# The NVO Data Discovery Portal

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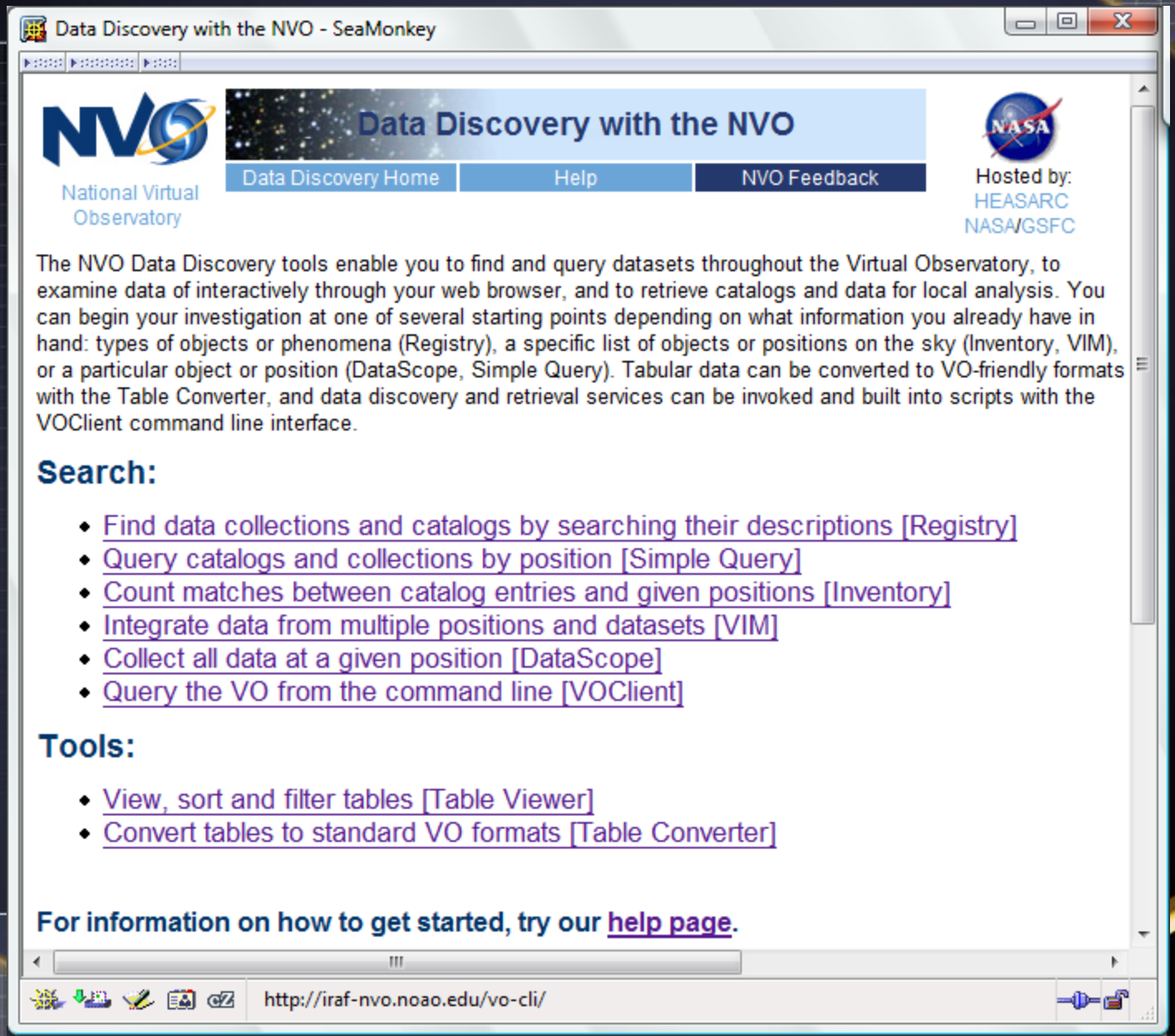
# Portal Summary

- Astronomer access to VO:
  - Address science right away without worrying about downloads, data models, formats, protocols, ....
- Quick and convenient
- Comprehensive
- Lead users to other VO resources
  - Transition to CLI and GUI tools
- Distributed implementation among NVO organizations

All elements publicly available: Portal home page currently at http://heasarc.gsfc.nasa.gov/vo/portal

# Portal home


Data Discovery with the NVO - SeaMonkey
National Virtual Observatory
Data Discovery with the NVO
Data Discovery Home
Help
NVO Feedback
Hosted by:
HEASARC
NASA/GSFC
The NVO Data Discovery tools enable you to find and query datasets throughout the Virtual Observatory, to examine data of interactively through your web browser, and to retrieve catalogs and data for local analysis. You can begin your investigation at one of several starting points depending on what information you already have in hand: types of objects or phenomena (Registry), a specific list of objects or positions on the sky (Inventory, VIM), or a particular object or position (DataScope, Simple Query). Tabular data can be converted to VO-friendly formats with the Table Converter, and data discovery and retrieval services can be invoked and built into scripts with the VOClient command line interface.
Search:
Find data collections and catalogs by searching their descriptions [Registry]
Query catalogs and collections by position [Simple Query]
Count matches between catalog entries and given positions [Inventory]
Integrate data from multiple positions and datasets [VIM]
Collect all data at a given position [DataScope]
Query the VO from the command line [VOClient]
Tools:
View, sort and filter tables [Table Viewer]
Convert tables to standard VO formats [Table Converter]
For information on how to get started, try our help page.
http://iraf-nvo.noao.edu/vo-cli/

# So why haven't we promoted it?

- Registry V1.0 transition
  - Adapting to protocols
  - Issues with new resources
- Reliability
  - Portal elements themselves
  - Services invoked
- Interoperability of elements
- Complexity
  - Balance between power and usability
  - User comprehension

Building something simple is hard.

# Registry transition

- Many more data resources registered with standardized interfaces (factor of 10 increase)
- Distinctions between resource and interface
- Known issues become more significant, new problems emerge.
- Complexity of new registry interface
  - New VOTable based format for conveying registry information.

# Reliability

- Portal services
  - Graceful failure modes.
  - Handling of large requests.
  - Formal testing
- External services
  - Finding actual failure modes
    - Often fail in ways not specified in standard
  - Failures due to overloading
  - Services down
    - Cannot always wait in a interactive environment
    - Service monitoring

# Interoperability of Portal Elements

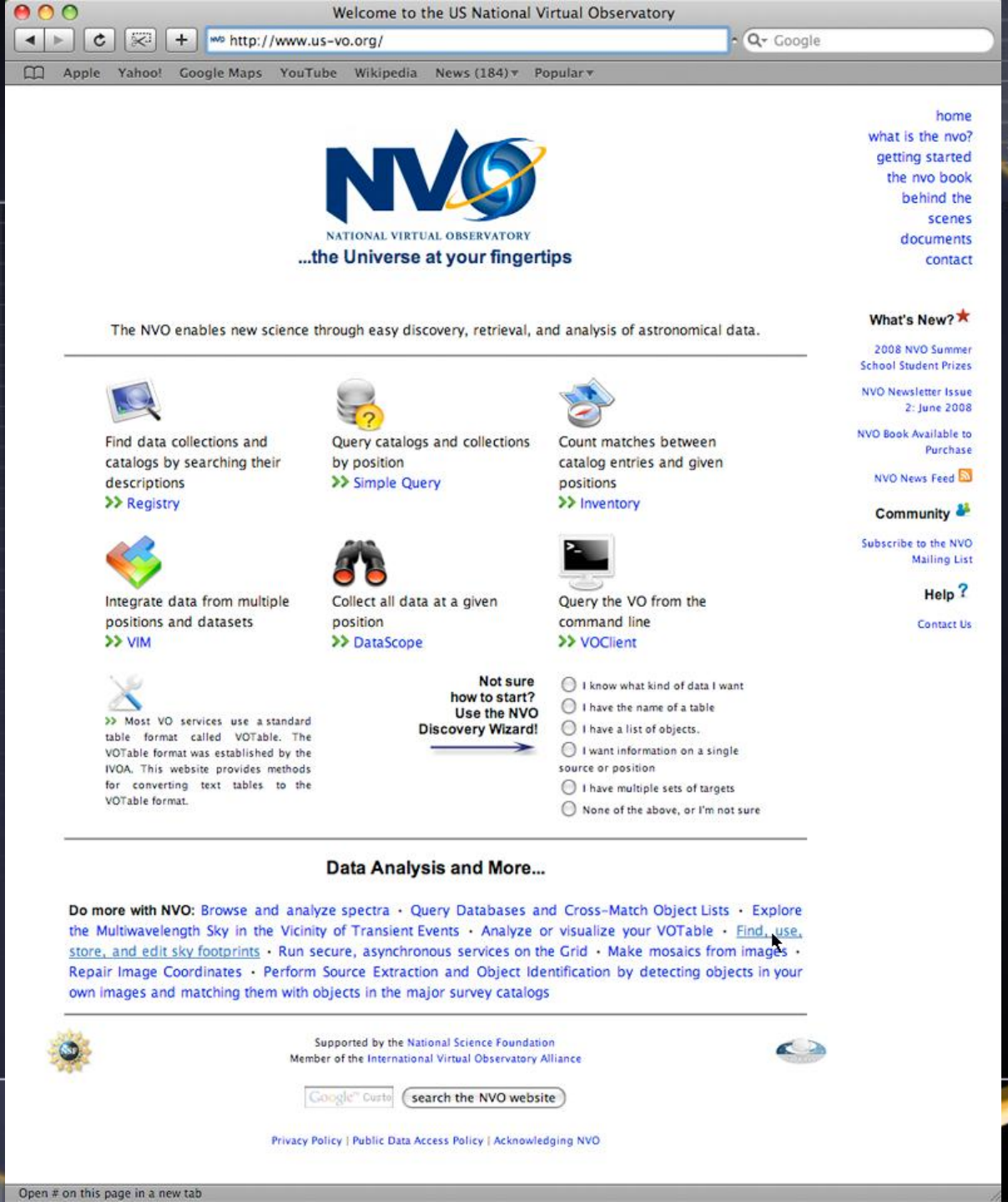
- What information should be passed around?
  - List of positions
  - List of resources
  - *Provenance*
  - *Where to send results*
- Syntax
  - Mini-standard
- Propagate ideas to registry group.

# Complexity

- Hide complexity of VO
  - Jargon
  - Inconsistent terminology and interfaces
- Guide user expectations
  - Make intuitive what is possible
  - Make manifest what is unfeasible
- Address scaling of user requests
  - How many sources, how many resources?
- “Where can I go from here?”
- Documentation

# Future

New NVO home page concept

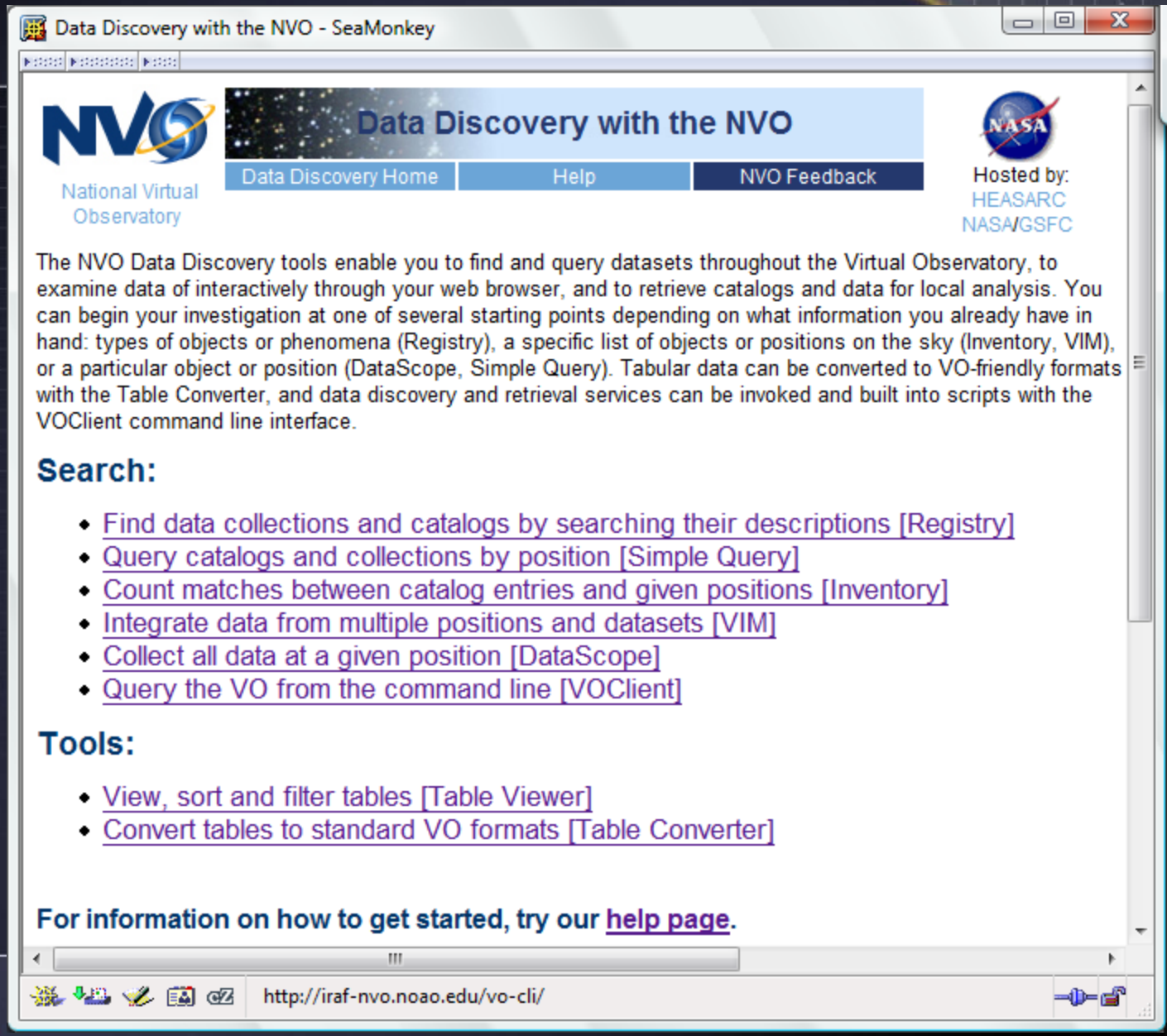


# FOLLOWING SLIDES FROM NVO SUMMER SCHOOL PORTAL TALK

# Portal elements

- What kind of data is there? (registry)
- Poke around in a resource. (simple query)
- What resources are there at my positions? (inventory)
- Everything known about a given source (DataScope)
- How can I use my data in the VO ?(table converter and wizard)?
- How can I combine information from multiple resources? (Vim)
- But I don't want to have to use the web! (voclient)

