Introduction of JVO

- how to use the JVO for your science study -

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1. What is VO ? Why do we need a VO ?
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5. VO compliant application
   - Aladin (Image Viewer)
   - SpecView (Spectrum Viewer) S. Kawanomoto
   - TopCat (Catalog Table Viewer) M. Tanaka

What is VO ?

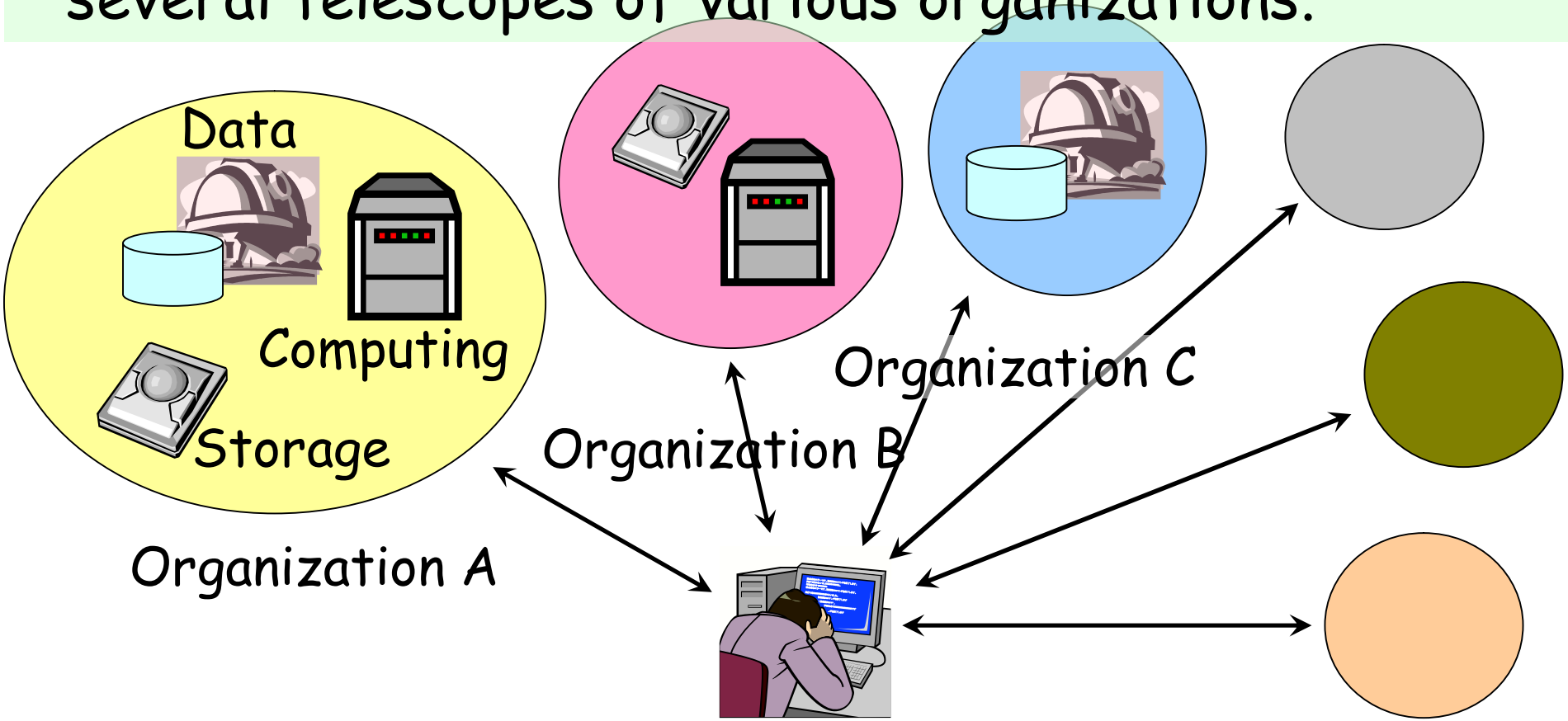
VO is a collection of astronomical data archives and analysis tools that can be federated through computer networks to create an environment in which research can be conducted.

Real Observatory	Virtual Observatory
Sky	Databases all over the world
Telescope	Internet
Instrument	Desktop Computer
Astronomical Data	Astronomical Data

As the databases can be accessed through the standard interface, they are easily integrated with the astronomical analysis tools.

Why do we need VO

- Classical astronomy was done by using one telescope of one organization.
- Many of modern astronomy has been done by using several telescopes of various organizations.



