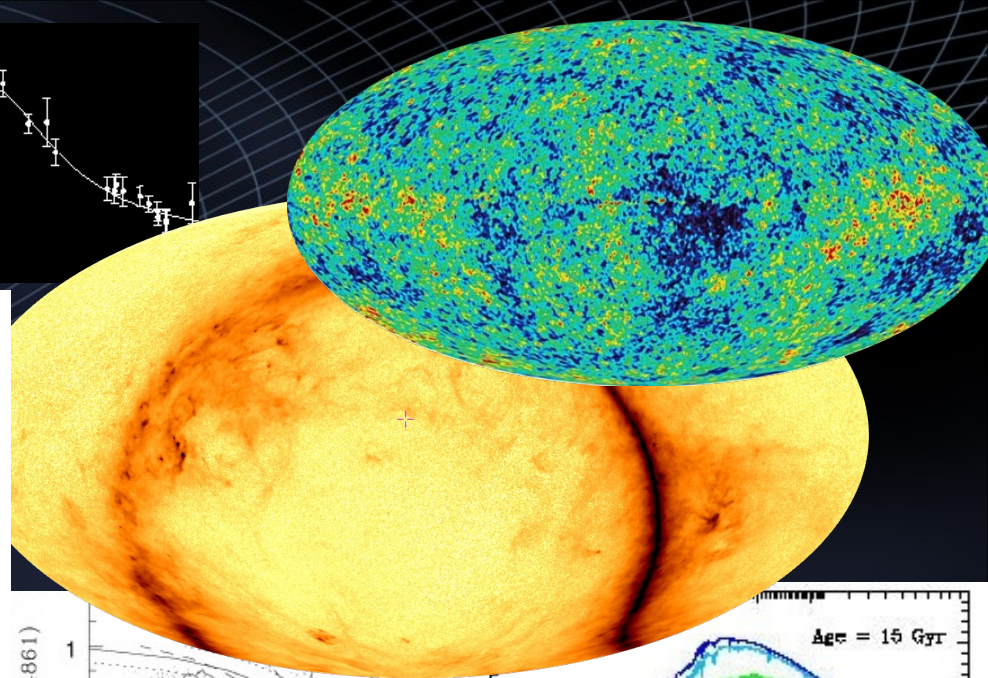
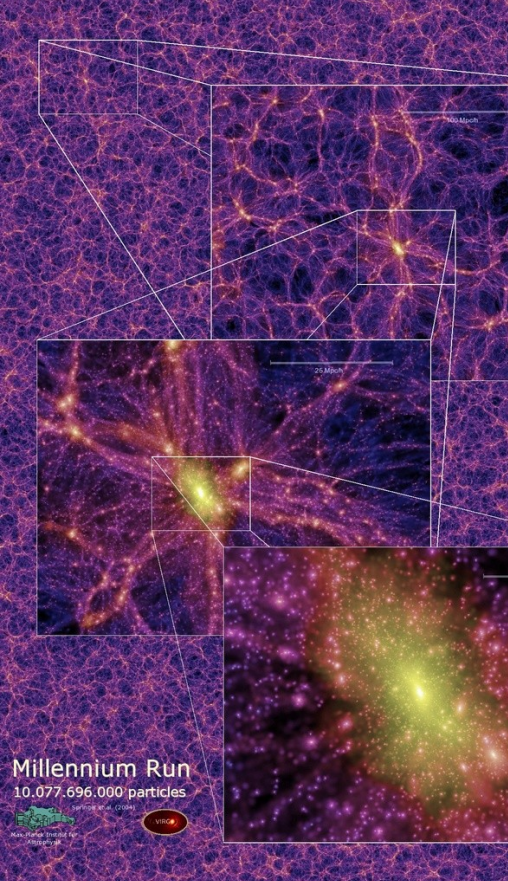
Observatoire de Strasbourg

Centre de Donnees de Strasbourg

# VO for doing Astronomy

- Essential for imminent data volumes and rates
- Multi- $\lambda$  science requires
  - Data from different telescopes
  - Analysis tools
  - on-line services
  - archived information

*to be readily compatible*
- VO = framework for interoperable systems
- VO Vision: *All Astronomy resources as if they were on your desktop*



# Astronomy Data interoperability

- Images (multi-band, mosaics, cutouts, FT)
- Catalogues
- Spectra
- Time series
- Spatial Information
  - Sky regions, slits, FoV, etc.
- Simulation data – many kinds
- Multi-d data sets
  - Data cubes, irregularly spaced data

# Science Driven

## e.g. AVO Science Reference Mission

- Circumstellar disks: from pre-Main Sequence stars to stars harbouring planets
- Intermediate Velocity Clouds
- Which Star will go Supernova next?
- Initial Mass Function within 1kpc: Planetary to Stellar Masses
- Initial Mass Function for Massive Stars
- Contributions of Low and Intermediate Mass Stars to the ISM
- Galaxy Formation and Evolution from  $z=10$  to 0.1
- Build-up of Supermassive Black Holes
- Formation and Evolution of Galaxy Clusters
- Correlation of CMB, radio/mm and optical/NIR Galaxy Surveys

# We need (1)

- Visual browsing of data and distributed information
- Visualizing heterogeneous data
  - Combining Multi-wavelength data taking into account different:
    - Units
    - coverage
    - Resolutions/PSF, observing technique

# We need (2)

- Multi-wave cutouts of individual sources
- Generate and visualize SEDs from image, and spectral and catalogue data
  - Taking into account different
    - Beams/apertures (extended sources)
    - Backgrounds
    - Photometric systems
- Time axis:
  - Light-curves
  - Multi-epoch imaging

# We need (3)

- Compare observations with models
  - Virtual observations of models
  - Projection of models to observed parameter space
  - Spectral fitting/classification
  - Colour-colour visualization Tool
- Astronomy functionality alongside visualization
  - Reproject data, correct for extinction, calculate luminosities etc.
  - Visualization requirements  $\in$  Analysis requirements



# VO Tools

- **Prototypes**
  - VO-enabled existing tools & new tools
- **Services**
  - VO-enabled with *'translation layer'*
  - New services
- **Applications Infrastructure**
  - Make tools accessible
  - Build your own customized system from VO components



A brief tour of some of the VO  
tools available now

2MASS  
ESO-WFI  
Chandra  
VLT-ISAAC  
HST-ACS  
DSS  
My Data

Data Tree

- GOODS-WFI
  - ICLWP
  - V89
    - DEEP2C-FV-Preview 38.1 'x37.3' 2000-10-26
    - DEEP2C-FV 6.2 'x8.2' 2000-10-26
  - B99
  - RC162
  - U38
- GOODS-ACIS
  - LR.1-10KEV
  - ACISMCDFSM000 1.2 'x1.2' 1999-10-14
  - HR.1-10KEV
- GOODS-ISAAC
  - J
    - GOODS-10 2.5 'x2.5' 08/04/2002
    - GOODS-11 2.5 'x2.5' 08/04/2002
    - GOODS-14 2.5 'x2.5' 08/04/2002
    - GOODS-15 2.5 'x2.5' 08/04/2002
    - GOODS-20 2.5 'x2.5' 08/04/2002
    - GOODS-16 2.5 'x2.5' 08/04/2002
    - GOODS-21 2.5 'x2.5' 08/04/2002
    - GOODS-9 2.5 'x2.5' 08/04/2002
  - H
  - KS
- GOODS-HST-ACS
  - F775W
    - epoch1
    - epoch2
    - epoch3
    - epoch4
    - epoch5
  - version1.0
    - CDF-SOUTH-SECT32-VERSION1.0
    - CDF-SOUTH-SECT25-VERSION1.0
    - CDF-SOUTH-SECT23-VERSION1.0
    - CDF-SOUTH-SECT21-VERSION1.0
    - CDF-SOUTH-SECT44-VERSION1.0
    - CDF-SOUTH-SECT14-VERSION1.0
    - CDF-SOUTH-SECT42-VERSION1.0
    - CDF-SOUTH-SECT12-VERSION1.0
    - CDF-SOUTH-SECT35-VERSION1.0
    - CDF-SOUTH-SECT33-VERSION1.0
    - CDF-SOUTH-SECT31-VERSION1.0
    - CDF-SOUTH-SECT24-VERSION1.0
    - CDF-SOUTH-SECT22-VERSION1.0
    - CDF-SOUTH-SECT45-VERSION1.0
    - CDF-SOUTH-SECT43-VERSION1.0
    - CDF-SOUTH-SECT13-VERSION1.0
    - CDF-SOUTH-SECT11-VERSION1.0
    - CDF-SOUTH-SECT34-VERSION1.0
- F606W
- F435W
- F850LP
- SERC
- J
- AA0

Data available at selected point are highlighted in tree

Info Frame

CDF-SOUTH-SECT23-VERSION1.0

Observation_Name	CDF-SOUTH-SECT23-VERSION1.0
ObservingProgram_Name	GOODS-HST-ACS
FilterName	F775W
Size_alpha	4.1'
Size_delta	4.1'
Angular Pixel Size	0.029"
Origin	STSC1
OriginalCoding	FITS
CentralPoint_RA	03:32:38.72
CentralPoint_DEC	-27:48:18.3
DateAndTime	2002-08-01
Position Angle	0.0°

Cutout Target: 03 32 33.50 -27 47 36. Grab

Stick FoV in stack LOAD Close

Image metadata

A.V.O demonstration prototype v1.0

Load... Save... Plugins... Print... Help... Quit

J2000 03:32:33.50 -27:47:36.9 Field: 03:32:25.77 -27:48:07.4 38.08"x37.2"

cdfs

1.0'

CDS - ESO - AstroGrid - ST-ECF - UMAN/Jodrell Bank - CNRS/DR01 - VO-India - STScI

Field of view outlines are plotted automatically

# Catalogues

- Manipulation
- X-match
- Visualization
- Direct links to:



A screenshot of the CDS Aladin software interface. The main window displays a multi-color star field with a central bright star marked by a white crosshair. The interface includes a menu bar with options: Load..., Save..., VOPlot..., Print..., Help..., and Quit. Below the menu bar, there are input fields for J2000 coordinates (14:02:43.71 +54:26:46.5) and a field size (12.9'x12.9'). A toolbar on the right side contains various icons for manipulation: select, prop, draw, text, tag, dist, filter, rgb, cont, hist, zoom, mglss, del, and pad. On the far right, there are controls for the eye icon, a label 'm101', a vertical stack of trapezoidal shapes, and a 'Mag.Circle' section with checkboxes for 'USNO-B1' and 'POSSII.F.DSS'. A 'Zoom 2/3x' dropdown menu is also present. In the bottom right corner, there is a small inset window showing a zoomed-in view of the star field with a purple crosshair and a north arrow.