# Portal Home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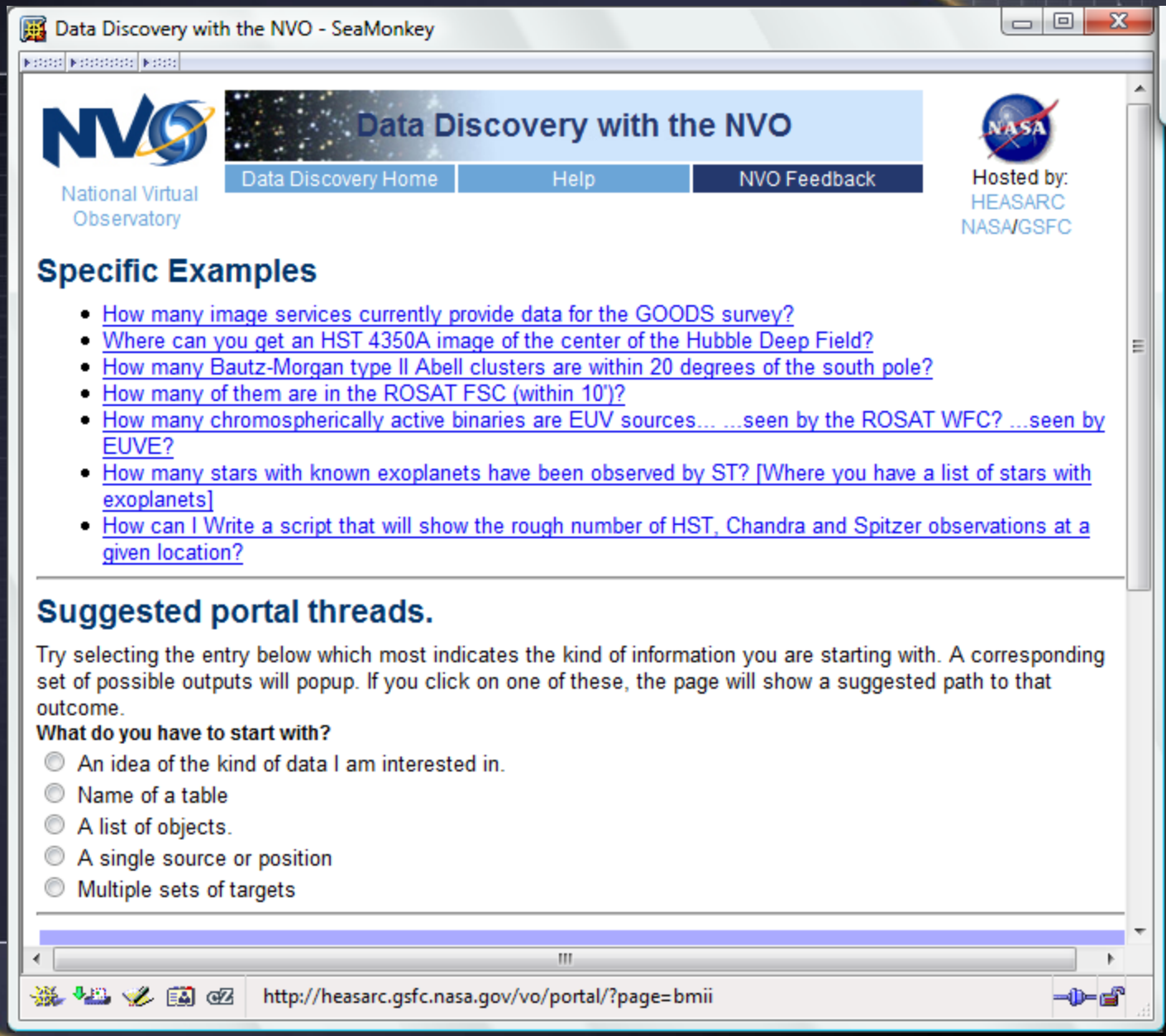
# Examples and Help



# What kind of data is out there?

# The active response page

Select

Search

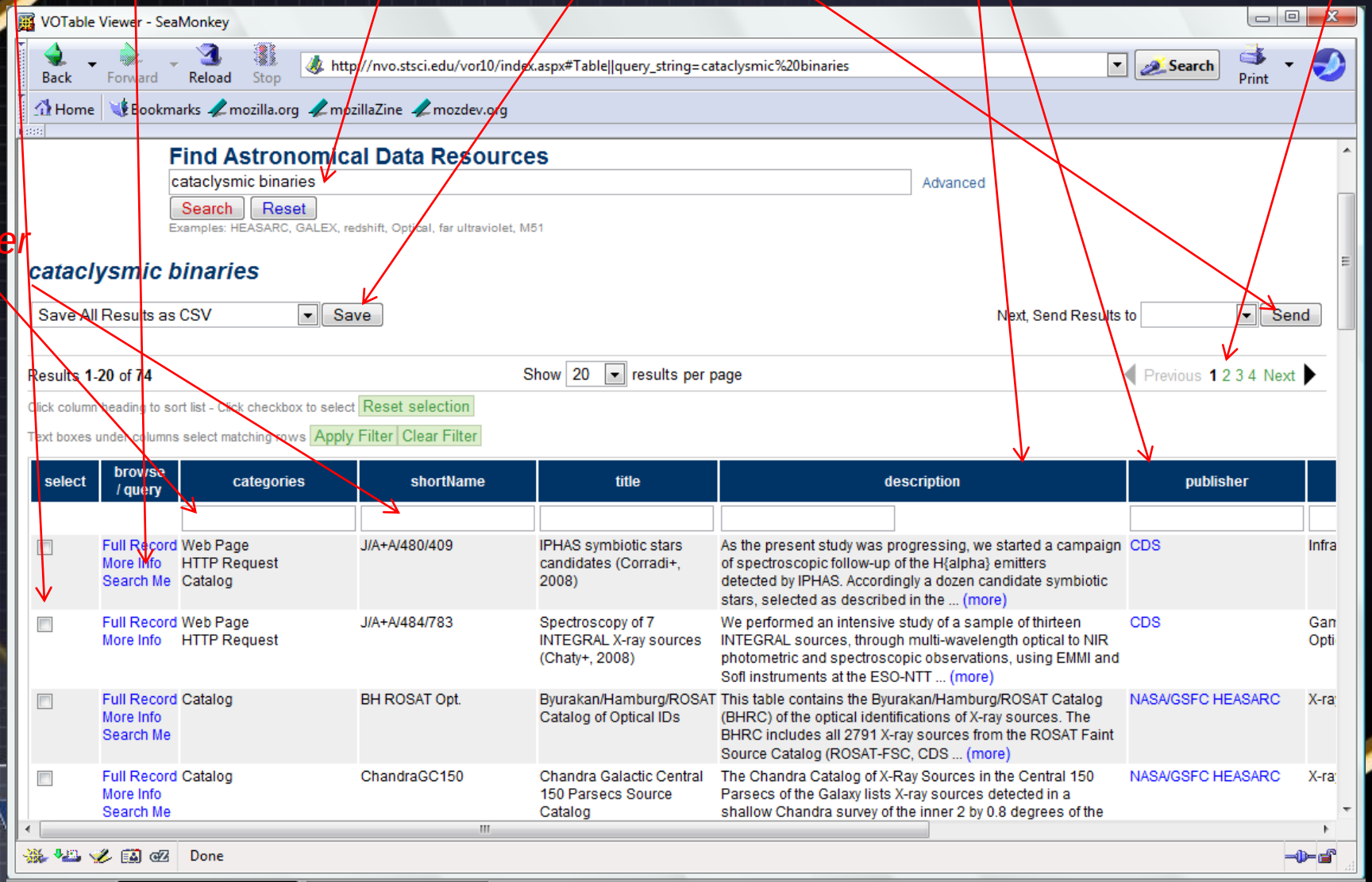
Requery

Save

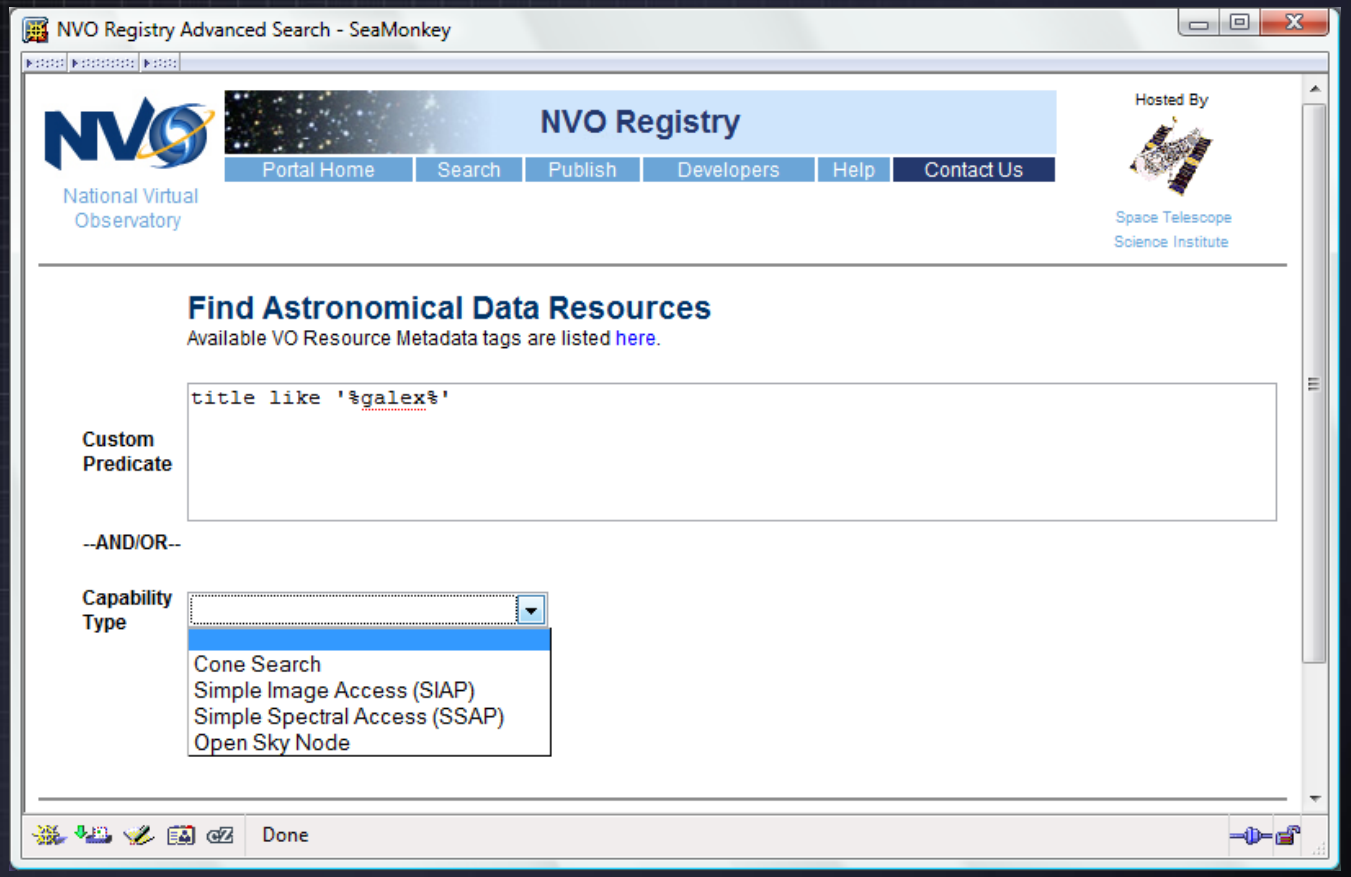
Sort

Page

Filter



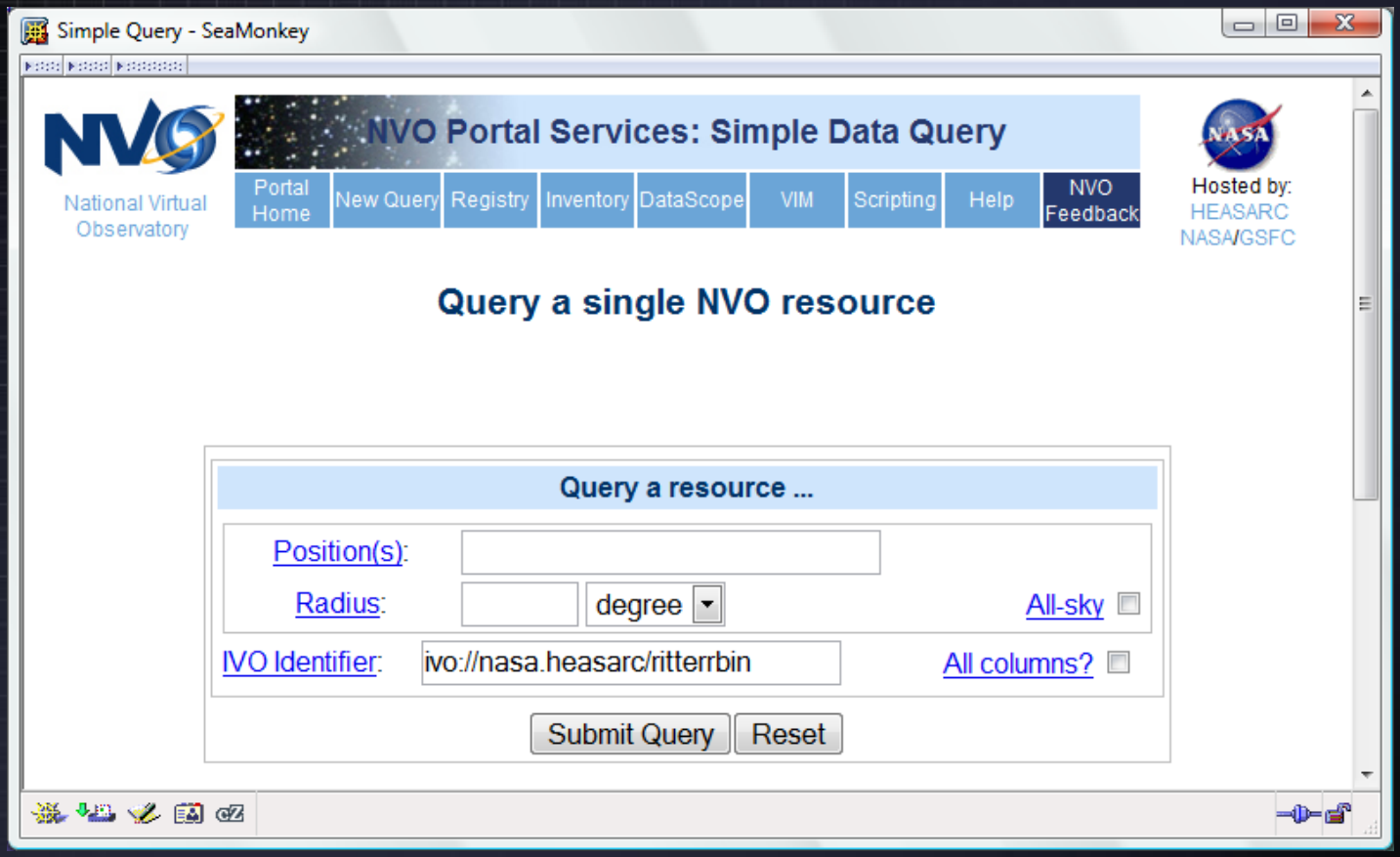
# Registry Advanced Search



# Poke around.

- Pick searchable service and click search button.
- Do all sky search if appropriate, or limited positional search.
- Filter results