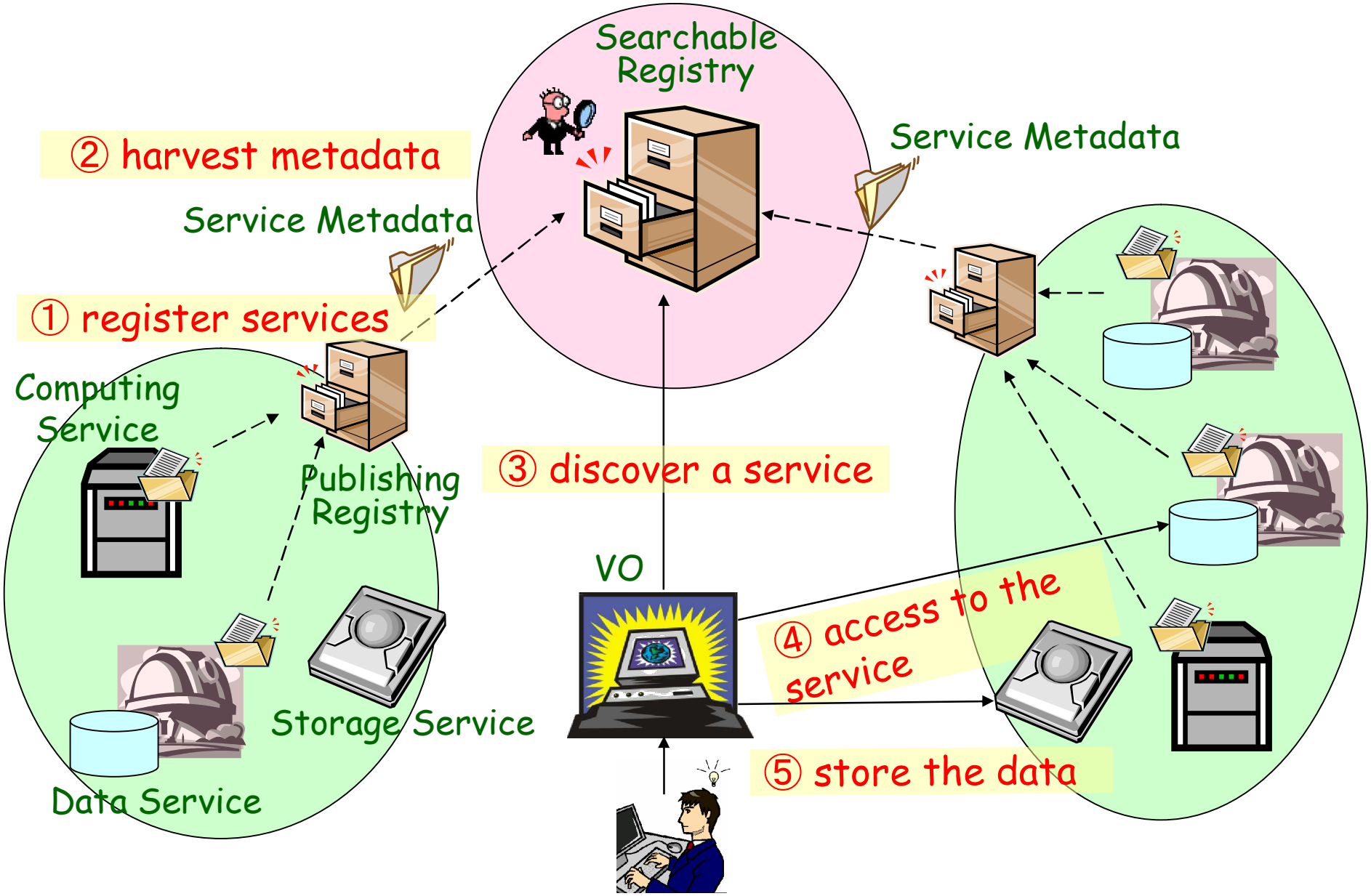
Problem in the classical system

1. User must access to the individual sites.
2. Query interface is different for each sites. Difficult for programming.
3. There is no reliable way to find a URL where astronomical data is provided.
4. There is no established procedure to publish your data to the astronomical community.

VO provides a framework for solving these problem:

- Standards on resource metadata management → (3,4)
- Standards on data access interface → (1,2)

Modern system in the VO framework



VO solve all the problem ?

No !

1. Raw data reduction is still an obstacle for most of the researchers who are not familiar with the instrument.
2. Data quality control is crucial for interpretation of the data.
3. Observatory is the only competent to manage these issues.
4. Closer collaboration between VO project and observatory is crucial for establishing an environment where astronomical research can be conducted efficiently.

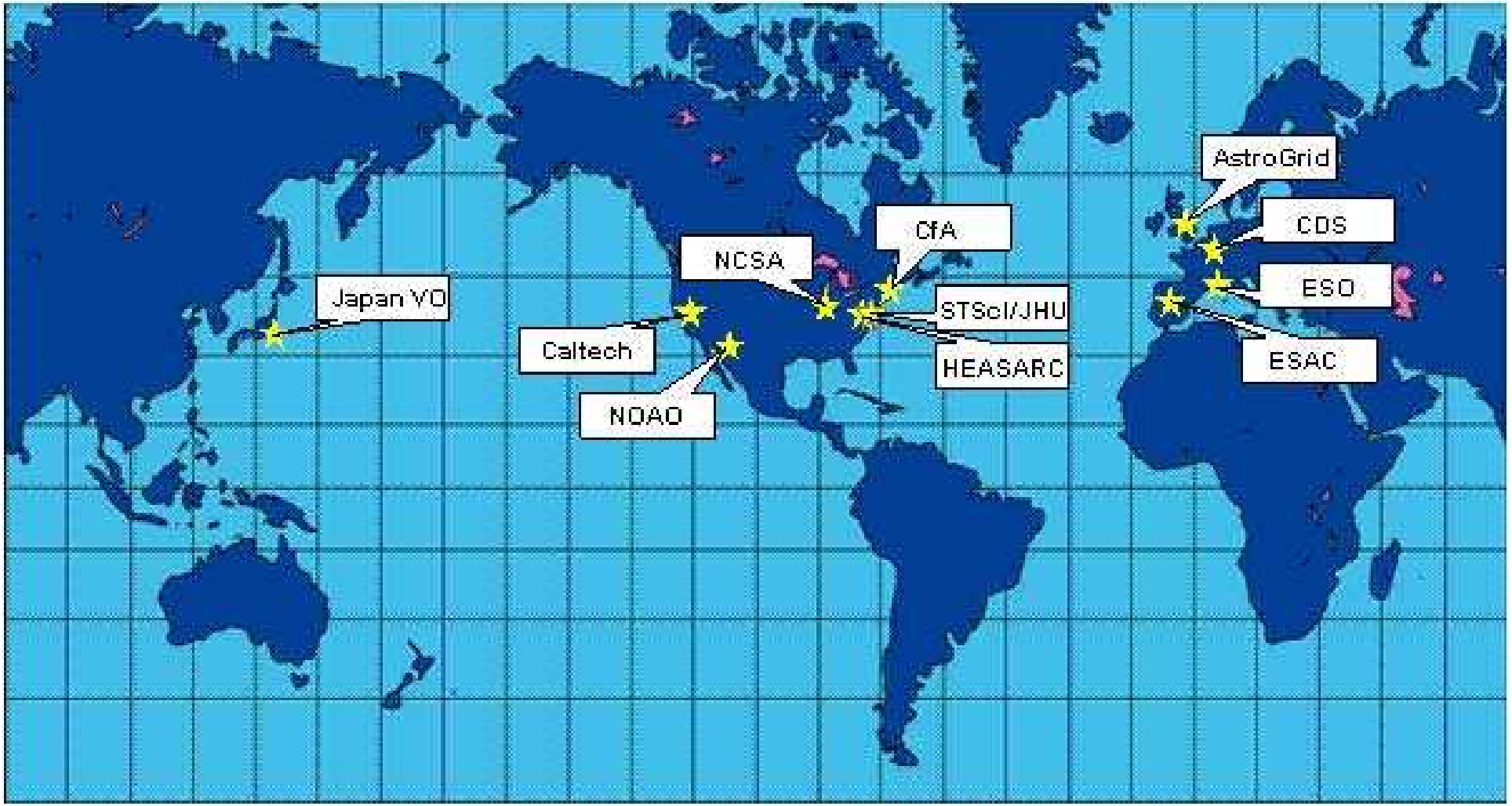
IVOA

International Virtual Observatory Alliance (IVOA)