# Image Cutout Tool

A.V.O demonstration prototype v2.000

Load... Save... Plugins... Print... Data Tree... Help... Quit

ALADIN for AVO Position J2000 Pixel full not available

img ROI on img ROI on img

15" 1.82' x 1.87' E N

ROI on img ROI on img ROI on img

ROI on img ROI on img ROI on img

ROI on img ROI on img ROI on img

multiview Zoom 1/16x

7 planes, 13 views, 148Mb

CDS - ESO - AstroGrid - ST-ECF - UMAN/J. Bank - CNRS/DR1 - VO-India - STScI - ESAC

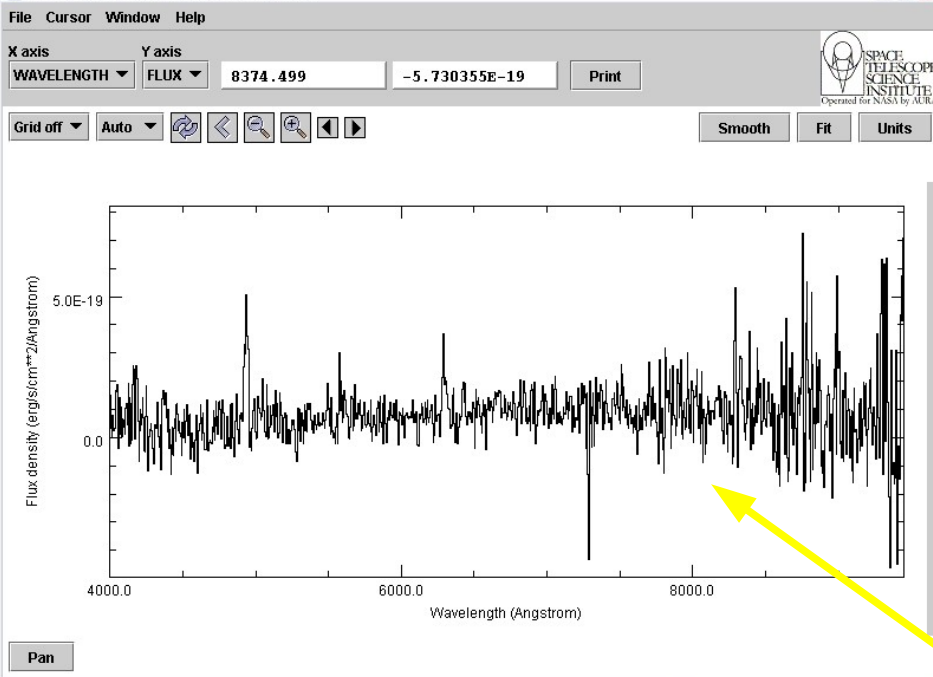
# Image Cutout Services

Cutouts generated remotely

The screenshot shows the 'A.V.O. demonstration prototype v2.000' interface. On the left is a 'Tree view' window titled 'Data Tree' showing a hierarchical list of files under 'SIA cutout server for SWIRE images'. The files are organized by resolution: 3.6um, 4.5um, 5.8um, 8um, 24um, 70um, 160um, Sloan-g, Sloan-i, Sloan-r, RGO-U, and RGO-z. Each resolution has sub-entries for 'cov. fits', 'mask. fits', 'mosaic. fits', and 'unc. fits'. A 'Server selector' dialog is open in the foreground, titled 'SWIRE cutout'. It contains a 'Target' field with coordinates '16 08 57.65 +54 10 35.7' and a note 'Fill in all these fields and press the SUBMIT'. Below the target are fields for 'Width (deg):' and 'Height (deg):', both set to '0.1'. A list of image servers is shown on the left of the dialog, including Aladin, VOdemo, SSS..., SkyView, VLA..., Others..., SDSS, Others:, All VO, SSA, MyData, and MySpace. At the bottom of the dialog are buttons for '\* SUBMIT \*', 'Reset', 'Clear', and 'Close'. A 'FoV' button is also visible.

The screenshot shows the main interface of the 'A.V.O. demonstration prototype v2.000'. The title bar includes 'Load...', 'Save...', 'Plugins...', 'Print...', 'Data Tree...', 'Help...', and 'Quit'. The status bar shows 'Position J2000', '16:08:59.24 +54:10:10.0', 'Pixel full', and '2.4530'. The main area is a grid of image cutouts. The top row shows four cutouts from different Sloan filters: Sloan-U, Sloan-g, Sloan-r, and Sloan-i. The middle row shows cutouts from RGO-z, 3.6um irac, 4.5um irac, and 5.8um irac. The bottom row shows cutouts from 8um irac, 24um mips, 160um mips, and a red channel. A 'Server selector' dialog is overlaid on the grid, showing the 'SWIRE cutout' form. The status bar at the bottom indicates 'CDS - ESO - AstroGrid - ST-ECF - UMAN/J. Bank - CNRS/DR01 - VO-India - STSci - ESAC' and '17 planes, 15 views, 100Mb'.

e.g. SWIRE cutout service



Pan

<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033214-274825
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033214-274825
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033214-275124
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033214-275257
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033214-275258
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033215-274633
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-275113
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-275228
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-275234
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-275247
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274721
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274807
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274810
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274811
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274823
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274838
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274844
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-275024
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274743
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033216-275238
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033216-275241
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274122
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033217-274602
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274619
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274619
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274705
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274705
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274705
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274718
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274743
<input type="checkbox"/>	FORS2	1d	spectrum	GOODS	J033218-274850

Submit Reset Clear Close

A.V.O demonstration prototype v1.0

Load... Save... Plugins... Print... Help... Quit

J2000 03:32:39.67 -27:48:50.5 Field: 03:32:40.38 -27:48:49.2 1.03"x1.03"

5.0001"

<input type="checkbox"/>	Spectrum	FORS2	1d	spectrum	GOODS	J033239-274850	53.1652972222222	-27.8140630555556
<input type="checkbox"/>	Spectrum	FORS2	1d	spectrum	GOODS	J033239-274851	53.1648288888889	-27.8143688888889
<input type="checkbox"/>	Spectrum	Spitzer	1d	spectrum	GOODS	J033239-274851	53.1648288888889	-27.8143688888889
<input type="checkbox"/>	Spectrum	FORS2	1d	spectrum	CDF 027		53.1652916666667	-27.8140277777778

CDS - ESO - AstroGrid - ST-ECF - UMAN/Jodrell Bank - CNRS/DR01 - VO-India - STScI