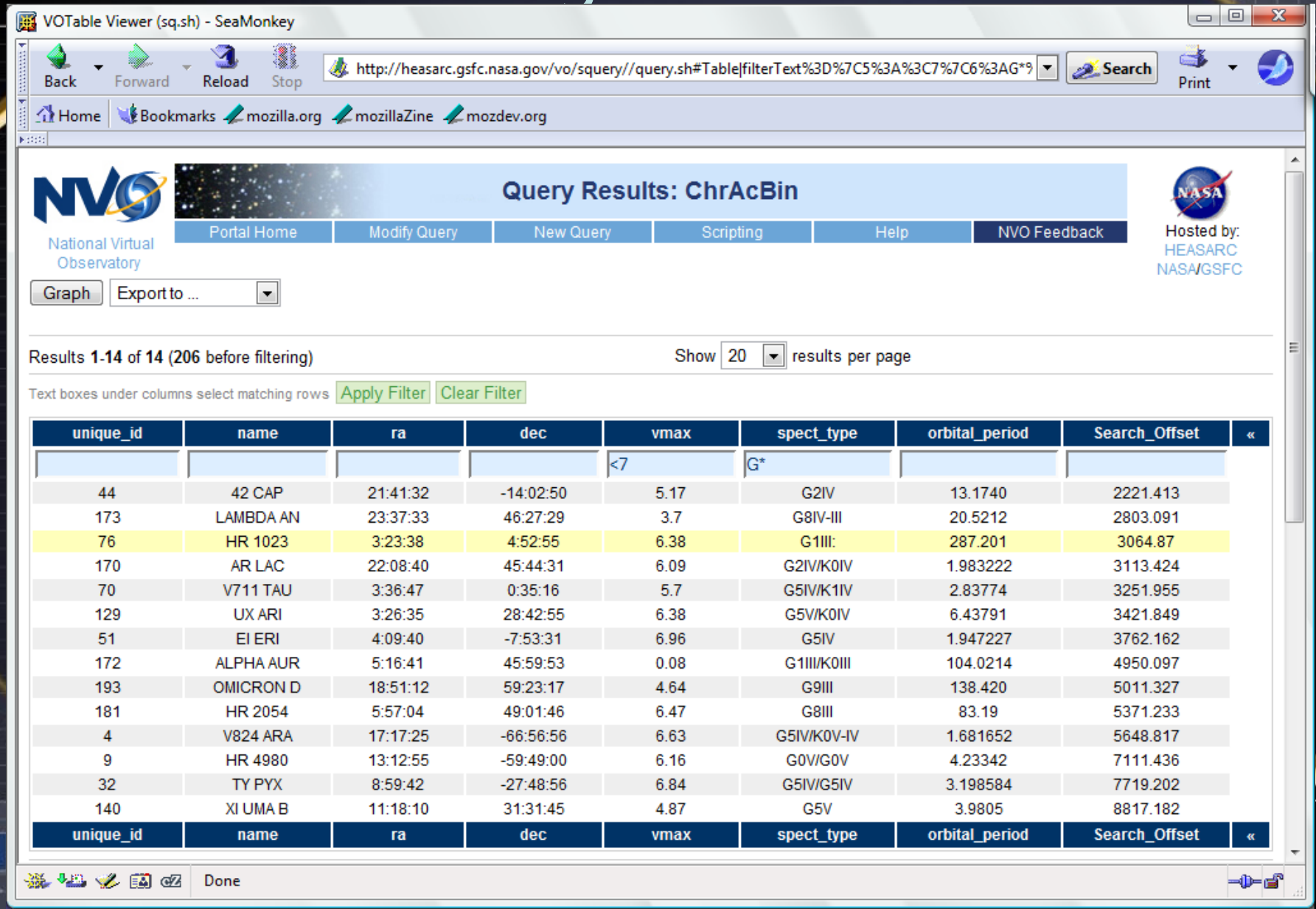
# Send results to the table viewer (SimpleQuery)



# Another active results screen

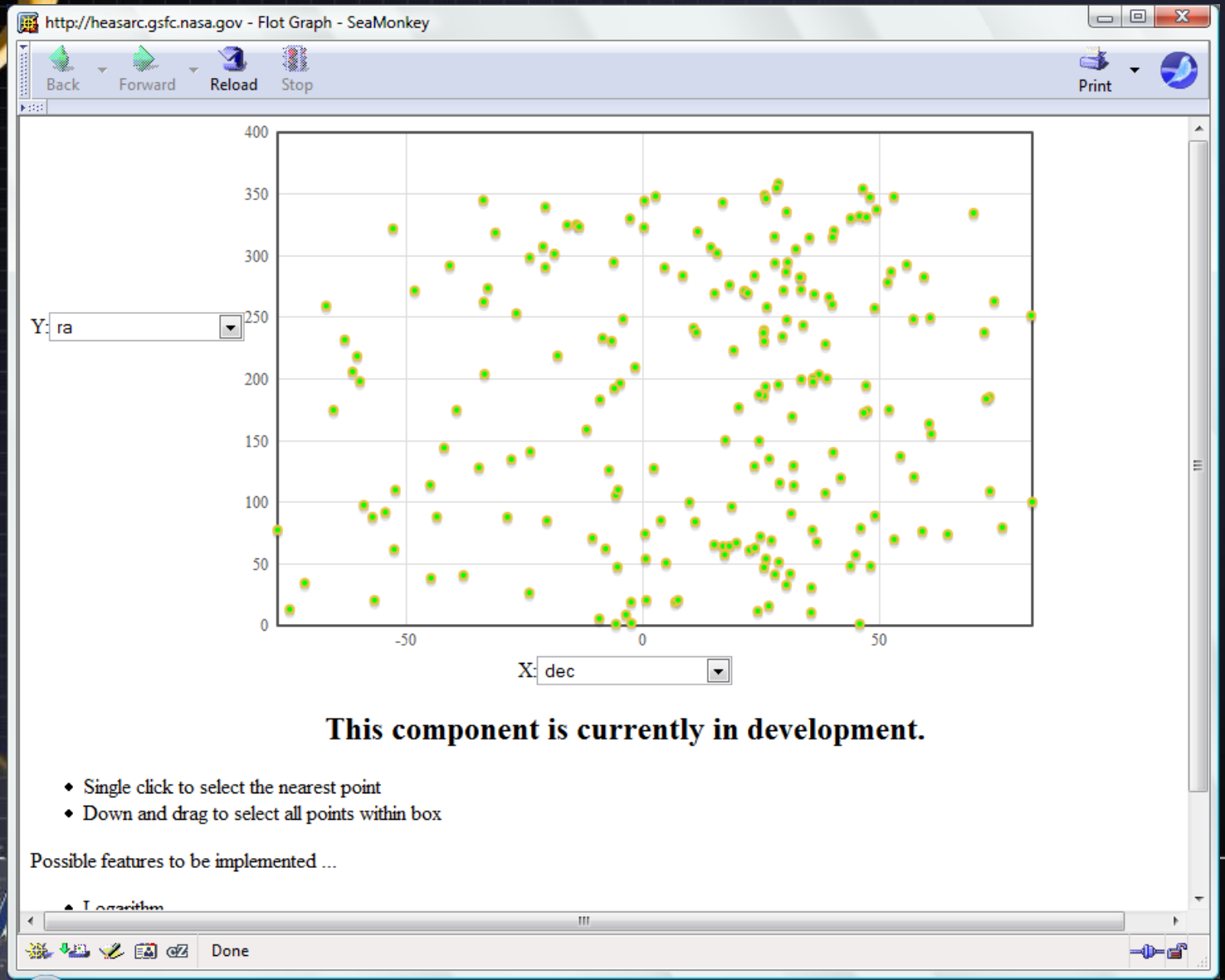

| unique_id | name | ra | dec | vmax | spect_type | orbital_period | Search_Offset |
|---|---|---|---|---|---|---|---|
| 65 | 5 CET | 0:08:11 | -2:26:52 | 6.07 | WF/K1III | 96.439 | 191.545 |
| 57 | 33 PSC | 0:05:20 | -5:42:26 | 4.61 | K0III | 72.93 | 351.646 |
| 62 | 13 CET A | 0:35:14 | -3:35:34 | 5.2 | {F7V/}G4V | 2.08200 | 570.636 |
| 48 | BD CET | 0:22:46 | -9:13:49 | 7.89 | K1III | 35.100 | 649.956 |
| 73 | SZ PSC | 23:13:23 | 2:40:32 | 7.2 | F8IV/K1IV | 3.965866 | 716.998 |
| 68 | AZ PSC | 22:58:52 | 0:18:57 | 7.3 | K0III | 47.121 | 917.016 |
| 64 | AY CET | 1:16:36 | -2:30:01 | 5.47 | WD/G5III | 56.824 | 1158.437 |
| 77 | UV PSC | 1:16:55 | 6:48:42 | 8.99 | G4-6V/K0-2V | 0.861048 | 1221.437 |
| 71 | BI CET | 1:22:50 | 0:42:42 | 8.08 | G5V:/G5V: | 0.515782 | 1243.277 |
| 78 | AR PSC | 1:22:56 | 7:25:09 | 7.24 | K2V/? | 14.300 | 1318.125 |
| 89 | IM PEG | 22:53:02 | 16:50:27 | 5.6 | K2III-II | 24.65 | 1414.399 |
| 106 | ZETA AND | 0:47:20 | 24:16:01 | 4.06 | /K1III | 17.7692 | 1610.478 |
| 115 | EZ PEG | 23:16:53 | 25:43:09 | 9.53 | G5V-IV/K0IV: | 11.6598 | 1664.612 |
| 39 | FK AQR | 22:38:42 | -20:37:22 | 9.05 | DM2E/DM3E | 4.08322 | 1718.277 |
| 128 | II PEG | 23:55:04 | 28:38:00 | 7.2 | K2-3V-IV | 6.724183 | 1719.475 |
| 126 | KT PEG | 23:39:31 | 28:14:47 | 7.04 | G5V/K6V | 6.201986 | 1720.15 |
| 118 | KU PEG | 23:05:29 | 26:00:33 | 7.9 | G8II | 1411. | 1748.477 |
| 63 | FF AQR | 22:00:35 | -2:44:33 | 9.34 | SDO-B/G8IV-III | 9.207755 | 1798.048 |
| 120 | BD+25 161 | 1:04:07 | 26:35:12 | 8.4 | G2V | 91.9: | 1844.459 |
| 34 | LIV FOR | 1:46:41 | 24:00:56 | 7.07 | K0IV | 15.05 | 2117.429 |

# Chromospherically Active Binaries with G stars brighter than v=8




| unique_id | name | ra | dec | vmax | spect_type | orbital_period | Search_Offset |
|---|---|---|---|---|---|---|---|
| | | | | <7 | G* | | |
| 44 | 42 CAP | 21:41:32 | -14:02:50 | 5.17 | G2IV | 13.1740 | 2221.413 |
| 173 | LAMBDA AN | 23:37:33 | 46:27:29 | 3.7 | G8IV-III | 20.5212 | 2803.091 |
| 76 | HR 1023 | 3:23:38 | 4:52:55 | 6.38 | G1III: | 287.201 | 3064.87 |
| 170 | AR LAC | 22:08:40 | 45:44:31 | 6.09 | G2IV/K0IV | 1.983222 | 3113.424 |
| 70 | V711 TAU | 3:36:47 | 0:35:16 | 5.7 | G5IV/K1IV | 2.83774 | 3251.955 |
| 129 | UX ARI | 3:26:35 | 28:42:55 | 6.38 | G5V/K0IV | 6.43791 | 3421.849 |
| 51 | EI ERI | 4:09:40 | -7:53:31 | 6.96 | G5IV | 1.947227 | 3762.162 |
| 172 | ALPHA AUR | 5:16:41 | 45:59:53 | 0.08 | G1III/K0III | 104.0214 | 4950.097 |
| 193 | OMICRON D | 18:51:12 | 59:23:17 | 4.64 | G9III | 138.420 | 5011.327 |
| 181 | HR 2054 | 5:57:04 | 49:01:46 | 6.47 | G8III | 83.19 | 5371.233 |
| 4 | V824 ARA | 17:17:25 | -66:56:56 | 6.63 | G5IV/K0V-IV | 1.681652 | 5648.817 |
| 9 | HR 4980 | 13:12:55 | -59:49:00 | 6.16 | G0V/G0V | 4.23342 | 7111.436 |
| 32 | TY PYX | 8:59:42 | -27:48:56 | 6.84 | G5IV/G5IV | 3.198584 | 7719.202 |
| 140 | XI UMA B | 11:18:10 | 31:31:45 | 4.87 | G5V | 3.9805 | 8817.182 |
| unique_id | name | ra | dec | vmax | spect_type | orbital_period | Search_Offset |