- 16 countries and organizations
- Standardization of data exchange format, data access interface …
- Development of VO software
- Discussion on a mailing list
- Interoperability meeting (twice per year)
- 10 Working Groups
- 8 Interest Groups

http://www.ivoa.net/

Interconnected VOs in the World



JVO

JVO collaborators

Project Scientists

NAOJ

- Mizumoto
- Ohishi
- Oe
- Shirasaki
- Tanaka
- Honda
- Kawanomoto

ICRR

- Yasuda

Ochanomizu U.

- Masunaga

System Engineers

Fujitsu Ltd.

- Monzen
- Kawarai
- Ishihara
- Tsutumi

SEC Ltd.

- Morita
- Nakamoto
- Kobayashi
- Sakamoto

Supporter

NII

- Miura

Current JVO activity

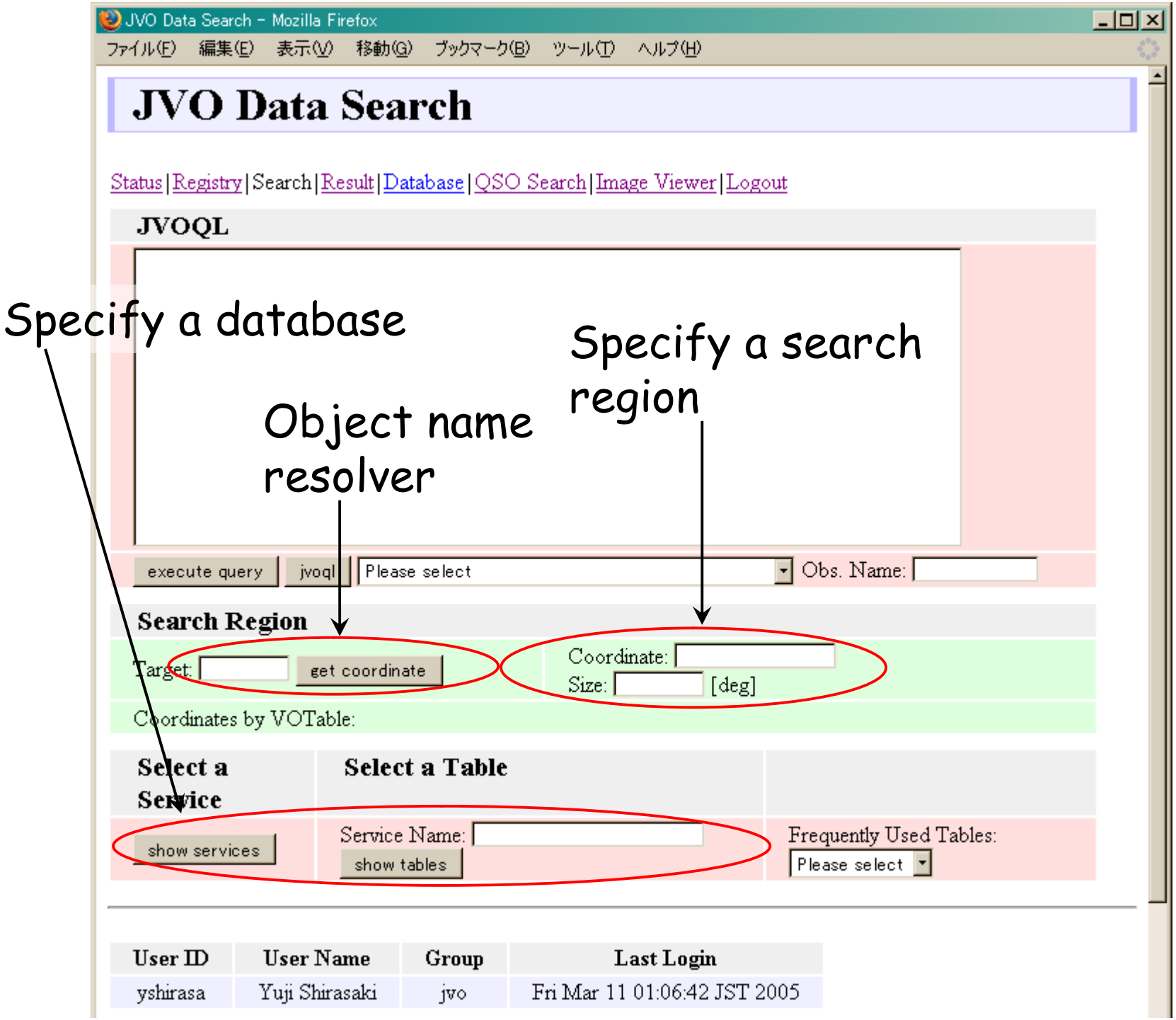
- Development of software using the VO standard
  - VO portal service
  - VO data service development toolkit
  - Data analysis web service
- VO data service
  - SXDS data service
  - Subaru Suprime-Cam image data service
  - SDSS, 2MASS …
- VO enabled science
  - Cosmic string search
  - QSO-Galaxy clustering study
  - More coming …