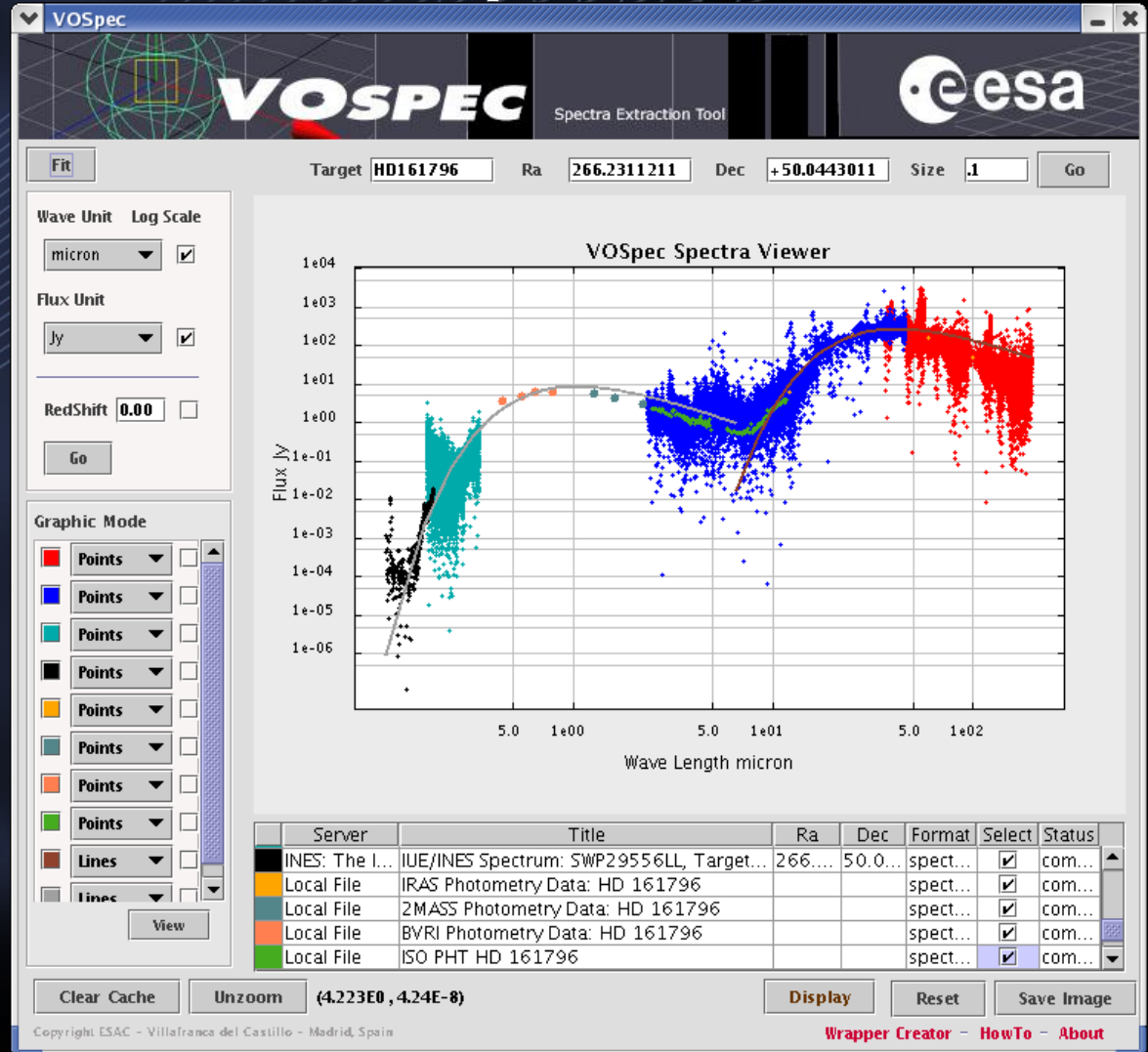
# Simple Spectrum Access

Image / Spectrum / Catalog interoperability

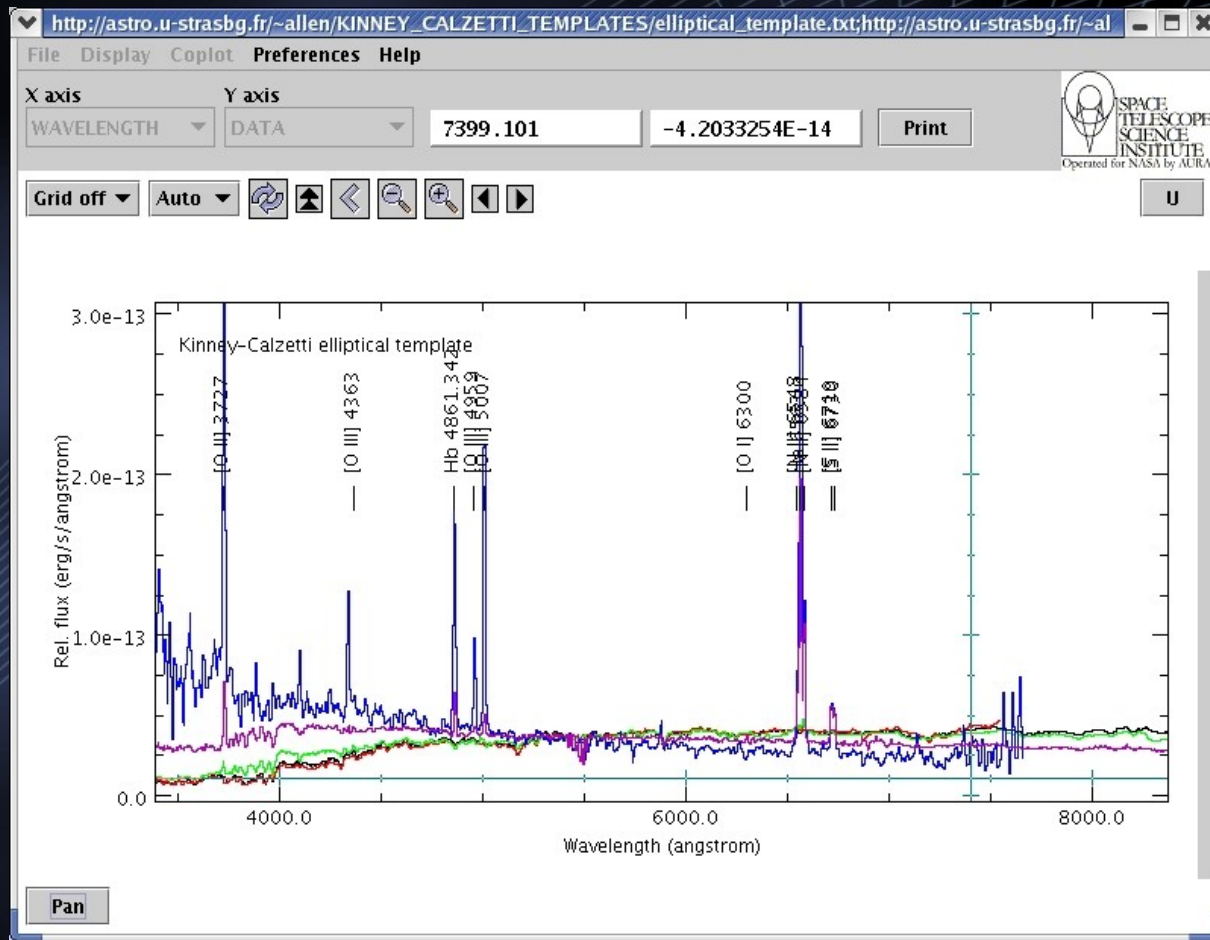


# Multi-archive spectra

- SSA servers
- Registry
- Unit interop.







Line lists integrated into the tool

# Line lists from a Service

SLAP Viewer Copyright ESAC, Spain

Server Selector

SLAP Services

- IASD - Simple Line Access Data Server
  - <http://esavo02.esac.esa.int/slap/jsp/slapBeta.jsp?>

Select

Range of Search ( $\mu\text{m}$ )

Wavelength Start  Wavelength End

Reset

Slap Services Output

Wavelength	Id	Transition	SourceType	ObsFlux	Intensity	Noise
18.72200	[SIII]	3P1-3P2	L	3.149999...	null	100.000
21.84100	[ArIII]	3P1-3P0	L	6.999999...	null	null
28.23200	H2	0-0 S(0)	L	7.799999...	null	null
33.49800	[SIII]	3P0-3P1	L	8.029999...	null	85.000
36.03100	[NeIII]	3P1-3P0	L	2.679999...	null	15.000

Close

VOSpec Spectra Extraction Tool

Target: 326.44+00.91 Ra: 235.5716667 Dec: -53.9755556 Size: 1 Go

Simple Line Access

Wave Unit:  Log Scale:

Flux Unit:

RedShift: 0.00

Go

Graphic Mode

- Points
- Points

VOSpec Spectra Viewer

Flux Jy

Wave Length micron

Server	Title	Ra	Dec	Format	Select	Status
Infrared Spa...	ISO LWS01 ...	235.571265	-53.97539	spectrum/fits	<input checked="" type="checkbox"/>	complete
Infrared Spa...	ISO SWS01 ...	235.571265	-53.97539	spectrum/fits	<input checked="" type="checkbox"/>	complete

Clear Cache Unzoom (1,8778E1, 3,459E1) Display Res... Save Image

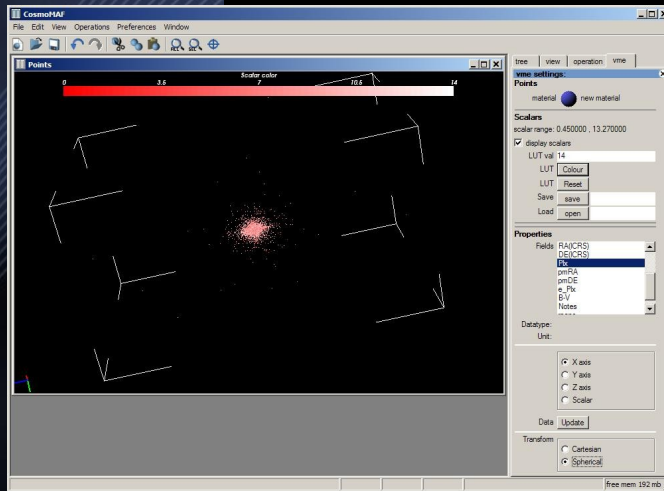
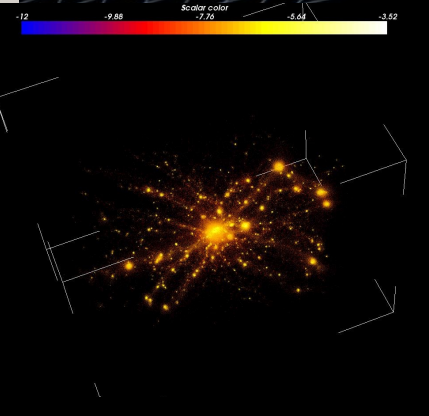
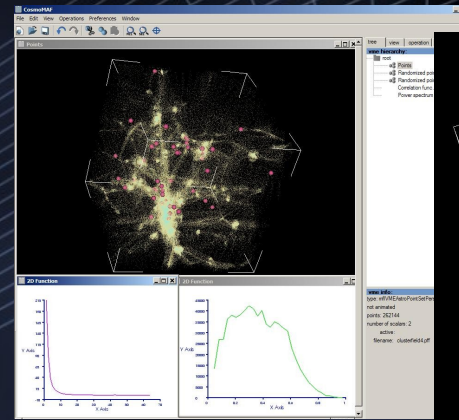
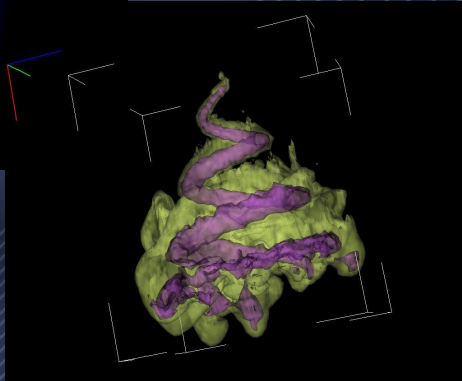
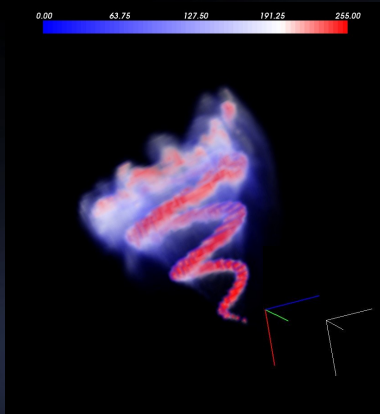
Copyright ESAC - Villafranca del Castillo - Madrid, Spain

Wrapper Creator - HowTo - About

# VisIVO : Visualization tools

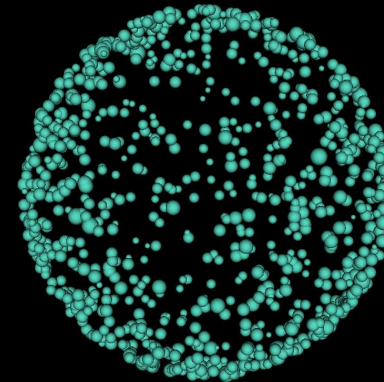
## Grid based data:

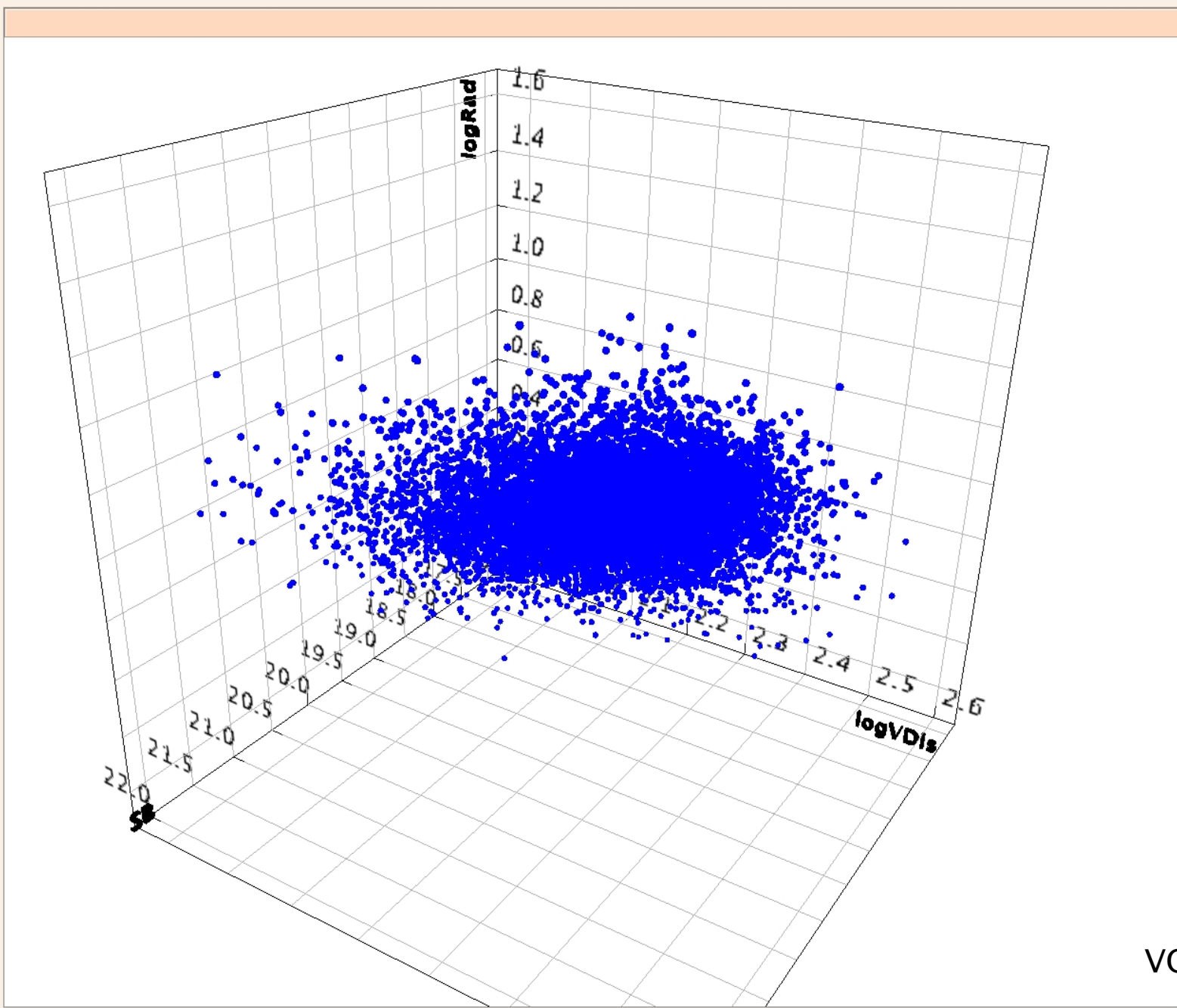
- Isosurfaces
- Volume rendering



## Point like data:

- Pixels
- Scalar quantities with colours
- Scalar quantities with variable size and shape glyphs





Theta : 0.52  
Phi : -0.48  
Psi : -0.29

X Axis  Log  
logVDis

Y Axis  Log  
logRad

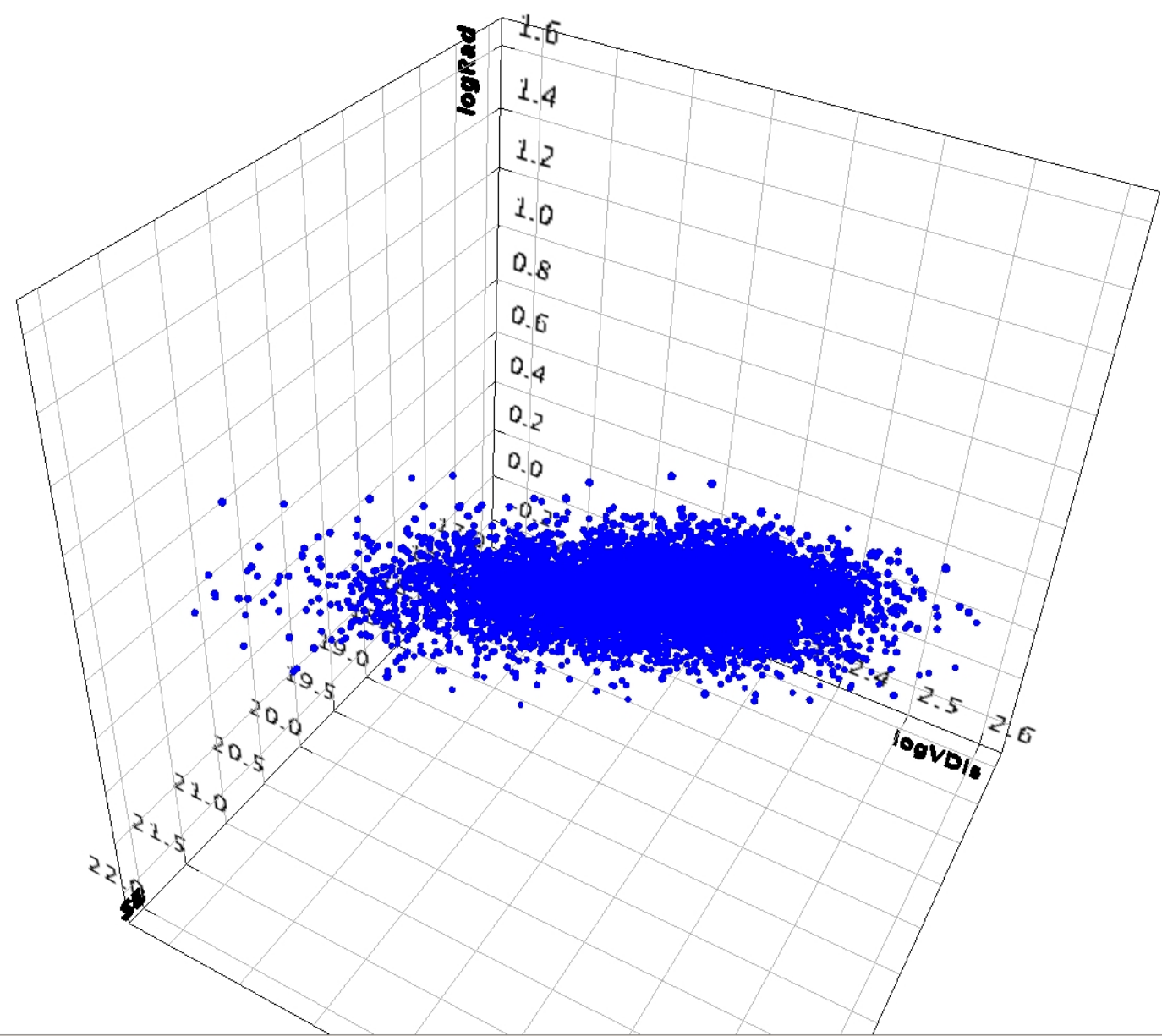
Z Axis  Log  
SB

Filter  
None

Overlay

Plot





Theta : 0.69  
Phi : -0.36  
Psi : -0.35

X Axis  Log  
logVDis

Y Axis  Log  
logRad

Z Axis  Log  
SB

Filter  
None

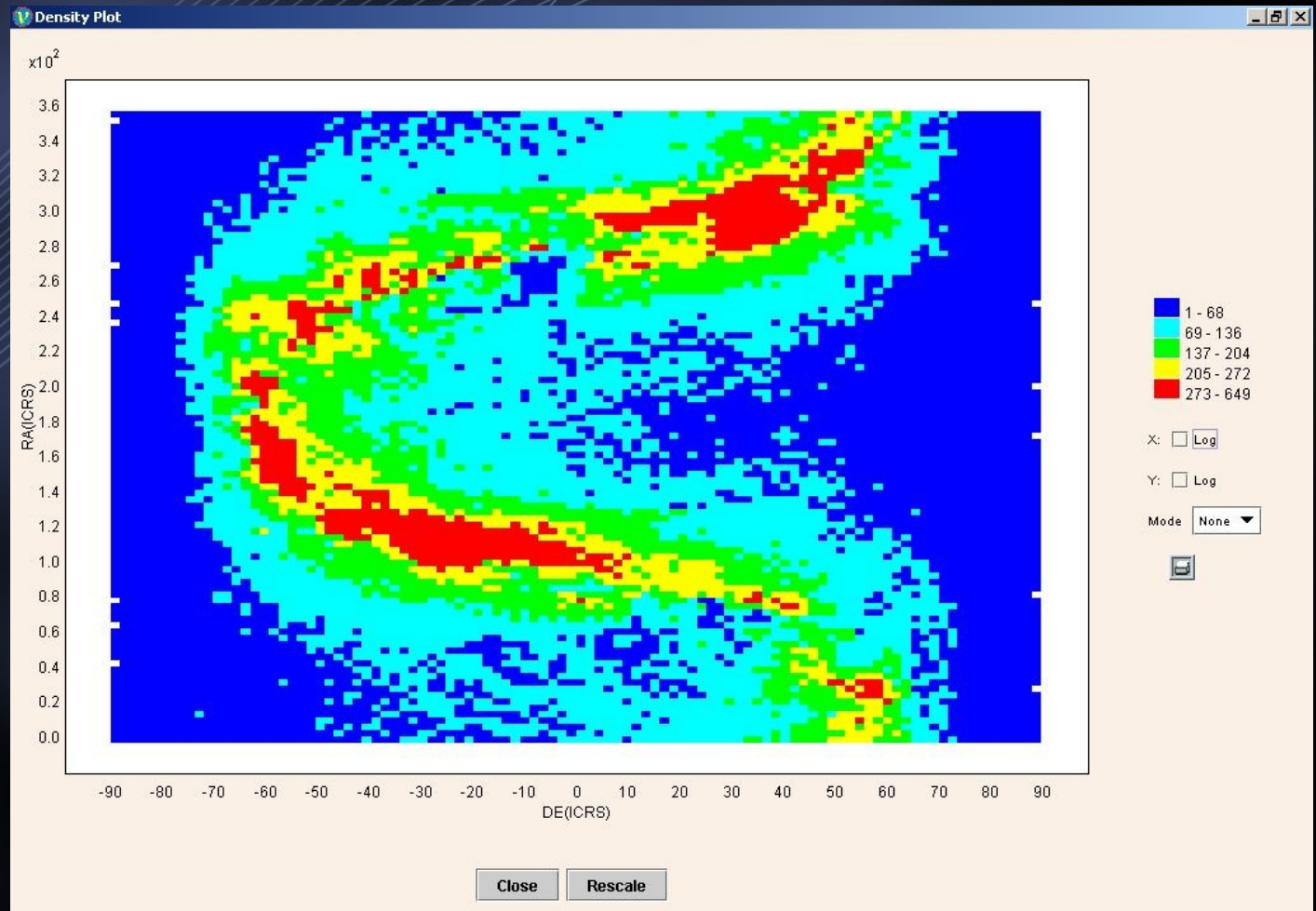
Overlay

Plot



# VO Mega-Plot density plot

- $\sim 10^6$  points





# US National Virtual Observatory

## News

- [VOEvent Workshop Report](#)
- [NVO at the AAS, January 2005](#)
- [VO Science Session at San Diego AAS Meeting](#)
- [LSST Meeting](#)
- [NVO News Archive](#)