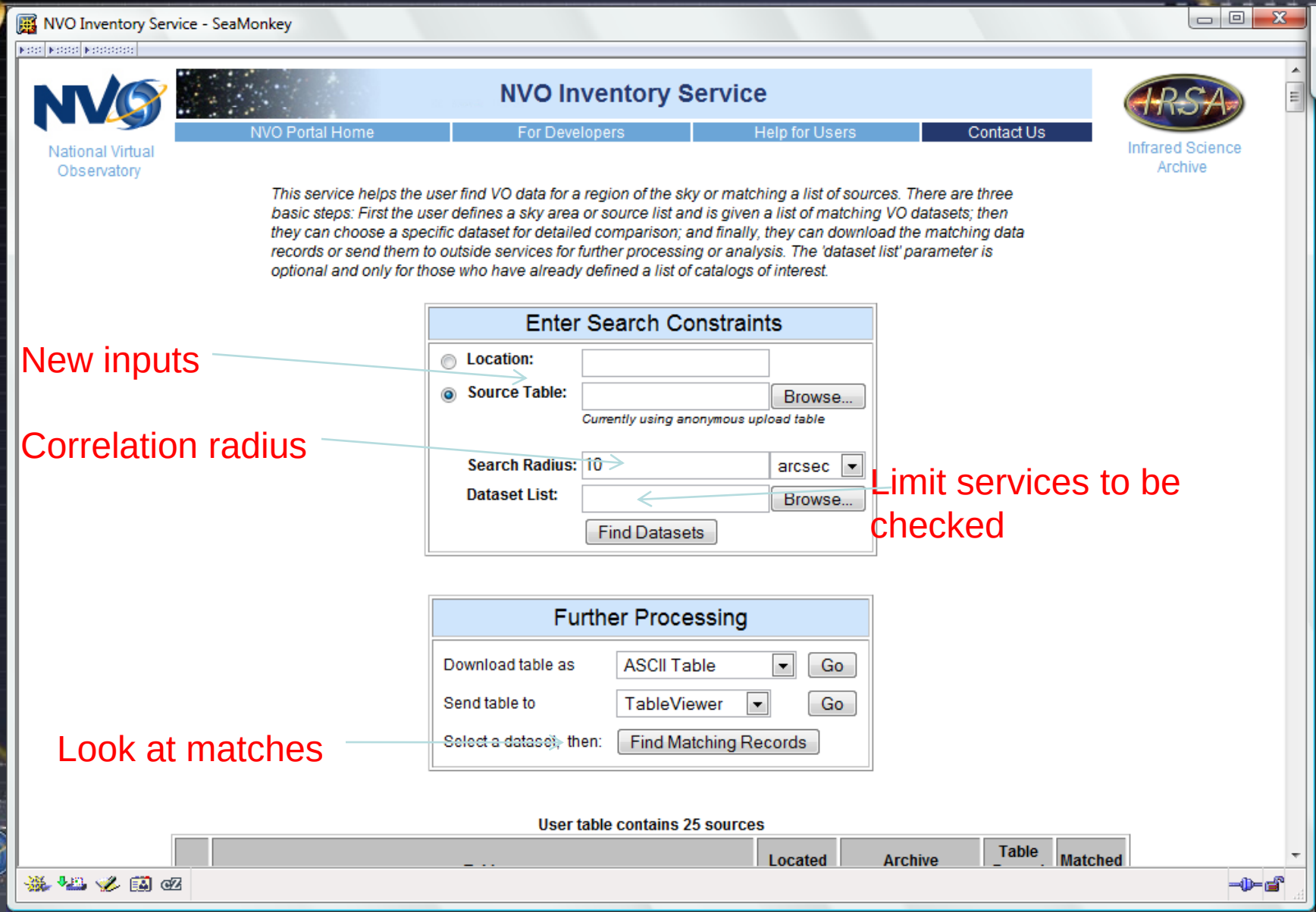
# Plotting


http://heasarc.gsfc.nasa.gov - Flot Graph - SeaMonkey
Back
Forward
Reload
Stop
Print
Y: ra
400
350
300
250
200
150
100
50
0
-50
0
50
X: dec
This component is currently in development.
Single click to select the nearest point
Down and drag to select all points within box
Possible features to be implemented ...
Done

# What's nearby?

- Go to inventory as result of search.

# Inventory



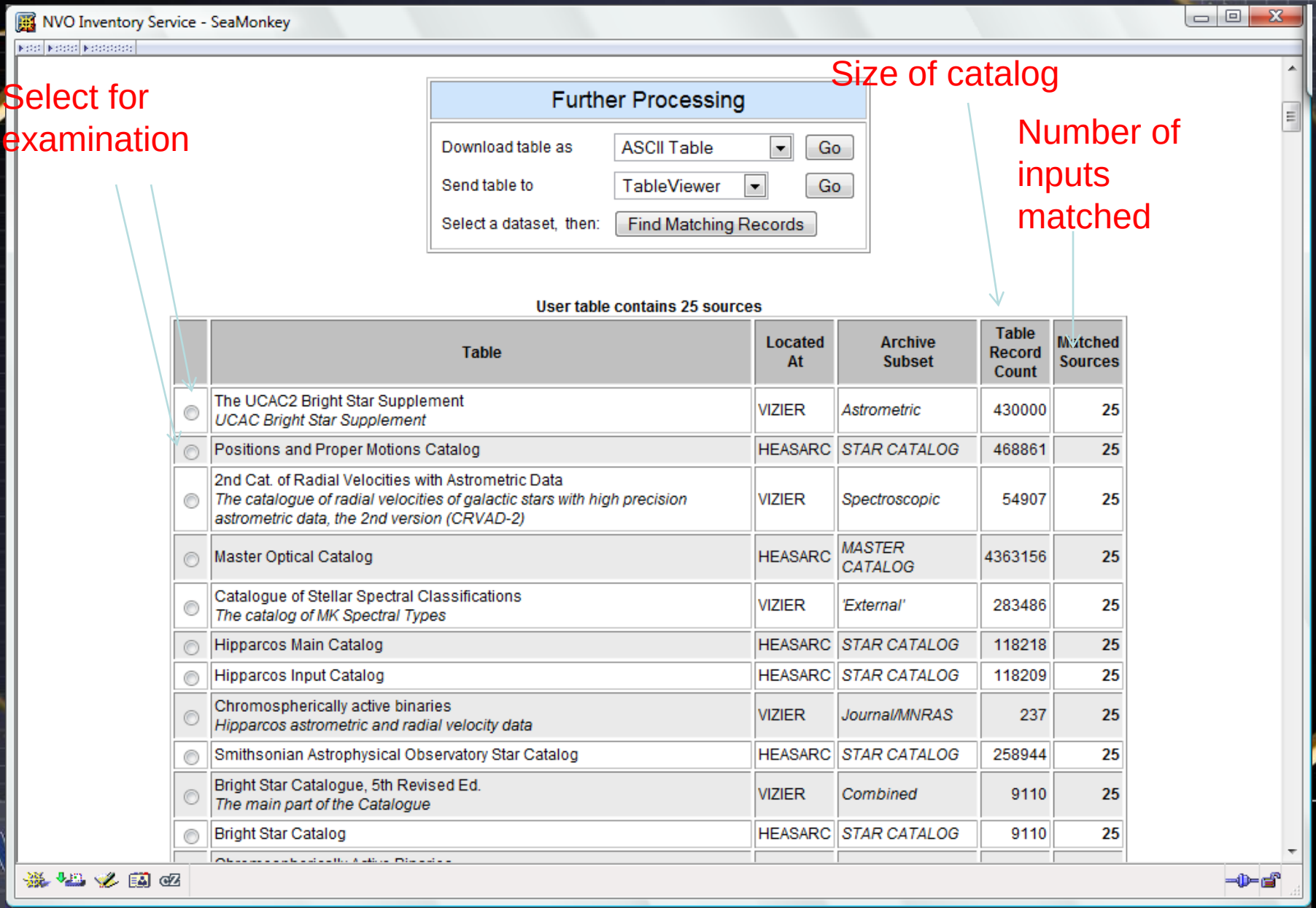

New inputs

Correlation radius

Limit services to be checked

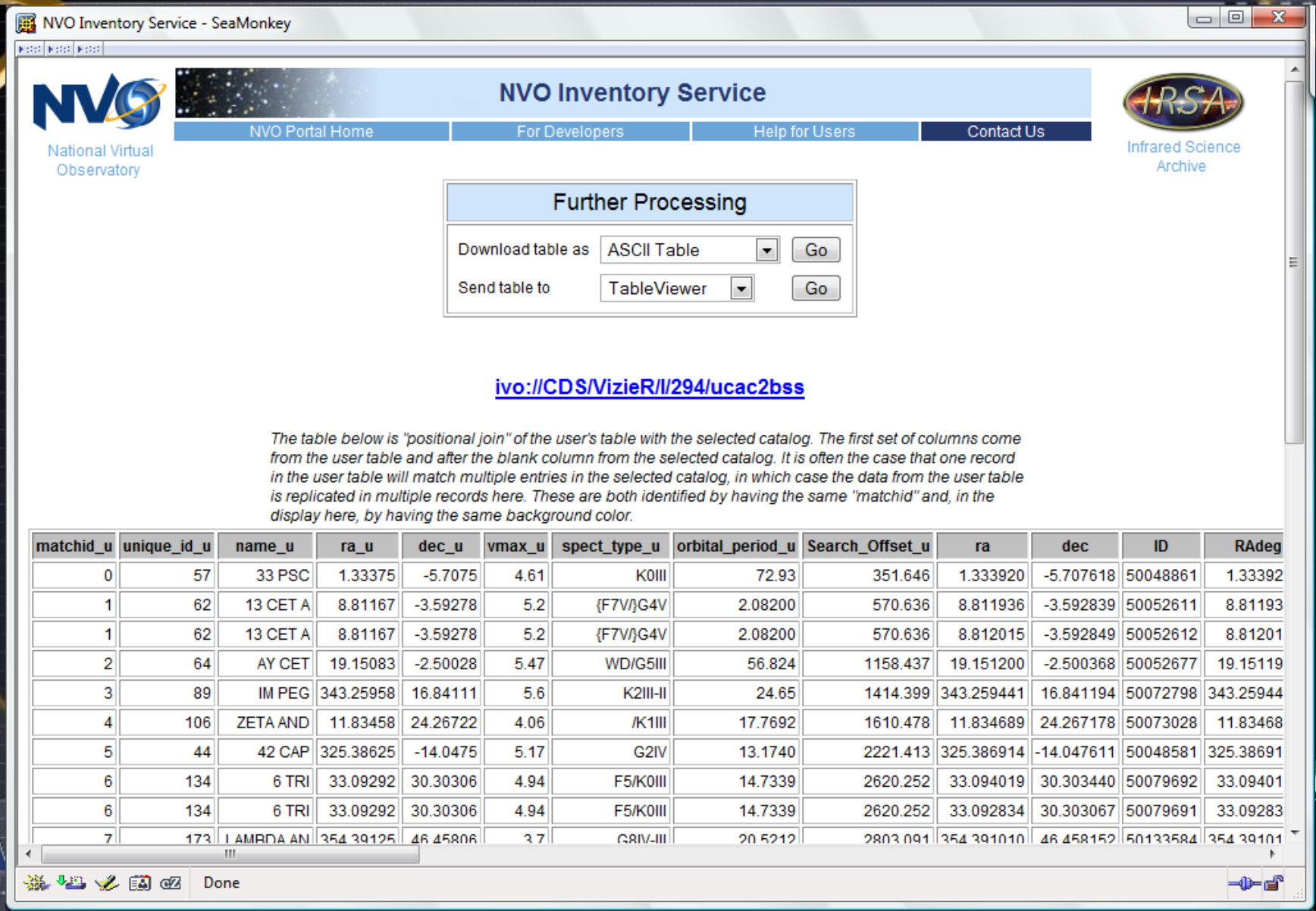
Look at matches

# Inventory results




| | Table | Located At | Archive Subset | Table Record Count | Matched Sources |
|---|---|---|---|---|---|
| ○ | The UCAC2 Bright Star Supplement<br>*UCAC Bright Star Supplement* | VIZIER | *Astrometric* | 430000 | 25 |
| ○ | Positions and Proper Motions Catalog | HEASARC | *STAR CATALOG* | 468861 | 25 |
| ○ | 2nd Cat. of Radial Velocities with Astrometric Data<br>*The catalogue of radial velocities of galactic stars with high precision astrometric data, the 2nd version (CRVAD-2)* | VIZIER | *Spectroscopic* | 54907 | 25 |
| ○ | Master Optical Catalog | HEASARC | *MASTER CATALOG* | 4363156 | 25 |
| ○ | Catalogue of Stellar Spectral Classifications<br>*The catalog of MK Spectral Types* | VIZIER | *'External'* | 283486 | 25 |
| ○ | Hipparcos Main Catalog | HEASARC | *STAR CATALOG* | 118218 | 25 |
| ○ | Hipparcos Input Catalog | HEASARC | *STAR CATALOG* | 118209 | 25 |
| ○ | Chromospherically active binaries<br>*Hipparcos astrometric and radial velocity data* | VIZIER | *Journal/MNRAS* | 237 | 25 |
| ○ | Smithsonian Astrophysical Observatory Star Catalog | HEASARC | *STAR CATALOG* | 258944 | 25 |
| ○ | Bright Star Catalogue, 5th Revised Ed.<br>*The main part of the Catalogue* | VIZIER | *Combined* | 9110 | 25 |
| ○ | Bright Star Catalog | HEASARC | *STAR CATALOG* | 9110 | 25 |