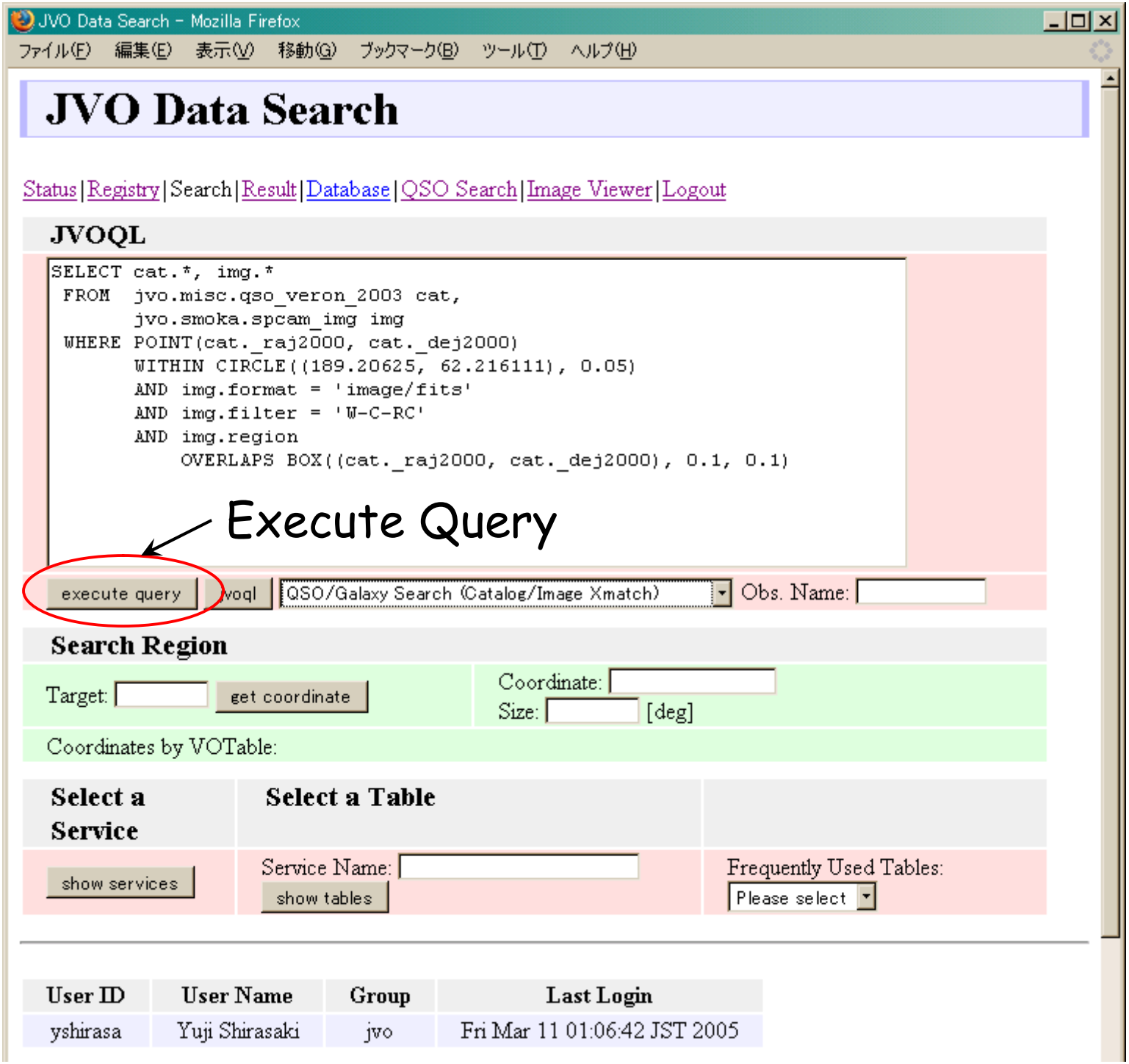
JVO Prototype 3

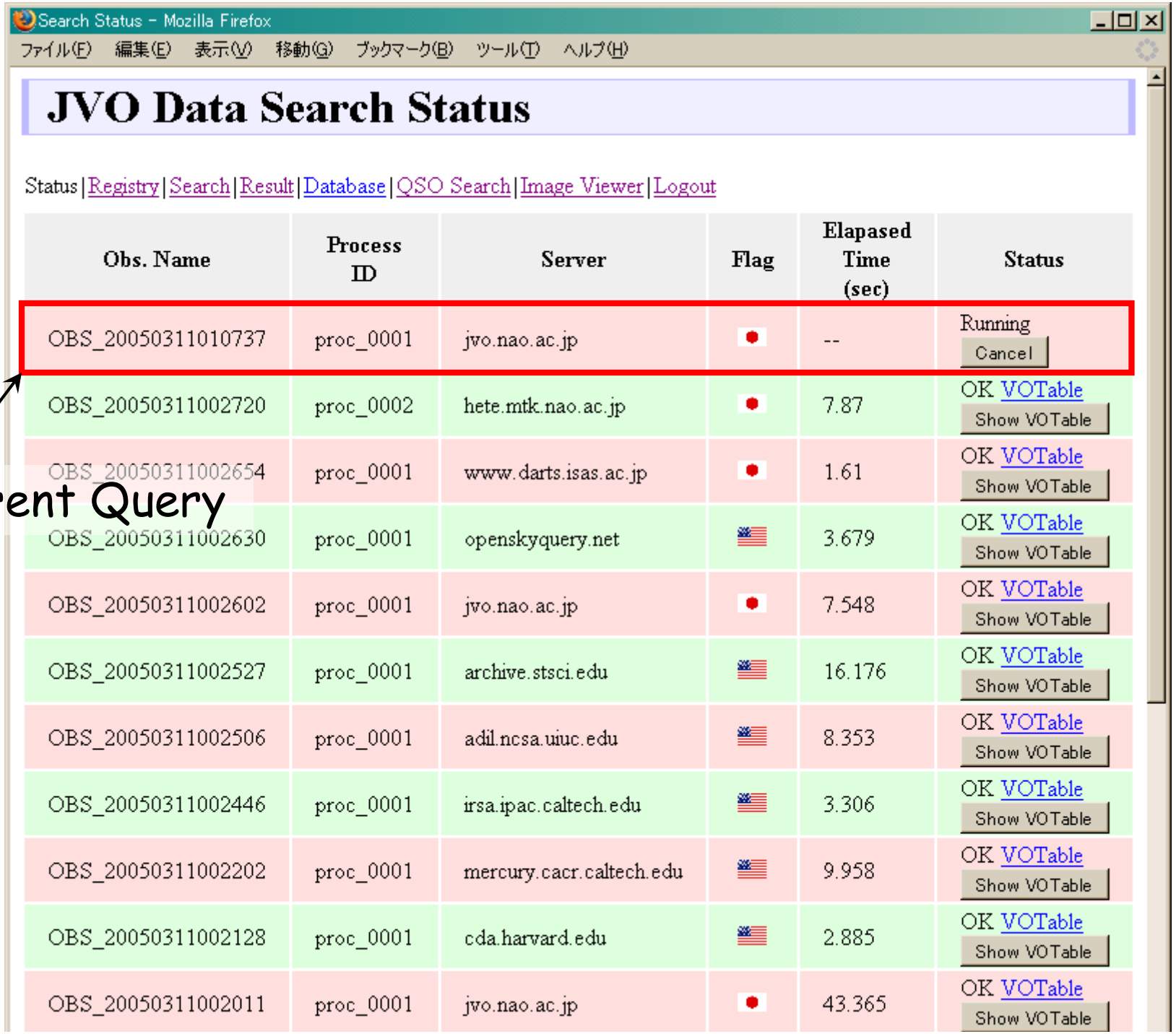
Demo

Open LDAP* authentication

* open source implementation of
the Lightweight Directory Access Protocol.


JVO Data Search - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
JVO Data Search
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
JVOQL
execute query
jvoql
Please select
Obs. Name:
Search Region
Target:
get coordinate
Coordinate:
Size:
[deg]
Coordinates by VOTable:
Select a Service
Select a Table
show services
Service Name:
show tables
Frequently Used Tables:
Please select
User ID
User Name
Group
Last Login
yshirasa
Yuji Shirasaki
jvo
Fri Mar 11 01:06:42 JST 2005
Specify a database
Object name resolver
Specify a search region


JVO Data Search - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
JVO Data Search
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
JVOQL
SELECT cat.*, img.*
FROM jvo.misc.qso_veron_2003 cat,
jvo.smoka.spcam_img img
WHERE POINT(cat._raj2000, cat._dej2000)
WITHIN CIRCLE((189.20625, 62.216111), 0.05)
AND img.format = 'image/fits'
AND img.filter = 'W-C-RC'
AND img.region
OVERLAPS BOX((cat._raj2000, cat._dej2000), 0.1, 0.1)
Execute Query
execute query
jvoql
QSO/Galaxy Search (Catalog/Image Xmatch)
Obs. Name:
Search Region
Target:
get coordinate
Coordinate:
Size:
[deg]
Coordinates by VOTable:
Select a Service
Select a Table
show services
Service Name:
show tables
Frequently Used Tables:
Please select
User ID
User Name
Group
Last Login
yshirasa
Yuji Shirasaki
jvo
Fri Mar 11 01:06:42 JST 2005


Search Status - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
JVO Data Search Status
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
Obs. Name
Process ID
Server
Flag
Elapased Time (sec)
Status
OBS_20050311010737 proc_0001 jvo.nao.ac.jp -- Running Cancel
OBS_20050311002720 proc_0002 hete.mtk.nao.ac.jp 7.87 OK VOTable Show VOTable
OBS_20050311002654 proc_0001 www.darts.isas.ac.jp 1.61 OK VOTable Show VOTable
OBS_20050311002630 proc_0001 openskyquery.net 3.679 OK VOTable Show VOTable
OBS_20050311002602 proc_0001 jvo.nao.ac.jp 7.548 OK VOTable Show VOTable
OBS_20050311002527 proc_0001 archive.stsci.edu 16.176 OK VOTable Show VOTable
OBS_20050311002506 proc_0001 adil.ncsa.uiuc.edu 8.353 OK VOTable Show VOTable
OBS_20050311002446 proc_0001 irsa.ipac.caltech.edu 3.306 OK VOTable Show VOTable
OBS_20050311002202 proc_0001 mercury.cacr.caltech.edu 9.958 OK VOTable Show VOTable
OBS_20050311002128 proc_0001 cda.harvard.edu 2.885 OK VOTable Show VOTable
OBS_20050311002011 proc_0001 jvo.nao.ac.jp 43.365 OK VOTable Show VOTable
Current Query


Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
この XML ファイルにはスタイル情報が関連づけられていないようです。以下にドキュメントツリーを表示します。
- <vt:VOTABLE>
- <vt:RESOURCE type="results">
<vt:INFO name="QUERY_STATUS" value="OK"/>
- <vt:TABLE>
- <vt:FIELD ID="cat.dej2000" arraysize="*" datatype="char" name="cat.dej2000">
<vt:DESCRIPTION>Declination J2000</vt:DESCRIPTION>
</vt:FIELD>
- <vt:FIELD ID="cat._dej2000" arraysize="*" datatype="char" name="cat._dej2000"
ucd="POS_EQ_DEC_MAIN">
<vt:DESCRIPTION>Declination (FK5) Equinox=J2000.</vt:DESCRIPTION>
</vt:FIELD>
- <vt:FIELD ID="cat.id" datatype="int" name="cat.id" ucd="ID_MAIN">
- <vt:DESCRIPTION>
Record number within the original table (starting from 1)
</vt:DESCRIPTION>
</vt:FIELD>
- <vt:FIELD ID="cat.l_z" arraysize="*" datatype="char" name="cat.l_z">
<vt:DESCRIPTION>[>*] limit or method flag on z</vt:DESCRIPTION>
</vt:FIELD>
- <vt:FIELD ID="cat.name" arraysize="*" datatype="char" name="cat.name">
<vt:DESCRIPTION>Most common name of the object</vt:DESCRIPTION>
</vt:FIELD>
- <vt:FIELD ID="cat.not_radio" arraysize="*" datatype="char" name="cat.not_radio">
<vt:DESCRIPTION>\\'*\\' if not detected in radio</vt:DESCRIPTION>
</vt:FIELD>
- <vt:FIELD ID="cat.n_rah" arraysize="*" datatype="char" name="cat.n_rah">
<vt:DESCRIPTION>[AOR] Approximative/Optical/Radio position</vt:DESCRIPTION>
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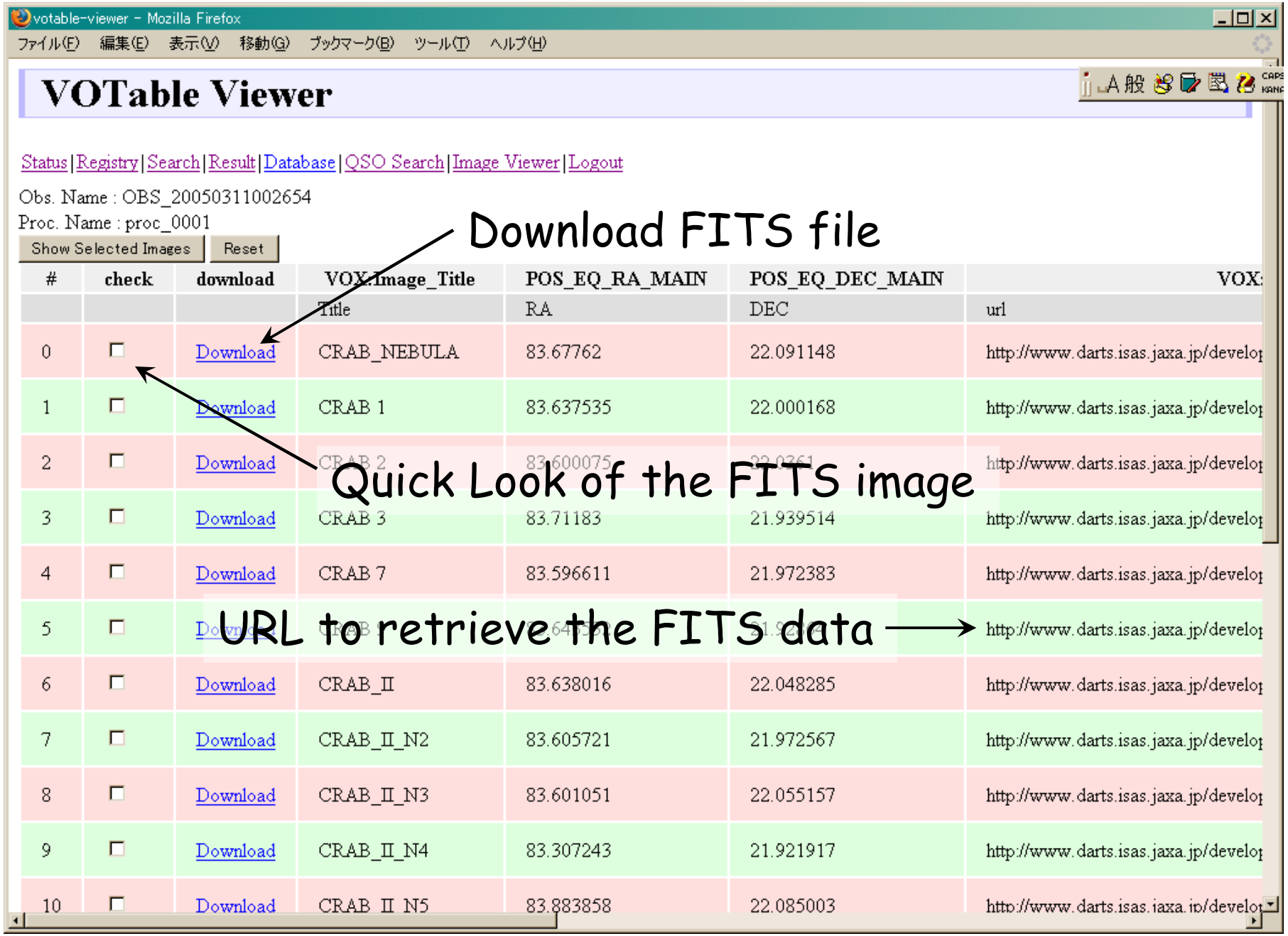
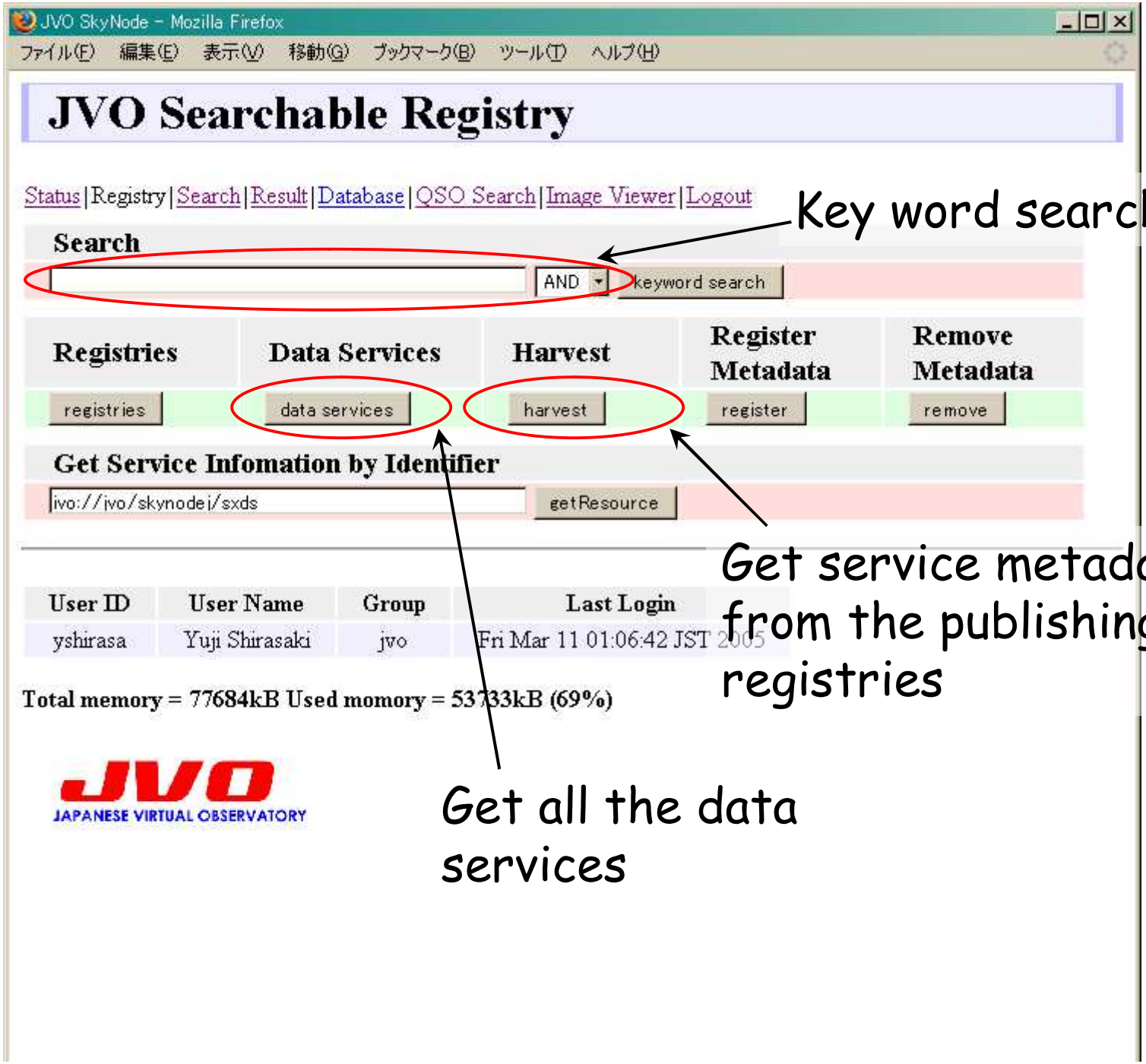
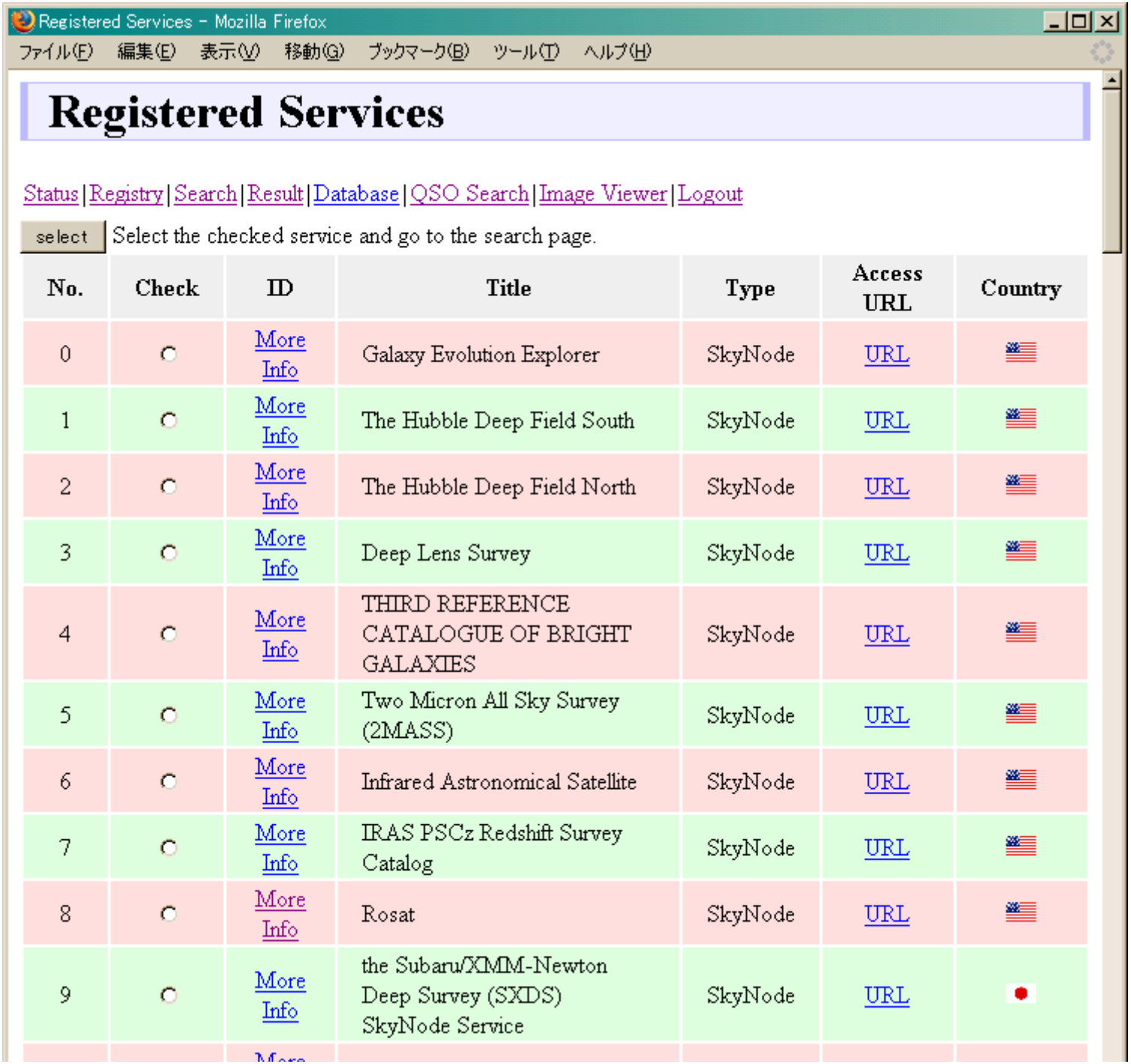