## About

- [What is the NVO?](#)
- [Who is Involved?](#)
- [Science Objectives](#)
- [NVO in Use](#)

## Community

- [NVO Meetings](#)
- [International VO Alliance](#)
- [NVO Summer School](#)

## Documents

- Recent NVO Documents:
- [Quarterly Report, Jan-Mar 2005](#)
  - [NVO Advisory Committee Report](#)
  - [White Paper: NASA Universe Roadmap Project Plan Update](#)
  - [All NVO Documents](#)
  - [IVOA Documents](#)

## Acknowledging NVO



Supported by the  
[National Science Foundation](#)



Member of the  
International  
Virtual Observatory  
Alliance

- [Home](#)
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## NVO Core Applications

NVO's objective is to enable new science by greatly enhancing access to data and computing resources. In conjunction with the January 2005 meeting of the American Astronomical Society, NVO is releasing a first set of software tools and applications that make it easy to locate, retrieve, and analyze data from archives and catalogs worldwide.

Title	Contact	Description
<a href="#">NVO Registry Portal at STScI</a>	Gretchen Greene	Find source catalogs, observation logs, image archives, and other astronomical resources registered with the NVO.
<a href="#">DataScope</a>	Thomas McGlynn	Discover and Explore Data in the Virtual Observatory
<a href="#">Open Sky Query</a>	William O'Mullane	Cross match your data with numerous catalogues
<a href="#">Spectrum Services</a>	Tamas Budavari	Search, plot, and retrieve SDSS, 2dF, and other spectra.
<a href="#">Web Enabled Source Identification with Cross Matching (WESIX)</a>	Simon Krughoff	Upload images to SExtractor and cross-correlate the objects found with selected survey catalogs.
<a href="#">How to Publish to the NVO</a>	Ray Plante	Find out how to make your data collection available to NVO users.

The NVO web site is a community-maintained collection with content control by the NVO Executive Committee. Content is judged by the extent to which it: (a) reflects an aspect of the Virtual Observatory, such as astronomy with federated data, (b) uses VO standards or software, or (c) exemplifies grid-based astronomical computing. If you would like a description of your project, data, or software included here, please write to web at us-vo.org with a short description of your work.

Open SkyQuery - Mozilla

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://openskyquery.net/Sky/skyite/browse/Browse.aspx#> Search Print

Home Bookmarks Red Hat Network Support Shop Products Training

## Open SkyQuery

Home Query Import Tutorial Help

National Virtual Observatory

Notes

- Rosat
- XMM
- GALEX
- DLS
- RC3
- SDSS
- SDSSDR2
- SDSSDR3
- TwoDF
- Twoqz
- USNOB
- GOODS
- HDFN
- HDFS
- UDF
- ISO
- TWOMASS
- IRAS
- PSCz
- ADIL
- FIRST
- NVSS
- DEEP2
- NDWFS
- NVORegistry
- phoenix
- POSSUM\_mini
- exds\_sky\_mode

**Build** Edit Submit

```
SELECT o.objId, o.ra,
       o.dec, o.r, o.type,
       r.r
FROM
  SDSS.PhotoPrimary o, SDSSDR2:Photoprimary r
WHERE XMATCH(o, r) < 3.5
```

Welcome to the Open SkyQuery interactive query builder. You should see a parsed, clickable version of your entered query in the pane directly above this one.

If instead you see 'Query is empty', this means that builder needs a node or two to get started. You can add nodes to the builder by clicking the desired node's '+' icon in the left panel.

Once you have some sql in the above panel, you can then click on a token in that query to pull up a menu with options appropriate for that specific token. For example, one way to select an additional column from a mythical 'mytable' is to click on 'mytable' and then chose 'Add Selection', then pick the desired column from the given choices.

You can switch between 'edit' and 'build' modes at any time by using the tabs at the top of the query panel. Your changes from one will carry over to the other. Most menu options have additional mouse-over info.

Sample Queries

- XMatch/Region
- XMatch/Region 2
- Three Node Match
- Brown Dwarf Search
- MyData XMatch (upload)
- Xmatch 1+ (upload)
- ABELL Xmatch (upload)
- Single Node Query
- Single Node Join

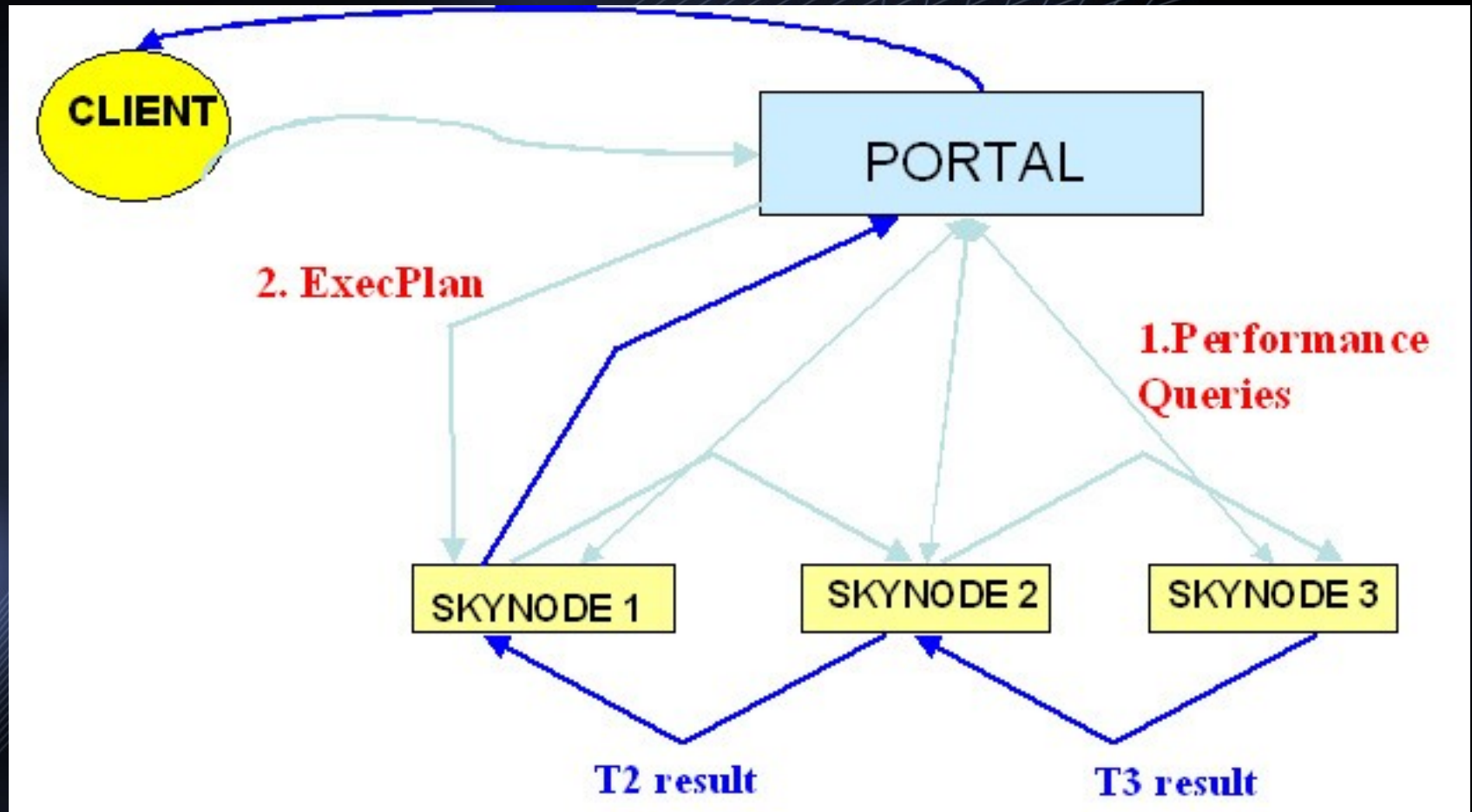
Version: v1\_0\_9  
US-VO.org

http://openskyquery.net/Sky/skyite/browse/Browse.aspx#

- PhotoPrimary Columns**
- objID
  - skyVersion
  - run
  - rerun
  - camcol
  - field
  - obj
  - mode
  - nChild
  - type
  - probPSF
  - insideMask
  - flags
  - rowc
  - rowcErr
  - colc
  - colcErr
  - rowv
  - rowvErr
  - colv
  - colvErr
  - rowc\_u
  - rowc\_g



# SkyQuery



Mozilla

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HTML Save

Only the first 128 of 5000 rows are displayed for this query. Please click 'Save'

sdss_objid	sdss_ra	sdss_dec	sdss_r	sdss
582100152821940758	259.717782786004	25.6622296171871	17.447	
582100152821941587	259.721099546249	25.6648094400192	21.97009	
582100152821941845	259.7266508356	25.6674890743119	22.04127	
582100152821941259	259.722602975049	25.6670984433228	21.15369	
582100152821940993	259.741105598172	25.6757329621483	21.06688	
582100152821941260	259.737180295526	25.675305780907	20.96707	
582100152821941582	259.738716367207	25.6768855982933	22.0847	
582100152821940992	259.748946684833	25.6819240558371	25.59123	
582100152821941761	259.728661478031	25.6743529419369	23.87707	
582100152821940752	259.754257953719	25.6842210782903	19.86288	
582100152821940949	259.733115993724	25.6772429133124	20.63649	