# View matches

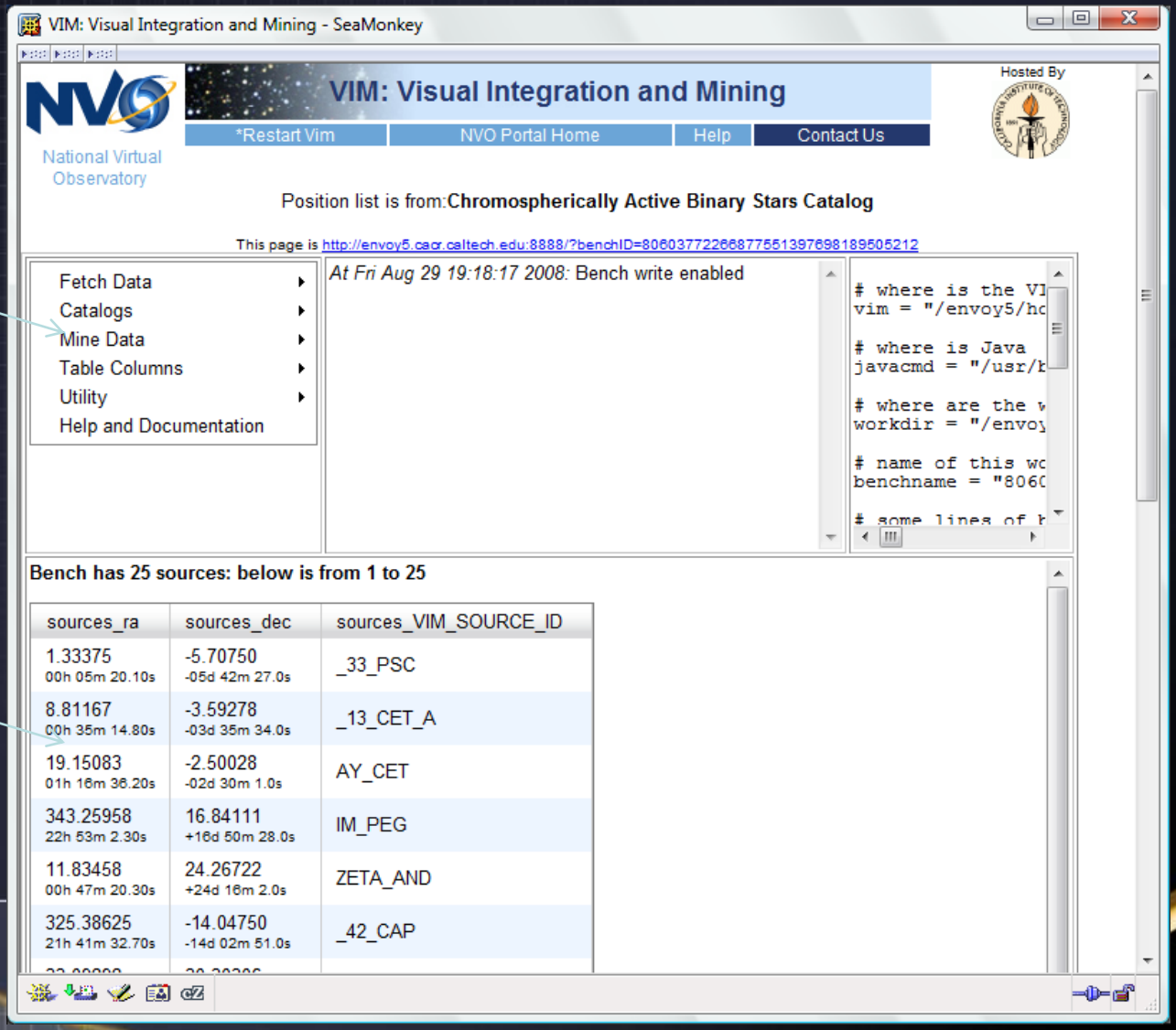



| matchid_u | unique_id_u | name_u | ra_u | dec_u | vmax_u | spect_type_u | orbital_period_u | Search_Offset_u | ra | dec | ID | RAdeg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 57 | 33 PSC | 1.33375 | -5.7075 | 4.61 | K0III | 72.93 | 351.646 | 1.333920 | -5.707618 | 50048861 | 1.33392 |
| 1 | 62 | 13 CET A | 8.81167 | -3.59278 | 5.2 | {F7V/}G4V | 2.08200 | 570.636 | 8.811936 | -3.592839 | 50052611 | 8.81193 |
| 1 | 62 | 13 CET A | 8.81167 | -3.59278 | 5.2 | {F7V/}G4V | 2.08200 | 570.636 | 8.812015 | -3.592849 | 50052612 | 8.81201 |
| 2 | 64 | AY CET | 19.15083 | -2.50028 | 5.47 | WD/G5III | 56.824 | 1158.437 | 19.151200 | -2.500368 | 50052677 | 19.15119 |
| 3 | 89 | IM PEG | 343.25958 | 16.84111 | 5.6 | K2III-II | 24.65 | 1414.399 | 343.259441 | 16.841194 | 50072798 | 343.25944 |
| 4 | 106 | ZETA AND | 11.83458 | 24.26722 | 4.06 | /K1III | 17.7692 | 1610.478 | 11.834689 | 24.267178 | 50073028 | 11.83468 |
| 5 | 44 | 42 CAP | 325.38625 | -14.0475 | 5.17 | G2IV | 13.1740 | 2221.413 | 325.386914 | -14.047611 | 50048581 | 325.38691 |
| 6 | 134 | 6 TRI | 33.09292 | 30.30306 | 4.94 | F5/K0III | 14.7339 | 2620.252 | 33.094019 | 30.303440 | 50079692 | 33.09401 |
| 6 | 134 | 6 TRI | 33.09292 | 30.30306 | 4.94 | F5/K0III | 14.7339 | 2620.252 | 33.092834 | 30.303067 | 50079691 | 33.09283 |
| 7 | 173 | LAMBDA AN | 354.39125 | 46.45806 | 3.7 | G8IV-III | 20.5212 | 2803.091 | 354.391010 | 46.458152 | 50133584 | 354.39101 |

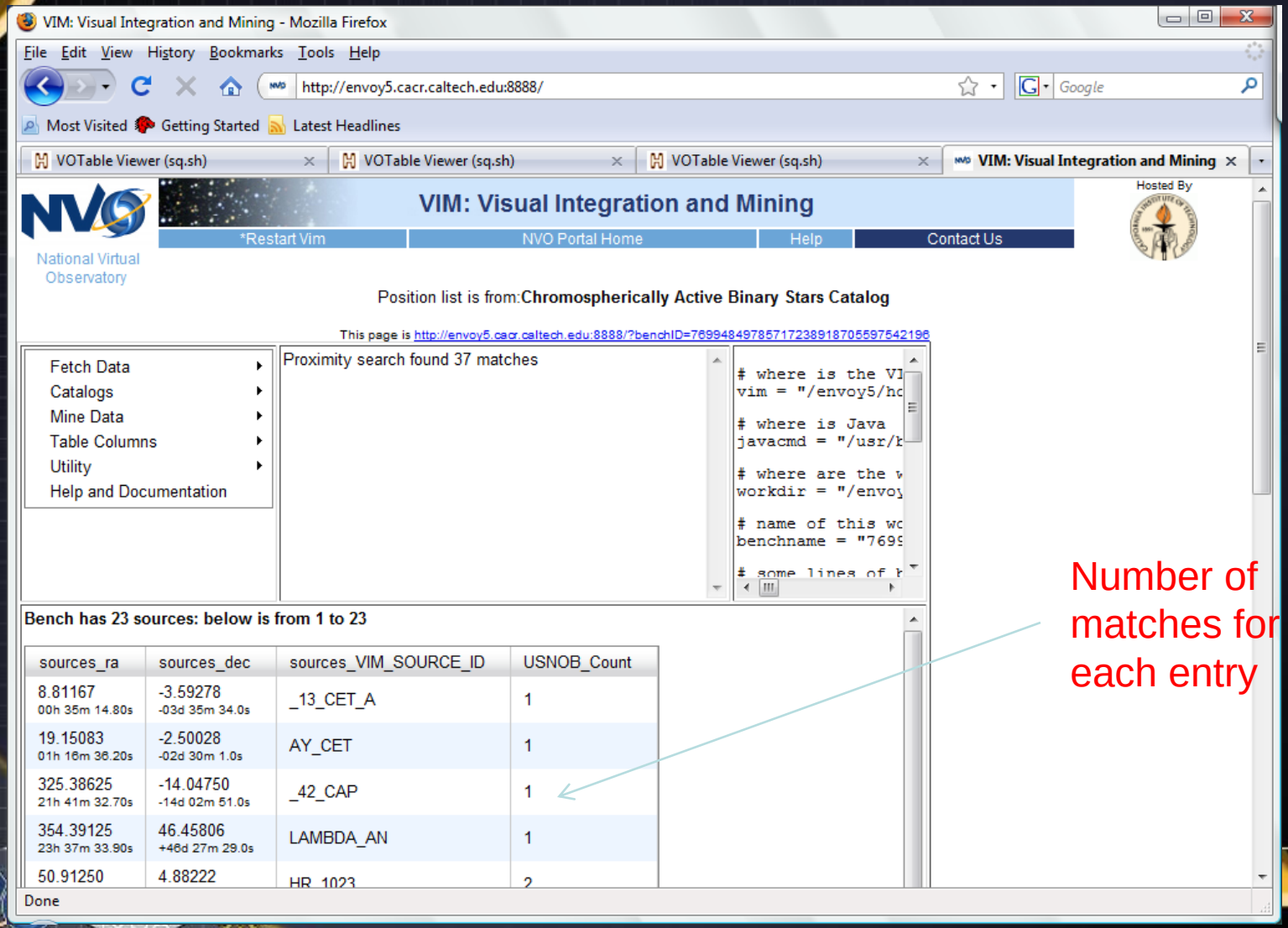
# Build up information on a list of sources: VIM