votable-viewer - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
VOTable Viewer
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
Obs. Name : OBS_20050311002654
Proc. Name : proc_0001
Show Selected Images
Reset
Download FITS file
Quick Look of the FITS image
URL to retrieve the FITS data
check download VOX:Image_Title POS_EQ_RA_MAIN POS_EQ_DEC_MAIN VOX:
Title RA DEC url
0 Download CRAB_NEBULA 83.67762 22.091148 http://www.darts.isas.jaxa.jp/develo
1 Download CRAB 1 83.637535 22.000168 http://www.darts.isas.jaxa.jp/develo
2 Download CRAB 2 83.600075 http://www.darts.isas.jaxa.jp/develo
3 Download CRAB 3 83.71183 21.939514 http://www.darts.isas.jaxa.jp/develo
4 Download CRAB 7 83.596611 21.972383 http://www.darts.isas.jaxa.jp/develo
5 http://www.darts.isas.jaxa.jp/develo
6 Download CRAB_II 83.638016 22.048285 http://www.darts.isas.jaxa.jp/develo
7 Download CRAB_II_N2 83.605721 21.972567 http://www.darts.isas.jaxa.jp/develo
8 Download CRAB_II_N3 83.601051 22.055157 http://www.darts.isas.jaxa.jp/develo
9 Download CRAB_II_N4 83.307243 21.921917 http://www.darts.isas.jaxa.jp/develo
10 Download CRAB_II_N5 83.883858 22.085003 http://www.darts.isas.jaxa.jp/develo