Done

Open SkyQuery - Mozilla

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## Open SkyQuery

National Virtual Observatory

Home Query Import Tutorial Help

Build Edit Submit

```

SELECT o.objId, o.ra,
       o.dec, o.r, o.type,
       a.r
FROM
  SDSS:PhotoPrimary o, SDSSDR2:Photoprimary a
WHERE XMATCH(o, a) < 3.5
  
```

Query Status: Query is complete

RESULTS View Plot

Dev: Info: ExoPlan

Nodes:	Colors?
Node:	SDSSDR2
Node:	SDSS

VOTable Plot - Mozilla

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File	Mode	View	Functions	Aladin	Help
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sdss\_r

sdssdr2\_r

X: 16.6  
Y: 13.2

Y:  Log  Rev  
sdss\_r

X:  Log  Rev  
sdssdr2\_r

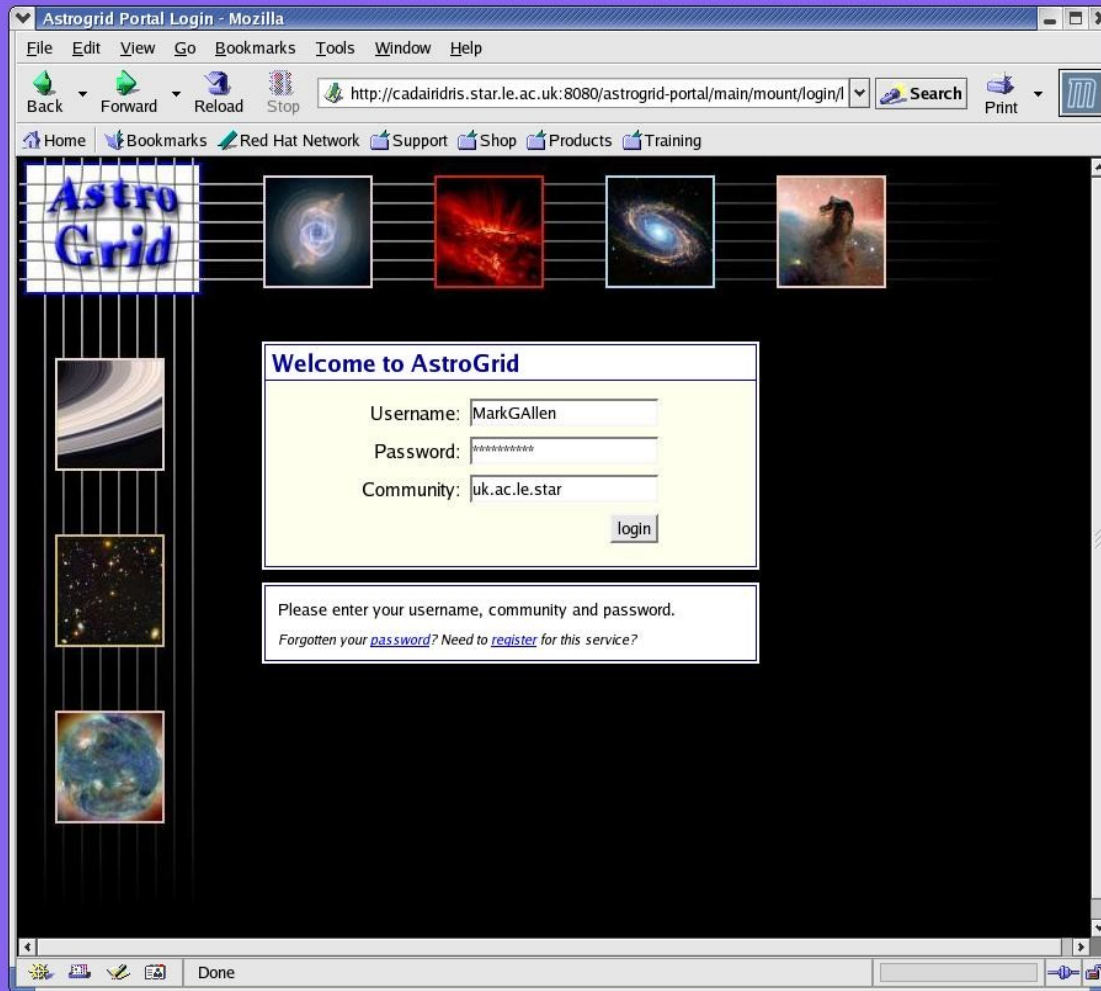
Filter: None

Overlay

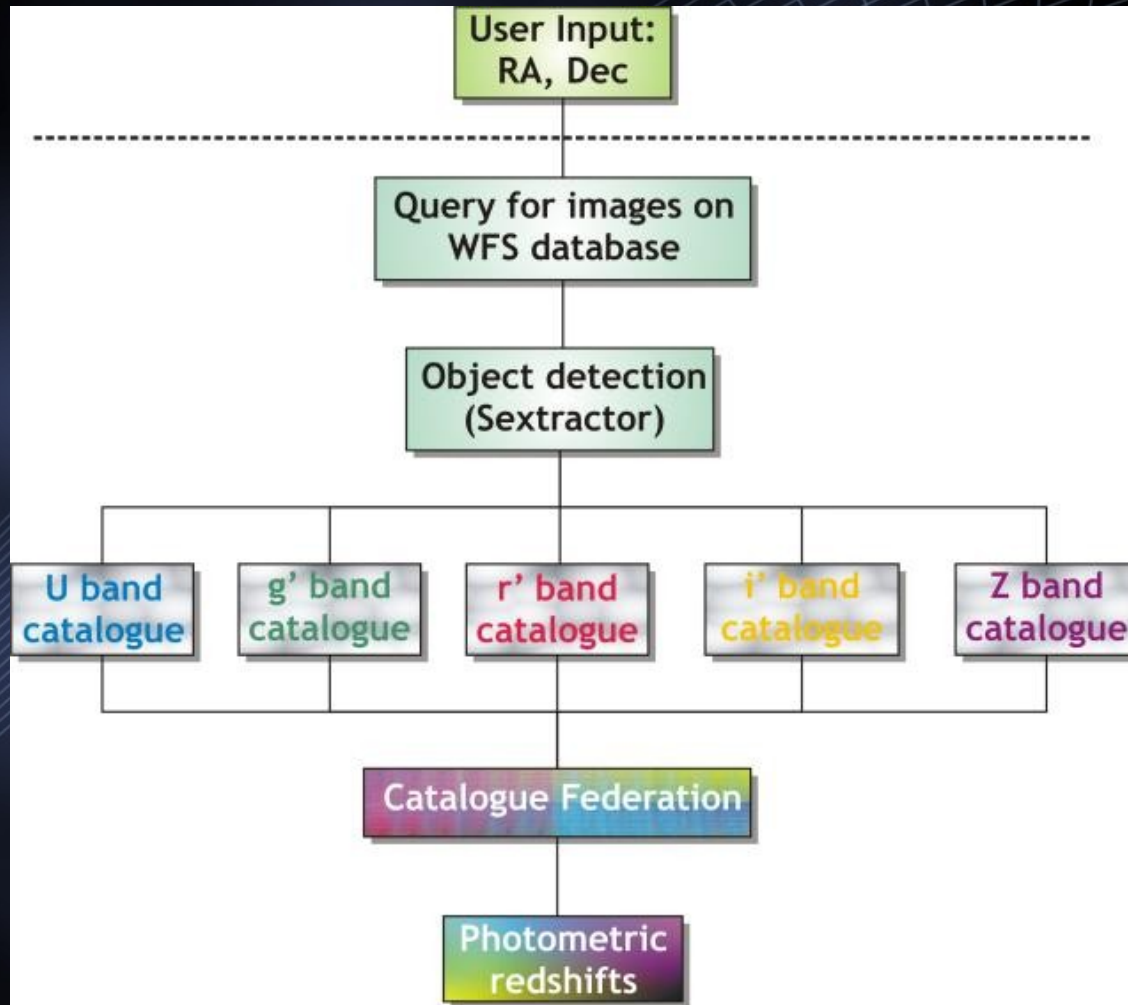
Plot Histogram

Mode: Select

Applet com.jvt.applets.PlotVOApplet started



AstroGrid : scaling up VO processing into WorkFlows





Workflow Editor - Mozilla

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Back Forward Reload Stop <http://cadairidris.star.le.ac.uk:8080/astrogrid-portal/main/mount/workflow/agjobmanager.html> Search Print