Actions

Current table

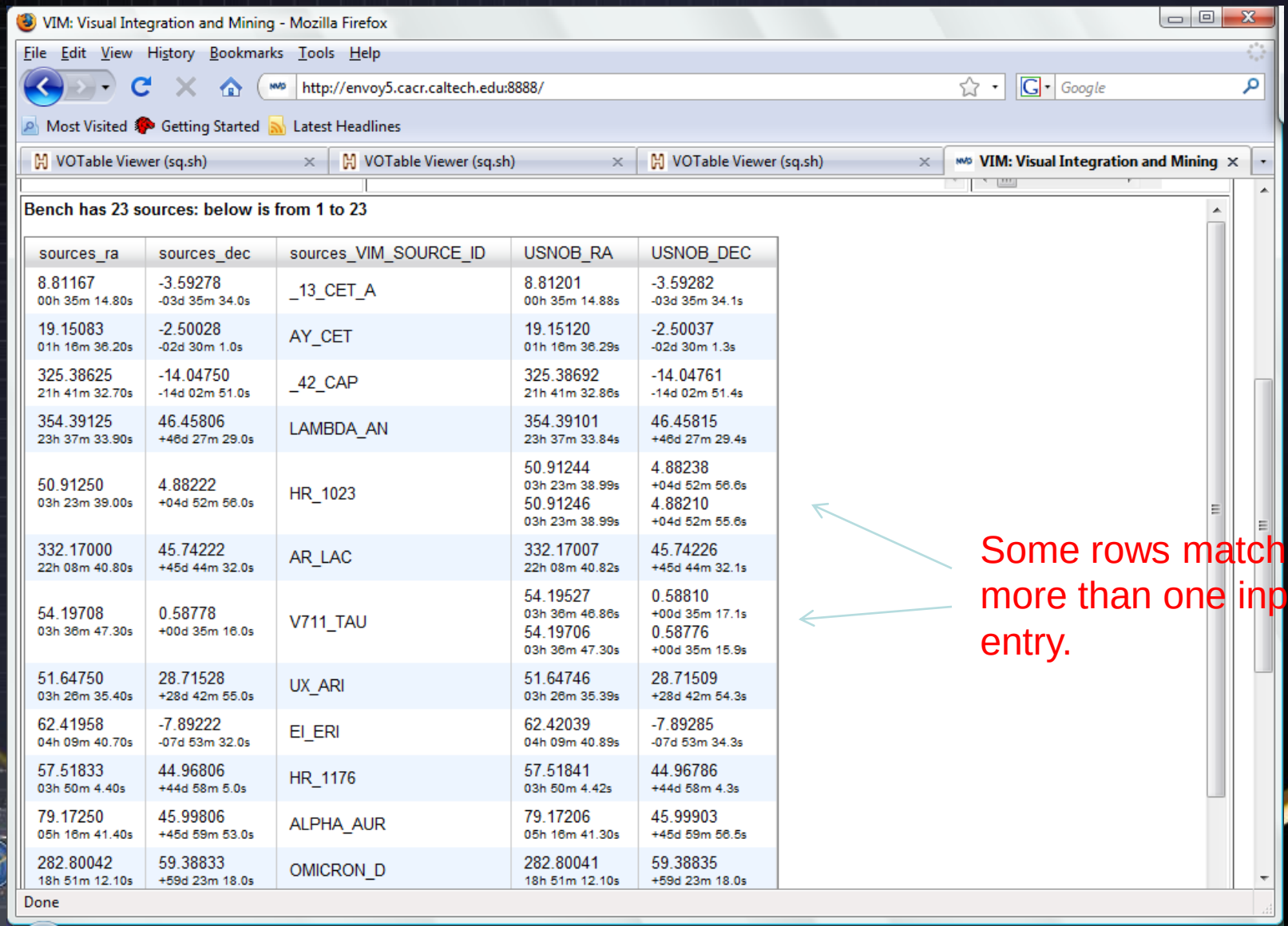


# Cross-correlate with USNOB




Number of matches for each entry

# Compare tables

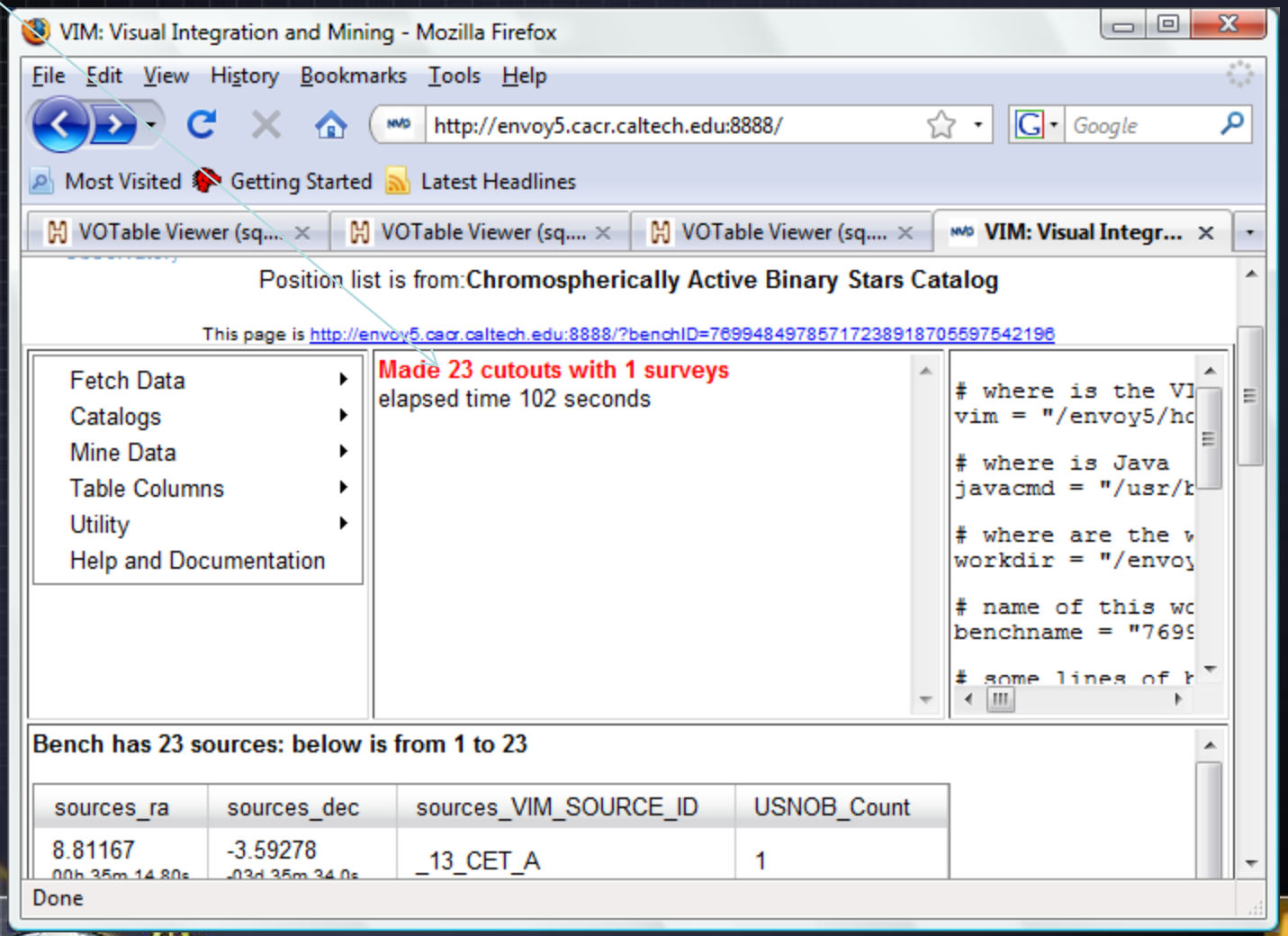



| sources_ra | sources_dec | sources_VIM_SOURCE_ID | USNOB_RA | USNOB_DEC |
|---|---|---|---|---|
| 8.81167<br>00h 35m 14.80s | -3.59278<br>-03d 35m 34.0s | _13_CET_A | 8.81201<br>00h 35m 14.88s | -3.59282<br>-03d 35m 34.1s |
| 19.15083<br>01h 16m 36.20s | -2.50028<br>-02d 30m 1.0s | AY_CET | 19.15120<br>01h 16m 36.29s | -2.50037<br>-02d 30m 1.3s |
| 325.38625<br>21h 41m 32.70s | -14.04750<br>-14d 02m 51.0s | _42_CAP | 325.38692<br>21h 41m 32.86s | -14.04761<br>-14d 02m 51.4s |
| 354.39125<br>23h 37m 33.90s | 46.45806<br>+46d 27m 29.0s | LAMBDA_AN | 354.39101<br>23h 37m 33.84s | 46.45815<br>+46d 27m 29.4s |
| 50.91250<br>03h 23m 39.00s | 4.88222<br>+04d 52m 56.0s | HR_1023 | 50.91244<br>03h 23m 38.99s<br>50.91246<br>03h 23m 38.99s | 4.88238<br>+04d 52m 56.6s<br>4.88210<br>+04d 52m 55.6s |
| 332.17000<br>22h 08m 40.80s | 45.74222<br>+45d 44m 32.0s | AR_LAC | 332.17007<br>22h 08m 40.82s | 45.74226<br>+45d 44m 32.1s |
| 54.19708<br>03h 36m 47.30s | 0.58778<br>+00d 35m 16.0s | V711_TAU | 54.19527<br>03h 36m 46.86s<br>54.19706<br>03h 36m 47.30s | 0.58810<br>+00d 35m 17.1s<br>0.58776<br>+00d 35m 15.9s |
| 51.64750<br>03h 26m 35.40s | 28.71528<br>+28d 42m 55.0s | UX_ARI | 51.64746<br>03h 26m 35.39s | 28.71509<br>+28d 42m 54.3s |
| 62.41958<br>04h 09m 40.70s | -7.89222<br>-07d 53m 32.0s | EI_ERI | 62.42039<br>04h 09m 40.89s | -7.89285<br>-07d 53m 34.3s |
| 57.51833<br>03h 50m 4.40s | 44.96806<br>+44d 58m 5.0s | HR_1176 | 57.51841<br>03h 50m 4.42s | 44.96786<br>+44d 58m 4.3s |
| 79.17250<br>05h 16m 41.40s | 45.99806<br>+45d 59m 53.0s | ALPHA_AUR | 79.17206<br>05h 16m 41.30s | 45.99903<br>+45d 59m 56.5s |
| 282.80042<br>18h 51m 12.10s | 59.38833<br>+59d 23m 18.0s | OMICRON_D | 282.80041<br>18h 51m 12.10s | 59.38835<br>+59d 23m 18.0s |

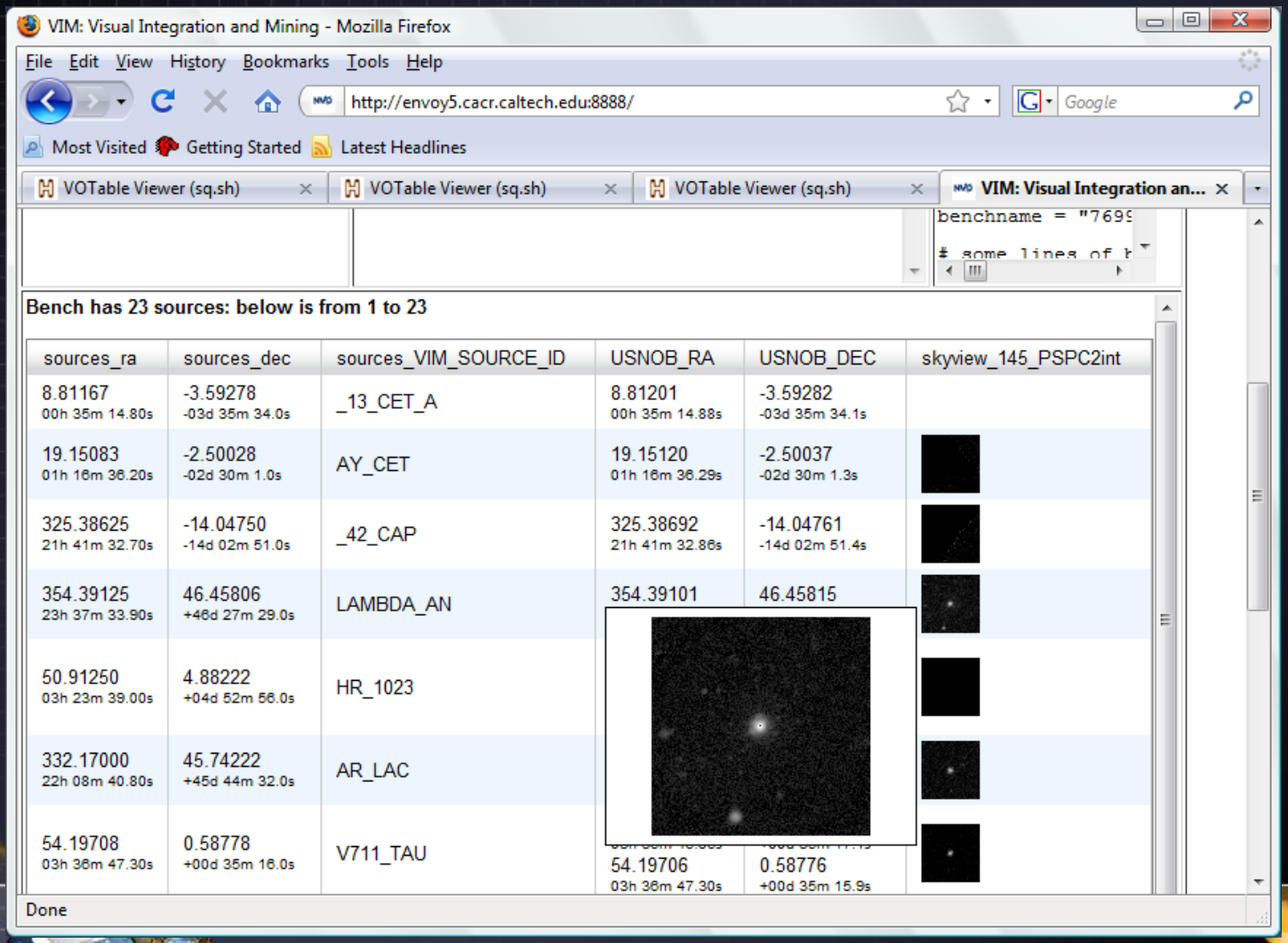
Some rows match more than one input entry.

# Larger scale requests

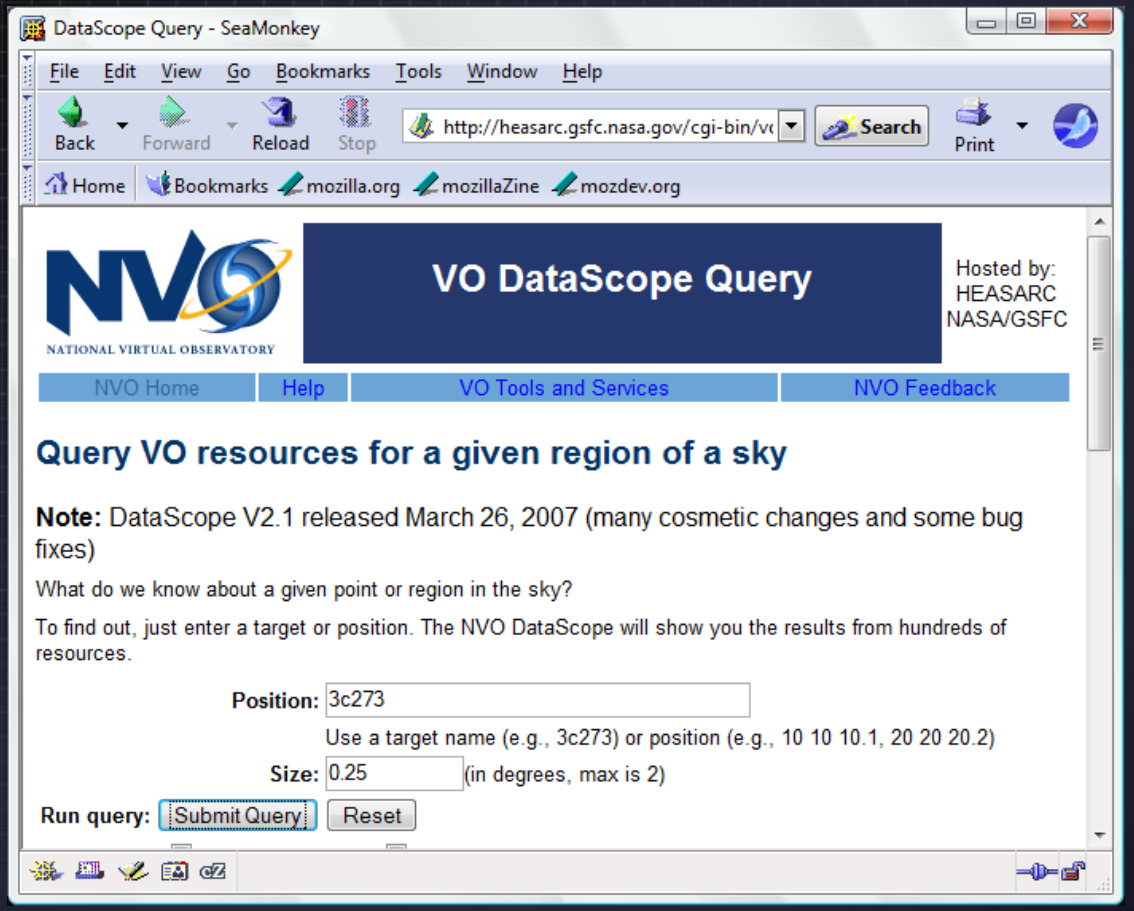
Status box



# Image gallery with VIM



# What's known about a given source?



http://heasarc.gsfc.nasa.gov - DataScope query:3c273 - SeaMonkey

Data found(234) | No data (339) | Errors(19) | Waiting(0) | 100% complete

Position:3c273 Resources/hits: 592/55481 Cache age:6.586 hours

Summary | Resources | Data Table | No Data | Still Processing | Errors | Help

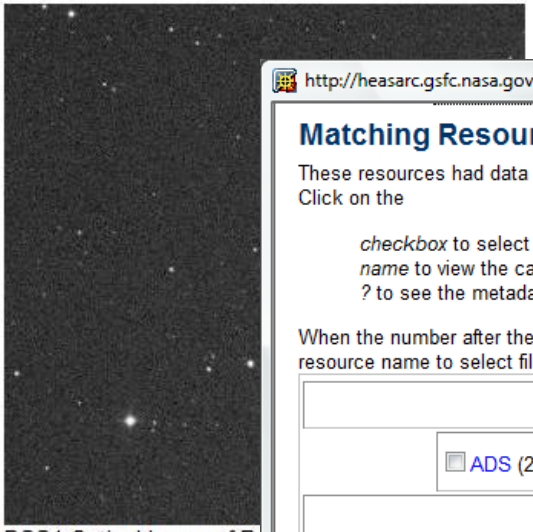
## Summary of Request and Selections

| Request parameters | |
|---|---|
| Target: 3c273 | |
| 12 29 06.70 | 02 03 08.6 |
| 187.277916 | 2.052388 |
| Size: | 0.25 |

No resources currently selected

Analysis Options

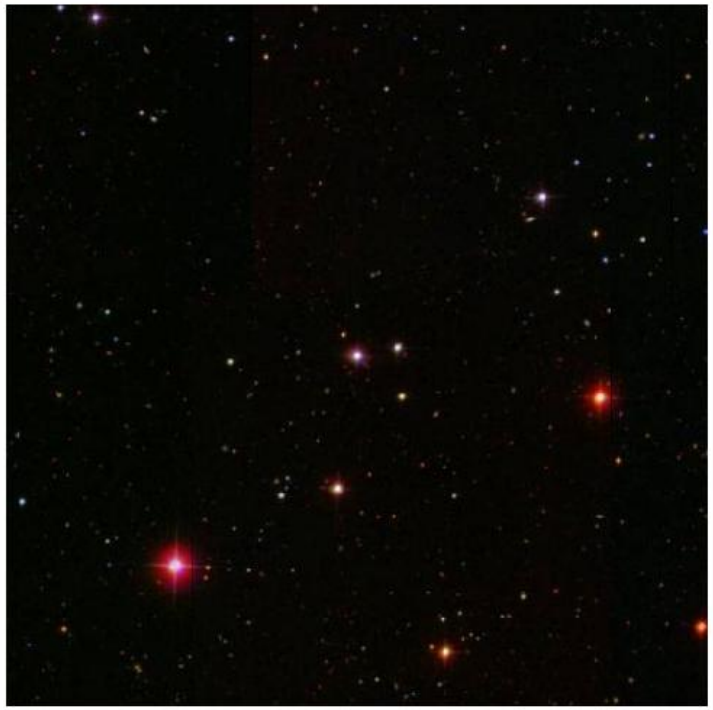
Aladin Applet | Aladin script | Save as tar



DSS1 Optical Image of R

http://heasarc.gsfc.nasa.gov - rf.pl (JPEG Image, 512x512 pixels) - Scale...

Back | Forward | Reload | Stop | Print



Done

http://heasarc.gsfc.nasa.gov - DataScope query:3c273

## Matching Resources

These resources had data in the specified region.
Click on the

*checkbox* to select the data for download or
*name* to view the catalog data and select file
*?* to see the metadata for the resource.

When the number after the name is given as *nn/mm*
resource name to select files within such resources

| | | | | | |
|---|---|---|---|---|---|
| | ADS (200) ? | NED(image ? | | | |
| Multi | ADIL (0/1) ? | Aladin (0/28) ? | CADC (0/218) ? | CADC/HST (0/196) ? | DSS ESO (0/8) ? |
| | ESO SAF SIAP (38) ? | HST/SIAP/PREVIEW (0/109) ? | HST/SIAP/PREVIEW (0/109) ? | MAST Scrapbook (0/41) ? | MAST-Scrapbook (0/34) ? |
| Optical | 3CR Snap SIAP (0/8) ? | CADC/MACHO (0/5) ? | DSS (0/1) ? | DSS2 (0/3) ? | HAlpha (0/1) ? |
| | HST Previews (0/360) ? | HST.APPP (0/10) ? | NEAT (0/1) ? | NOAO (0/4) ? | SDSS (0/5) ? |
| | SDSSDR2-Color (1) ? | SDSSDR2-G (0/6) ? | SDSSDR2-I (0/6) ? | SDSSDR2-R (0/6) ? | SDSSDR2-U (0/6) ? |
| | SDSSDR2-Z (0/6) ? | SDSSDR3-Color (1) ? | SDSSDR3-G (0/6) ? | SDSSDR3-I (0/6) ? | SDSSDR3-R (0/6) ? |
| | SDSSDR3-U (0/6) ? | SDSSDR3-Z (0/6) ? | SDSSDR4 (0/30) ? | SDSSDR4-Color (1) ? | SDSSDR5 (0/30) ? |

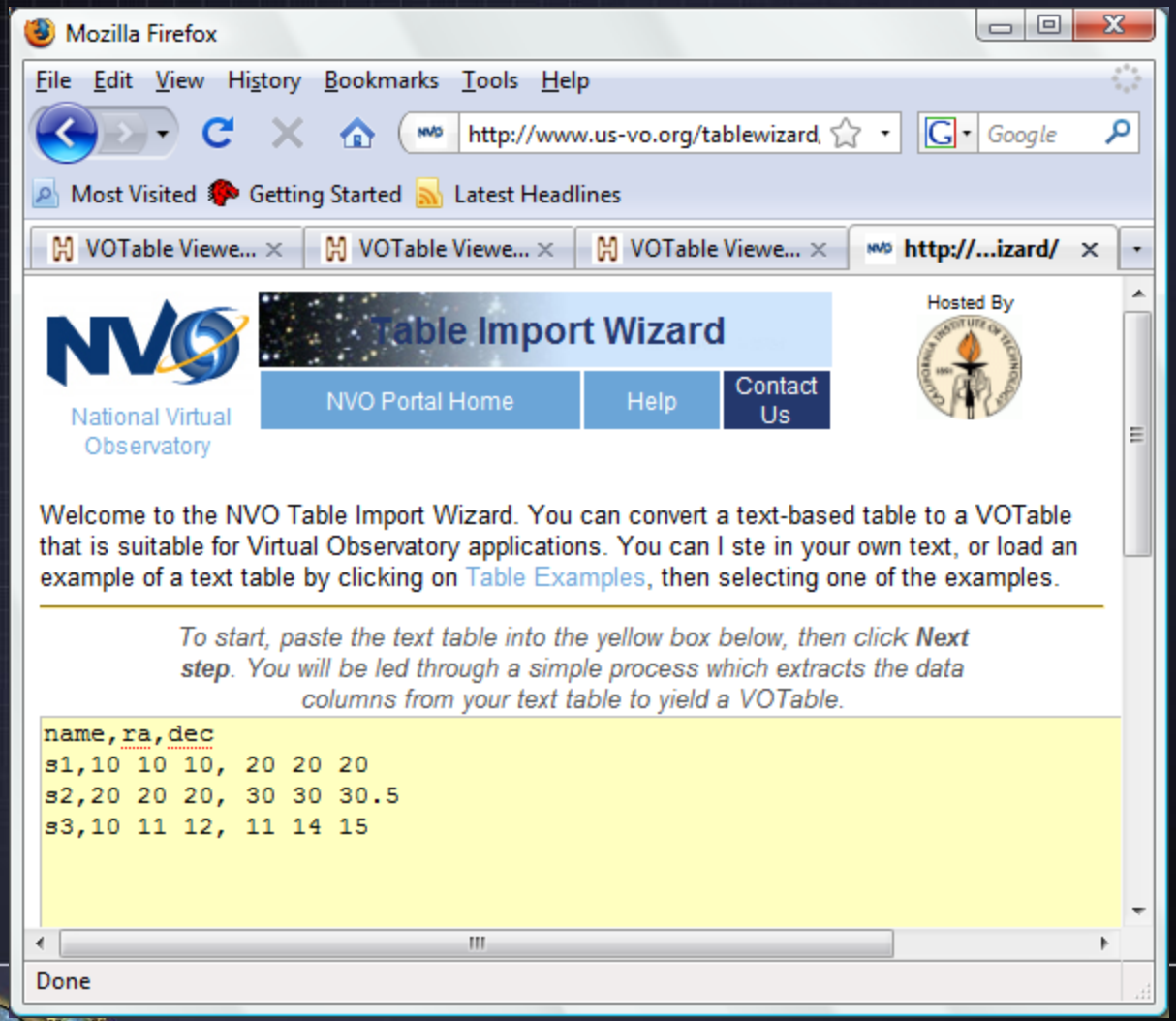
Some DataScope windows

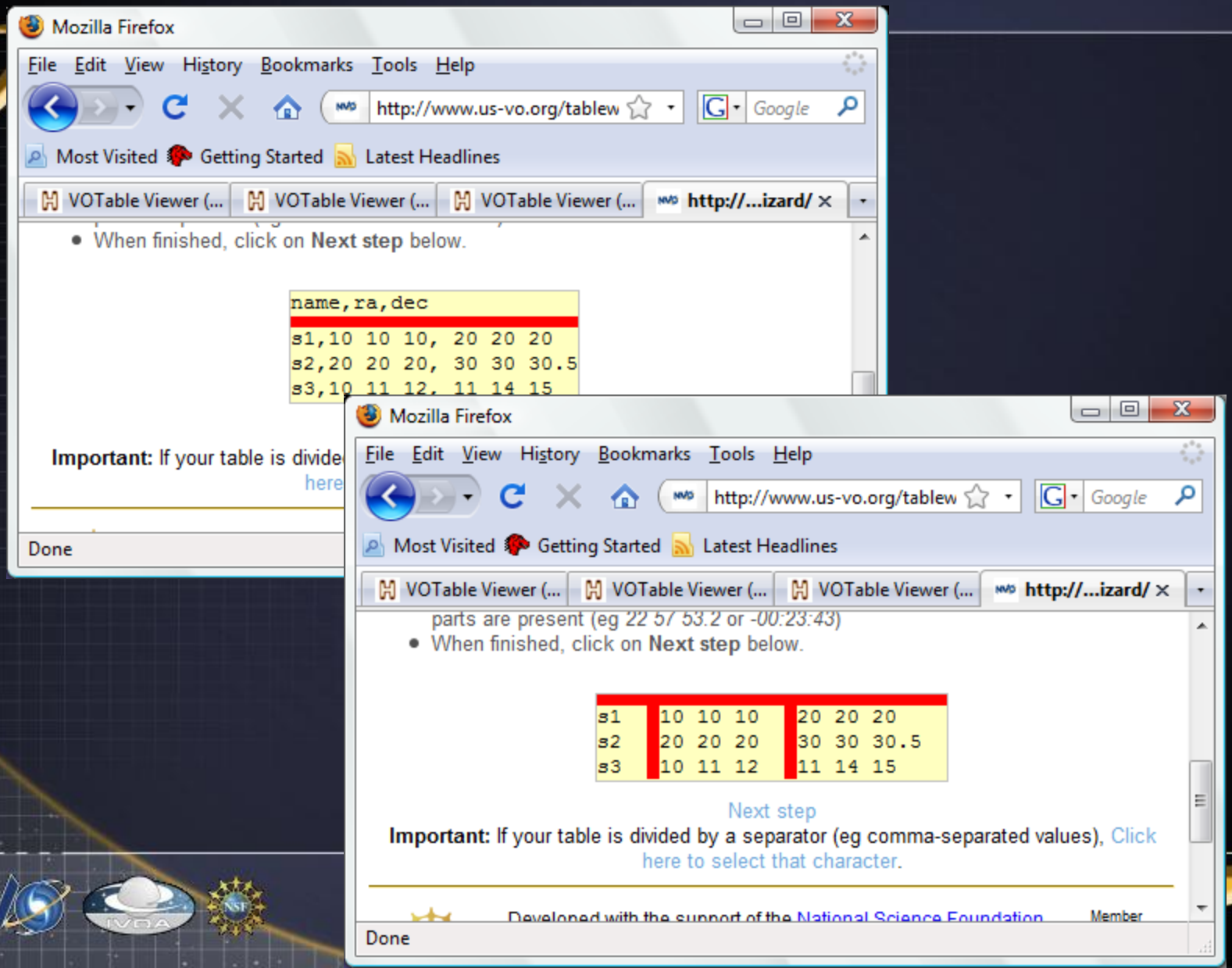
NVO | IVOA | NSF

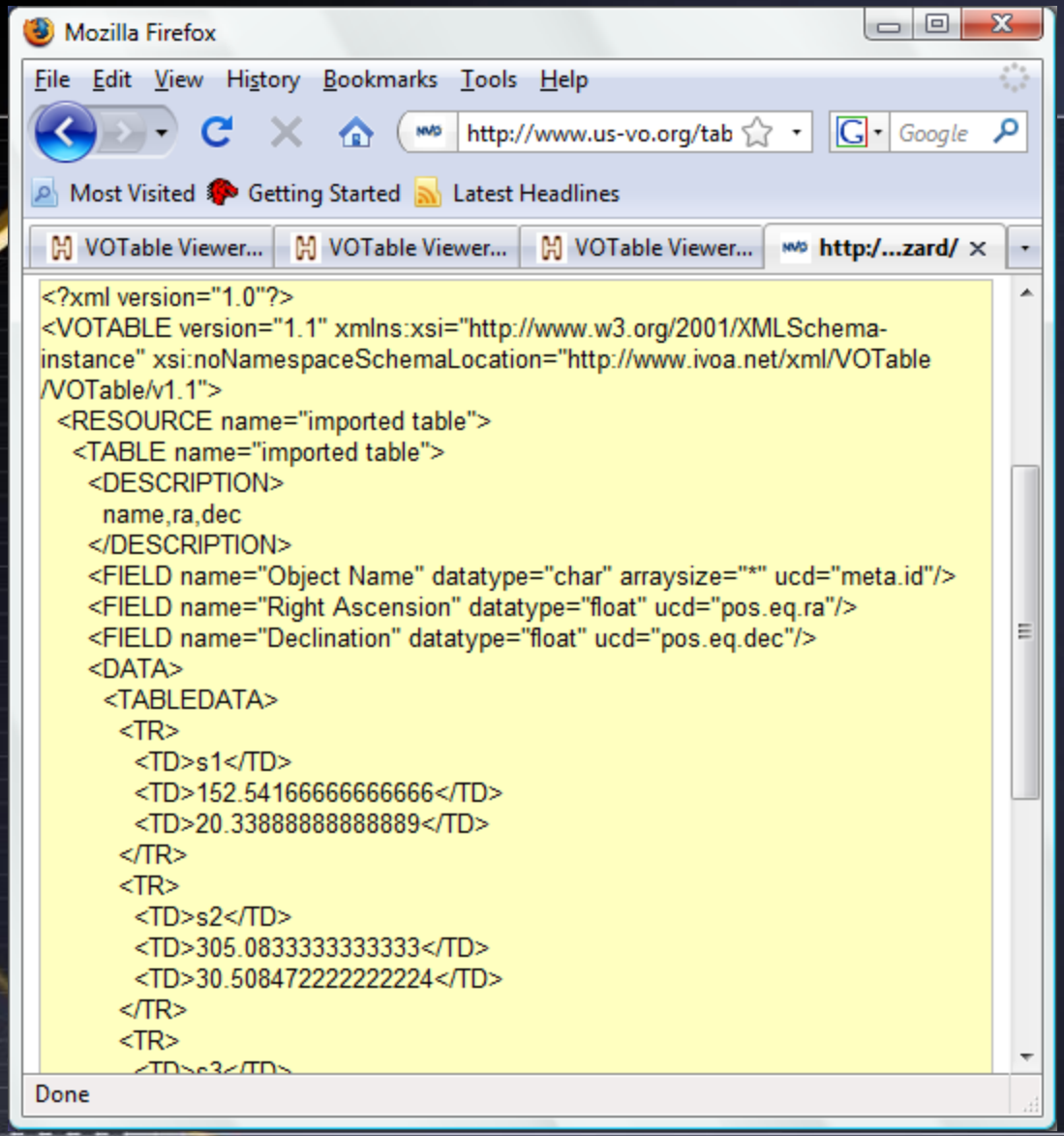
# Handling user input lists

- User created lists
- Lists downloaded from non-VO sources

# Table Wizard



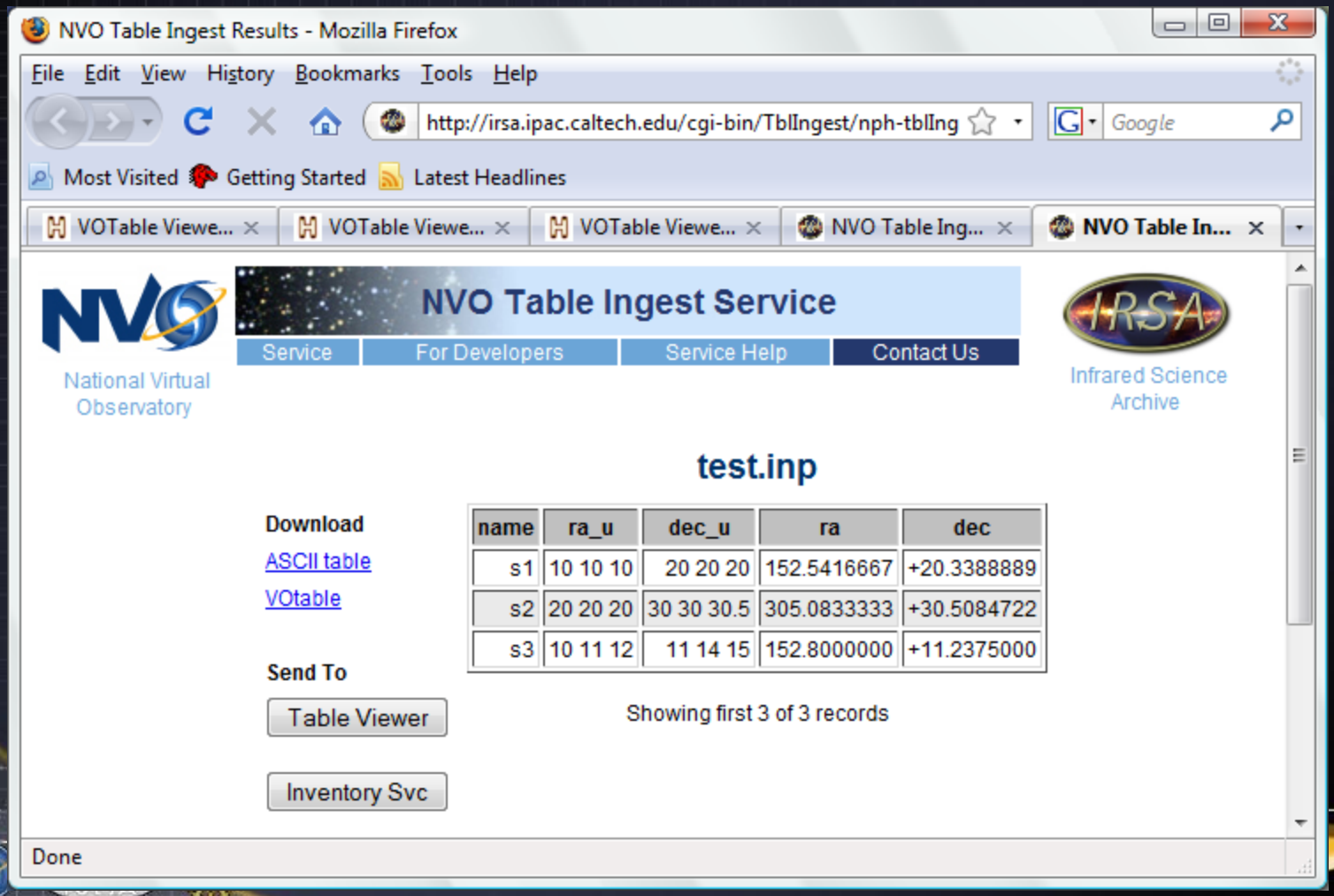

Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://www.us-vo.org/tablew
Google
Most Visited Getting Started Latest Headlines
VOTable Viewer (...
VOTable Viewer (...
VOTable Viewer (...
http://...izard/
When finished, click on Next step below.
name,ra,dec
s1,10 10 10, 20 20 20
s2,20 20 20, 30 30 30.5
s3,10 11 12, 11 14 15
Important: If your table is divide
here
Done
Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://www.us-vo.org/tablew
Google
Most Visited Getting Started Latest Headlines
VOTable Viewer (...
VOTable Viewer (...
VOTable Viewer (...
http://...izard/
parts are present (eg 22 57 53.2 or -00:23:43)
When finished, click on Next step below.
s1 10 10 10 20 20 20
s2 20 20 20 30 30 30.5
s3 10 11 12 11 14 15
Next step
Important: If your table is divided by a separator (eg comma-separated values), Click here to select that character.
Developed with the support of the National Science Foundation
Member
Done