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### Workflow Editor

Name: AstroGrid Redshift Maker NG

Description: Calculate redshifts from imaging data

update workflow details

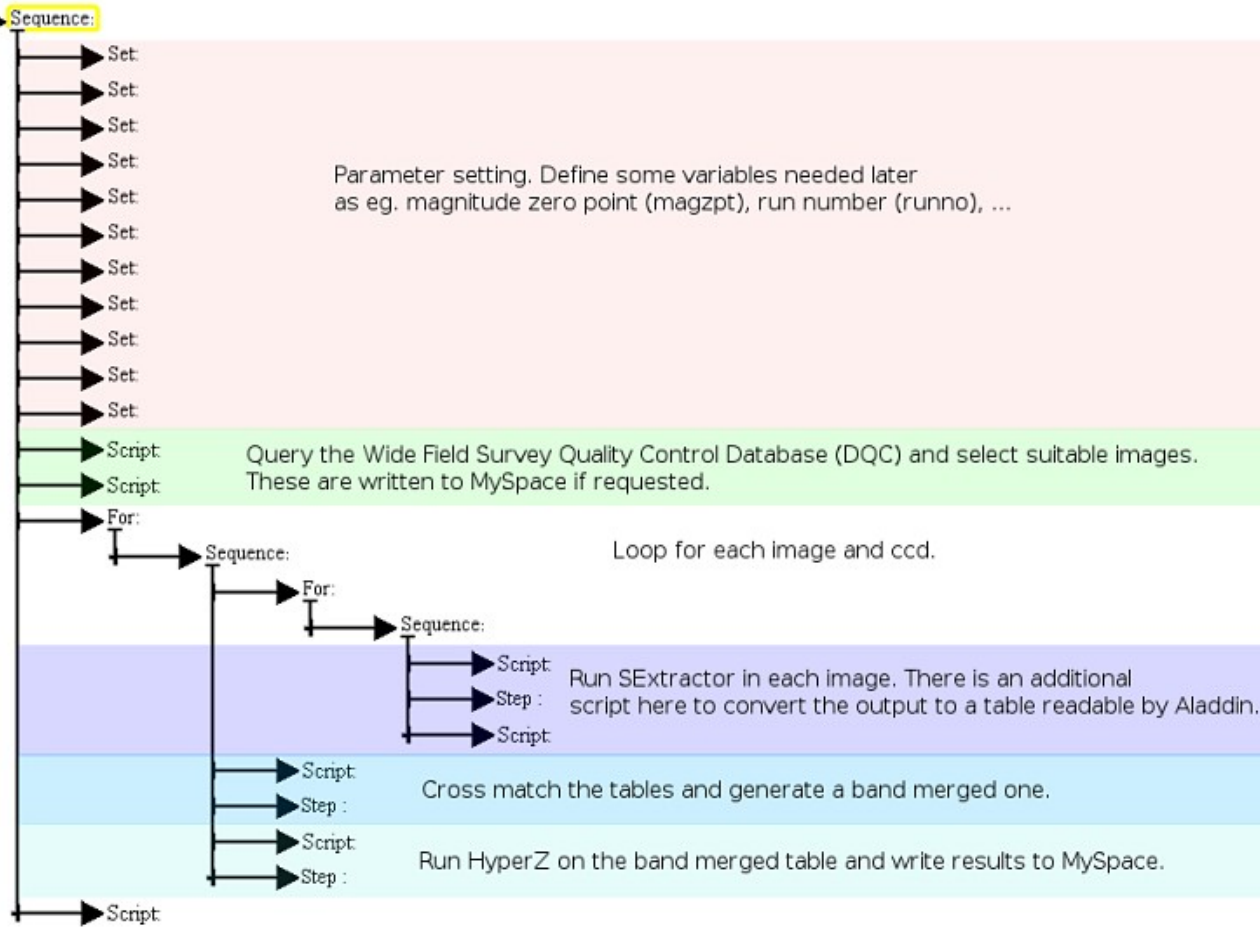
- Sequence (yellow)
- Flow (black)
- Step (grey)
- Logic (if/scope/script/set/unset) (green)
- Loops (for/parallel for/while) (blue)
- Error handling (try/catch) (red)

Step:	Task:
Step name: sex_COPY	org.astrogrid/SExtractor SExtractor : Galactic
Var. name:	Task name: -- Select task --
Description: SExtractor	Description: SExtractor is a program that builds a catalogue of objects from an astronomical image. Although it is particularly oriented towards reduction of large scale galaxy-survey data, it performs rather well on moderately crowded star fields....

update step details

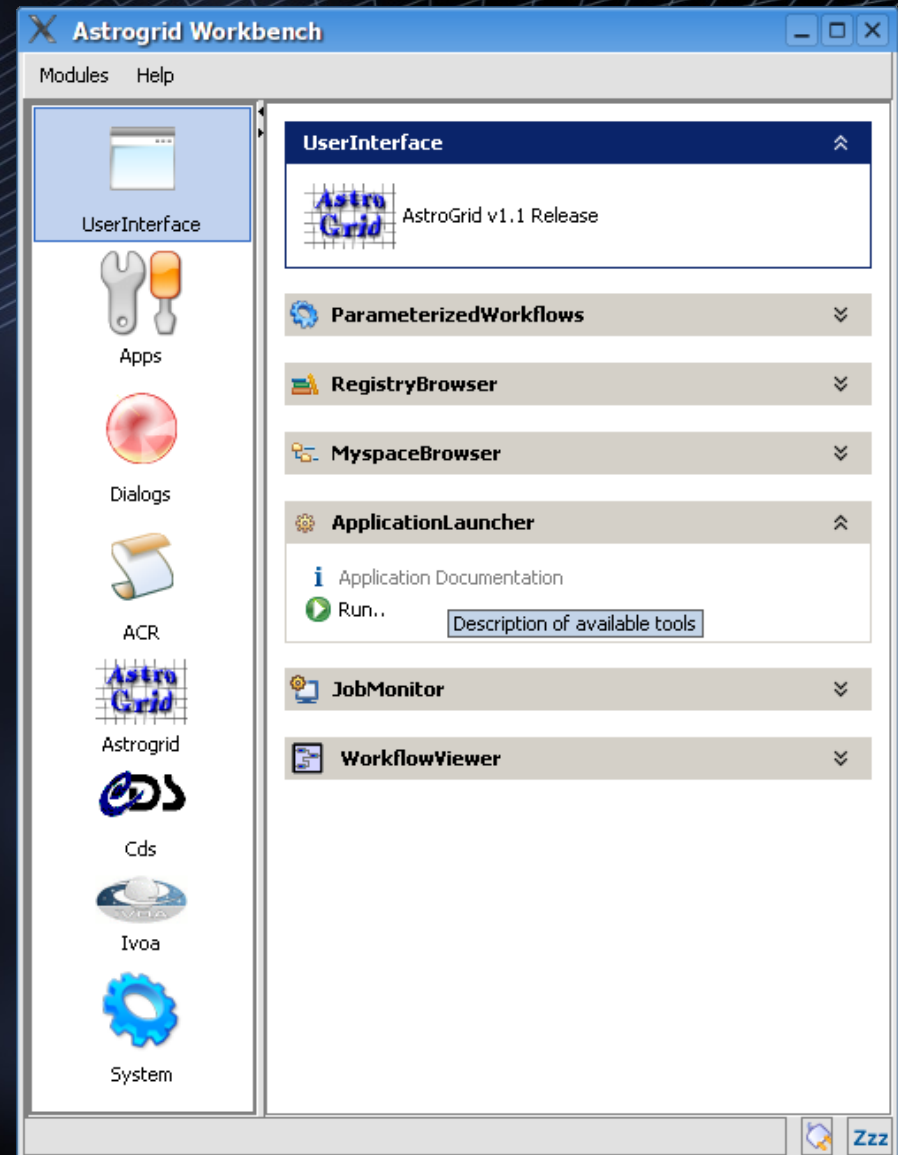
File...

# The Workflow explained



# Workbench

- Launcher
- Lists a suite of GUI Applications
- Also exposes some of the basic functions of the ACR
  - good for experimentation



# Workbench UI

The screenshot displays the AstroScope Workbench UI, a complex environment for astronomical data management and analysis. The interface is divided into several key components:

- Application Launcher - GdF:** Located at the top left, it provides a search interface for applications. The search criteria are set to 'Find: roe'. A list of applications is shown, including 'SuperCOSMOS Science Archive', 'GdF', '2MASS', and 'USNO-B'. Below the list, there are fields for 'XML', 'Parameter', 'Info', and 'Chooser'.
- Registry Browser:** A central panel showing a list of registry entries. The selected entry is titled 'Radio and Infrared observations of EROs (Small+ 2002) - ERO Catalog (Short name: JApJ/581/844/ta)'. It includes a description: 'The radio image of A851 comprises a combination of A, B, C, and D configuration observations at the National Radio Astronomy Observatory's VLA at 1.4GHz between 1996 and 2000. Our primary infrared imaging data set comes from wide-field images in JHK taken with the KPNO 2.1 m telescope on nights of 2001 January 4-11. On the nights of 1999 July 28, March 10/2, and March 15/16 we completed band mosaic of 5x5 pointings using the UFTI imager KIRT On 2000 December 11/12 we used the INGRID infrared imager in the WHT to obtain a J-band image of the cluster core. The optical imaging to complement our deep near-infrared data sets was imaged from three facilities. We have two wide-fielding data sets of this region. The first comes from the...'. It also lists the creator: 'VizieR Creator: Small I., Owen F.N., Morrison Keel W.C., Ivison R.J., Ledlow M.J.' and the version: '2004-04-20T00:01:08Z Version: 09-Feb-2004'. The identifier is 'ivo://cds/VizieR/JApJ/581/844/table1'.
- AstroScope Visualization Controls:** Located at the top right, it shows the current position/object as 'm32', region as '0.1', and visualization controls for 'Images' and 'Catalogues'. There is a 'Submit' button and a 'Go to Top' link.
- Central Visualization:** A large, complex network diagram showing relationships between various astronomical data sources. Nodes include 'M31 Globular Cluster', 'M31 Source', 'Morphological Galaxy Catalog', 'GCV Virtual Observatory', 'The Westerbork Northern Sky', 'Digitized Sky Survey', 'NRAO VLA Sky Survey', 'Green Bank 8cm radio survey', 'ROSAT PSPC Pointed', 'ROSAT All Sky Survey', 'ROSAT All Sky Survey Draft', 'ASCA Mast', 'Astrographic Catalog', 'CTIP results for the WHT', and 'GAP results for the WHT'. Each node is associated with a numerical value, often in red or green circles, representing a score or weight.
- Application Launcher - GdF (SQL Editor):** A window showing an SQL query: 'select b.OBJID, b.CATNAME from DENISI as b where'. It includes a 'Validate ADQL' button and a list of columns to insert.
- AstroGrid:** A panel on the left side showing a 'User Interface' with icons for 'Apps', 'Dialogs', 'ACR', 'AstroGrid', 'Cds', 'Ivoa', and 'System'. It also displays a 'Tree View' of a workflow: 'AstroGrid Redshift Maker' -> 'Calculate redshifts from imaging data' -> 'Script WFS DQC query' -> 'For j in S(ccdn)' -> 'Script' -> 'Step sex\_COPY' -> 'Script scripts' -> 'Step xmatch Result Variable xmatch'.
- Properties Panel:** A window showing the properties of a file named 'Run-169604-CCD-2.fits'. It includes fields for 'Created' (06-Jul-2005 18:45:54), 'Modified' (06-Jul-2005 18:45:55), 'Node Ivorn', 'Node Ivorn', 'Size' (16394 Kb), and 'Store' (ivo://uk.ac.le.star/ilestore-001).
- Message List:** A window showing a list of messages with columns for 'Subject', 'Date', and 'From'. The messages include 'Status Change', 'Alerts', 'Queries', 'Tasks', 'Workflows', 'CTIP: mode A 5', 'TimeMovieMaker 7', 'TimeMovieMaker 8', 'AstroGrid Redshift Maker', 'TimeMovieMaker 9', 'TimeMovieMaker 10', 'TimeMovieMaker 11', 'TimeMovieMaker 12', 'TimeMovieMaker 13', 'TimeMovieMaker 14', 'TimeMovieMaker 15', 'TimeMovieMaker 16', 'TimeMovieMaker 17', 'TimeMovieMaker 18', and 'TimeMovieMaker 19'.