The table wizard creates the VOTable for you, but currently you need to manually stripe it into a file or other service to use it.

# Table converter

# Converter outputs



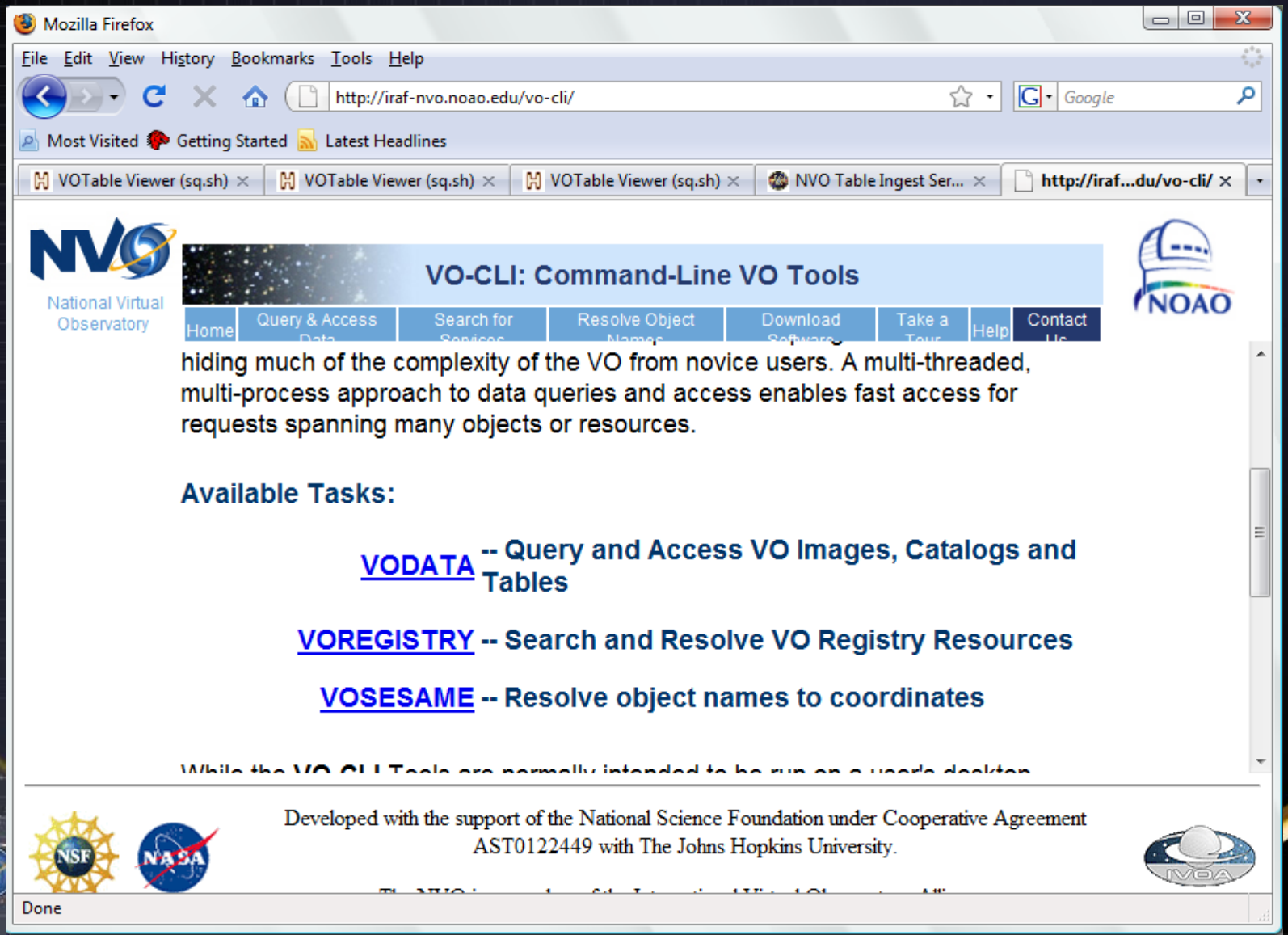
# Wizard versus converter

- Wizard
  - is interactive
  - lets user see how conversion is done
  - requires data to be striped in and out.
- Converter
  - uses files
  - can send data to other services
  - will do name resolution of target names.
  - no interactive input, may get confused by complex files

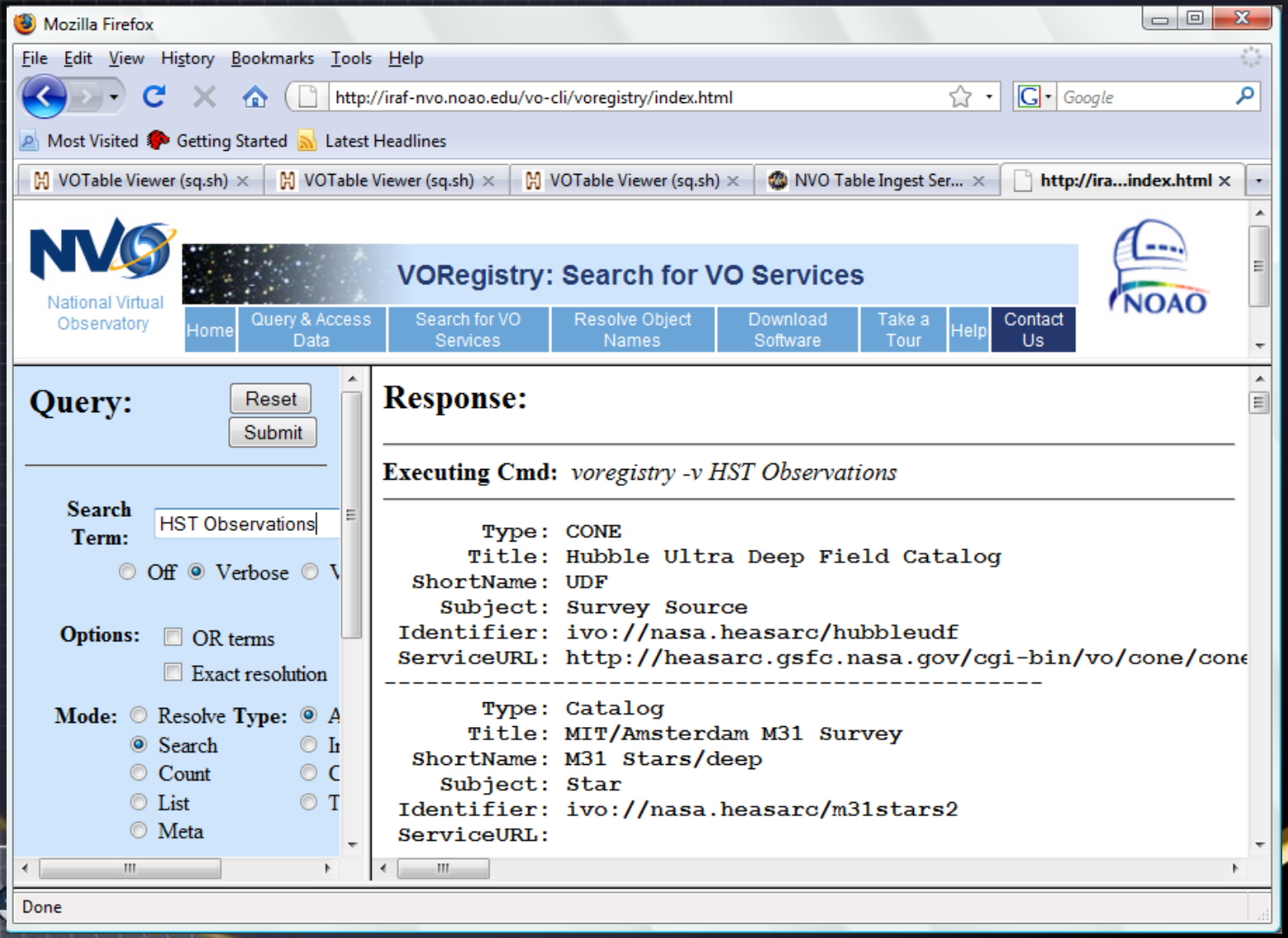
# Off the Web: VOClient

- Three main tasks:
  - VORegistry: query the registry for data resources
  - VOData: Query the data resources
  - VOSesame: Convert names to coordinates
- Can interchange lists of sources and data resources with portal Web pages.

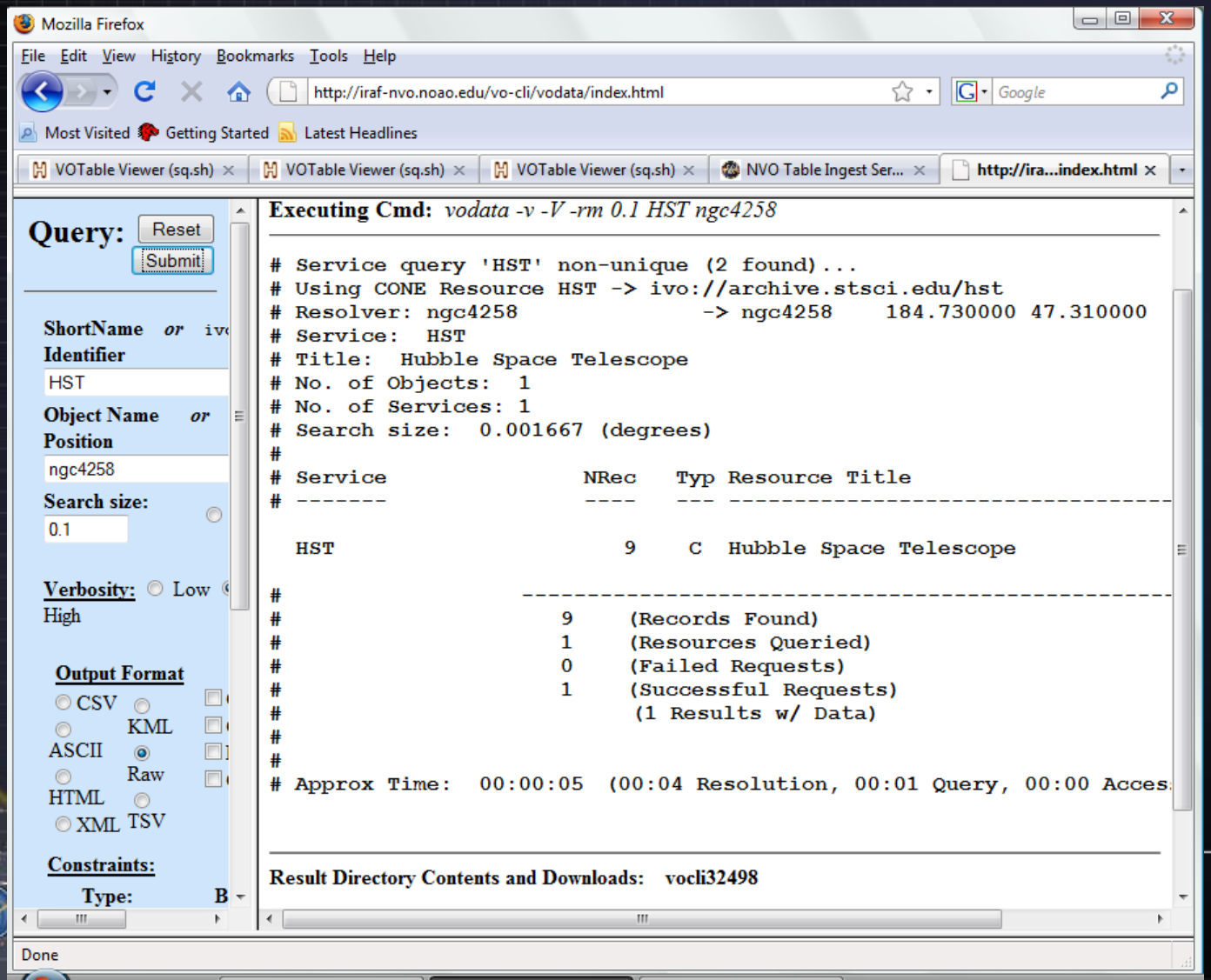
# … and it can be used from the Web too!



# VORegistry Example



# VOData example



# VOClient usage

- Use Web pages to see examples and try out usage.
- Use on the command line for repeated and operational use
  - Long commands
- VOClient can create lists for use in simple query, inventory or VIM.
- Download your own copy from: http://iraf-nvo.noao.edu/vo-cli/downloads/index.html

# After starting in the portal…

- TOPCAT or VOPLOT: Display and manipulate tables of results
- Aladin: Compare images and tables
- Use specialized features of discovered resources
- Data mining in VIM, OpenSkyQuery, WESIX or other tools
- Publish results
- …