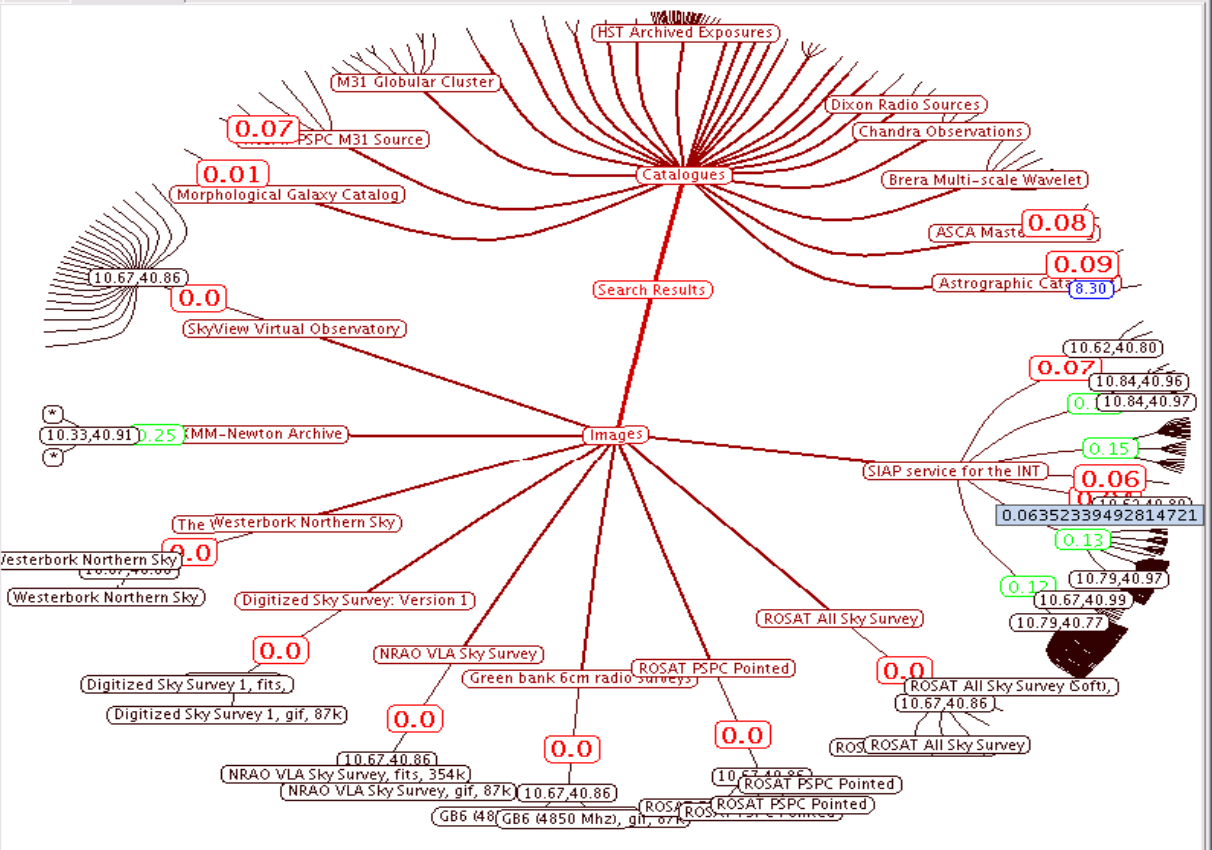


# AstroScope

Position/Object: m32  
Region: 0.1  
 Images  Catalogues  
Submit Save

Radial Hyperbolic

Vizualization Controls:  
Go to Top



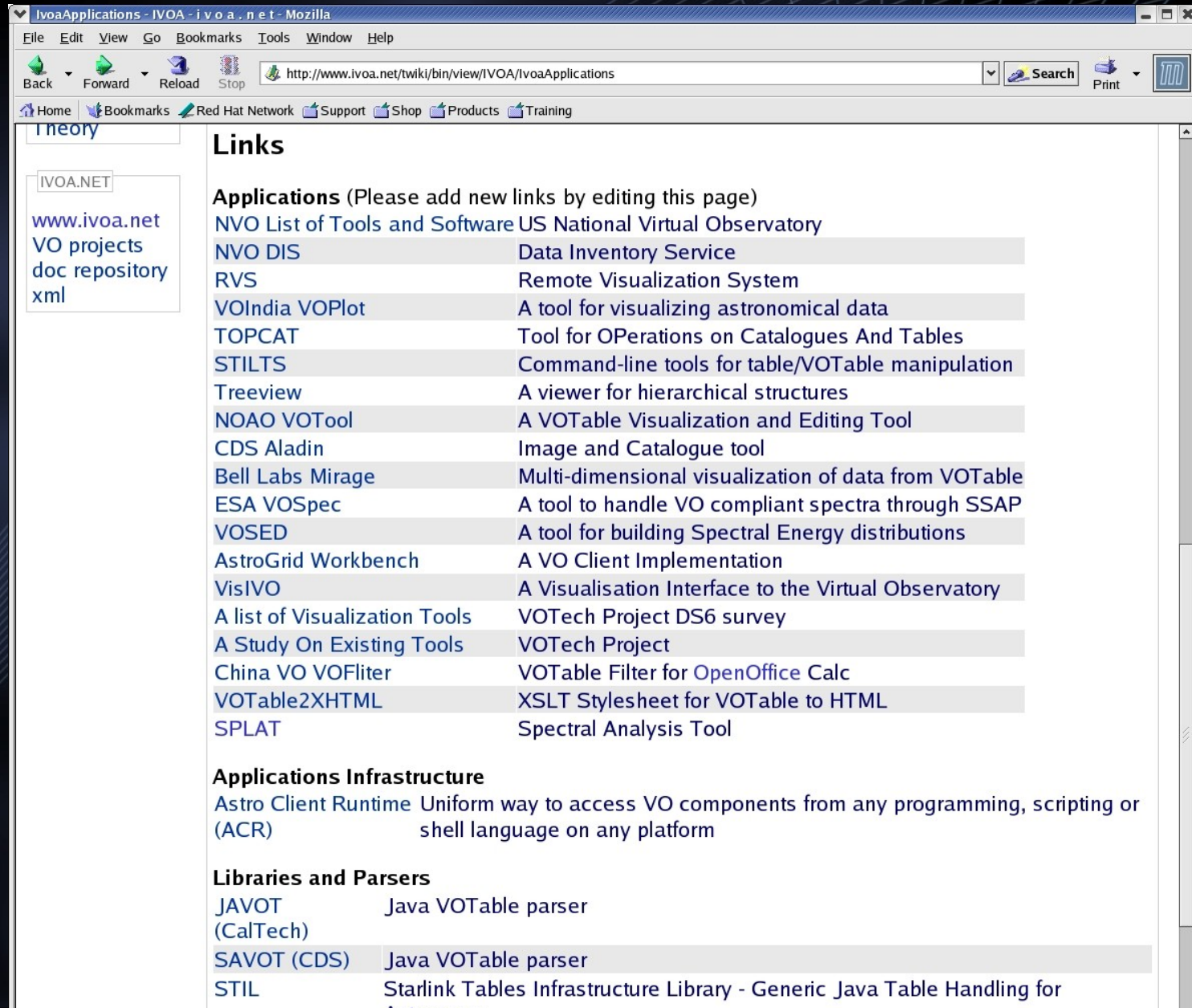
Adding results from SIAP service for the INT wide-field survey



# IVOA Applications Interest Group

- Announcements of new tools
- Discussion on VO tools
- Suggestions for enhancements
- Feedback to IVOA working groups on standards etc.
- [www.ivoa.net](http://www.ivoa.net) - Community - Applications

# Working list of applications – add your own!



**theory**

**IVOA.NET**

[www.ivoa.net](http://www.ivoa.net)  
VO projects  
doc repository  
xml

## Links

**Applications** (Please add new links by editing this page)

<a href="#">NVO List of Tools and Software</a>	US National Virtual Observatory
<a href="#">NVO DIS</a>	Data Inventory Service
<a href="#">RVS</a>	Remote Visualization System
<a href="#">VOIndia VOPlot</a>	A tool for visualizing astronomical data
<a href="#">TOPCAT</a>	Tool for OPERations on Catalogues And Tables
<a href="#">STILTS</a>	Command-line tools for table/VOTable manipulation
<a href="#">Treeview</a>	A viewer for hierarchical structures
<a href="#">NOAO VOTool</a>	A VOTable Visualization and Editing Tool
<a href="#">CDS Aladin</a>	Image and Catalogue tool
<a href="#">Bell Labs Mirage</a>	Multi-dimensional visualization of data from VOTable
<a href="#">ESA VOSpec</a>	A tool to handle VO compliant spectra through SSAP
<a href="#">VOSED</a>	A tool for building Spectral Energy distributions
<a href="#">AstroGrid Workbench</a>	A VO Client Implementation
<a href="#">VisIVO</a>	A Visualisation Interface to the Virtual Observatory
<a href="#">A list of Visualization Tools</a>	VOTech Project DS6 survey
<a href="#">A Study On Existing Tools</a>	VOTech Project
<a href="#">China VO VOfliter</a>	VOTable Filter for <a href="#">OpenOffice Calc</a>
<a href="#">VOTable2XHTML</a>	XSLT Stylesheet for VOTable to HTML
<a href="#">SPLAT</a>	Spectral Analysis Tool

## Applications Infrastructure

[Astro Client Runtime](#) Uniform way to access VO components from any programming, scripting or shell language on any platform (ACR)

## Libraries and Parsers

<a href="#">JAVOT</a> (CalTech)	Java VOTable parser
<a href="#">SAVOT (CDS)</a>	Java VOTable parser
<a href="#">STIL</a>	Starlink Tables Infrastructure Library - Generic Java Table Handling for

# Summary

- **VO tools are ready for doing science**
  - Varying levels of stability and maturity
- **VO services are rapidly coming online**
  - Data centres implementing translation layers
  - Specialized services uptake of VO standards
- **Workflows and Grid capabilities**
  - First steps are promising