JVO SkyNode - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
JVO Searchable Registry
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
Search
AND
keyword search
Registries
Data Services
Harvest
Register Metadata
Remove Metadata
registries
data services
harvest
register
remove
Get Service Infomation by Identifier
ivo://jvo/skynodej/sxds
getResource
User ID
User Name
Group
Last Login
yshirasa
Yuji Shirasaki
jvo
Fri Mar 11 01:06:42 JST 2005
Total memory = 77684kB Used momory = 53733kB (69%)
JVO
JAPANESE VIRTUAL OBSERVATORY
Key word search
Get service metadata from the publishing registries
Get all the data services


Registered Services - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
Registered Services
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
select
Select the checked service and go to the search page.
No. | Check | ID | Title | Type | Access URL | Country
0 | More Info | Galaxy Evolution Explorer | SkyNode | URL
1 | More Info | The Hubble Deep Field South | SkyNode | URL
2 | More Info | The Hubble Deep Field North | SkyNode | URL
3 | More Info | Deep Lens Survey | SkyNode | URL
4 | More Info | THIRD REFERENCE CATALOGUE OF BRIGHT GALAXIES | SkyNode | URL
5 | More Info | Two Micron All Sky Survey (2MASS) | SkyNode | URL
6 | More Info | Infrared Astronomical Satellite | SkyNode | URL
7 | More Info | IRAS PSCz Redshift Survey Catalog | SkyNode | URL
8 | More Info | Rosat | SkyNode | URL
9 | More Info | the Subaru/XMM-Newton Deep Survey (SXDS) SkyNode Service | SkyNode | URL

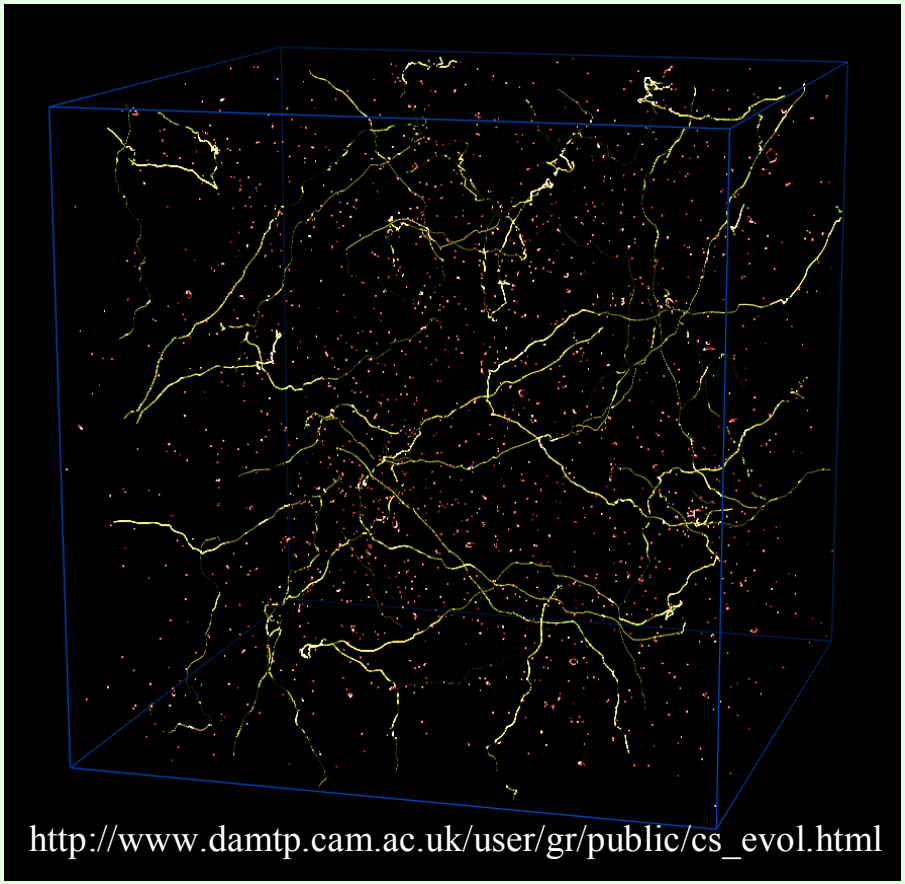

Registered Services - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
70 Info Filter i SIAP URL
71 More Info 2MASS All-Sky Quicklook Image Service SIAP URL
72 More Info INES: The IUE Newly Extracted Spectra SIAP URL
73 More Info ASCA SIA Service SIAP URL
74 More Info JVO Publishing Registry Registry URL
75 More Info NCSA Radio Astronomy Imaging Registry Registry URL
76 More Info Minnesota Automated Plate Scanner Registry URL unknown
77 More Info CADC Registry Registry URL unknown
78 More Info CASU publishing registry Registry URL unknown
79 More Info Source-Extractor Unknown URL unknown
80 More Info HyperZ Unknown URL unknown
select Select the checked service and go to the search page.
80 VO resources are available on JVO portal
User ID User Name Group Last Login
yshirasa Yuji Shirasaki jvo Fri Mar 11 01:06:42 JST 2005
Total memory = 77684kB Used momory = 58603kB (75%)
JVO

Science Use Case 1

Cosmic String Search

Cosmic String

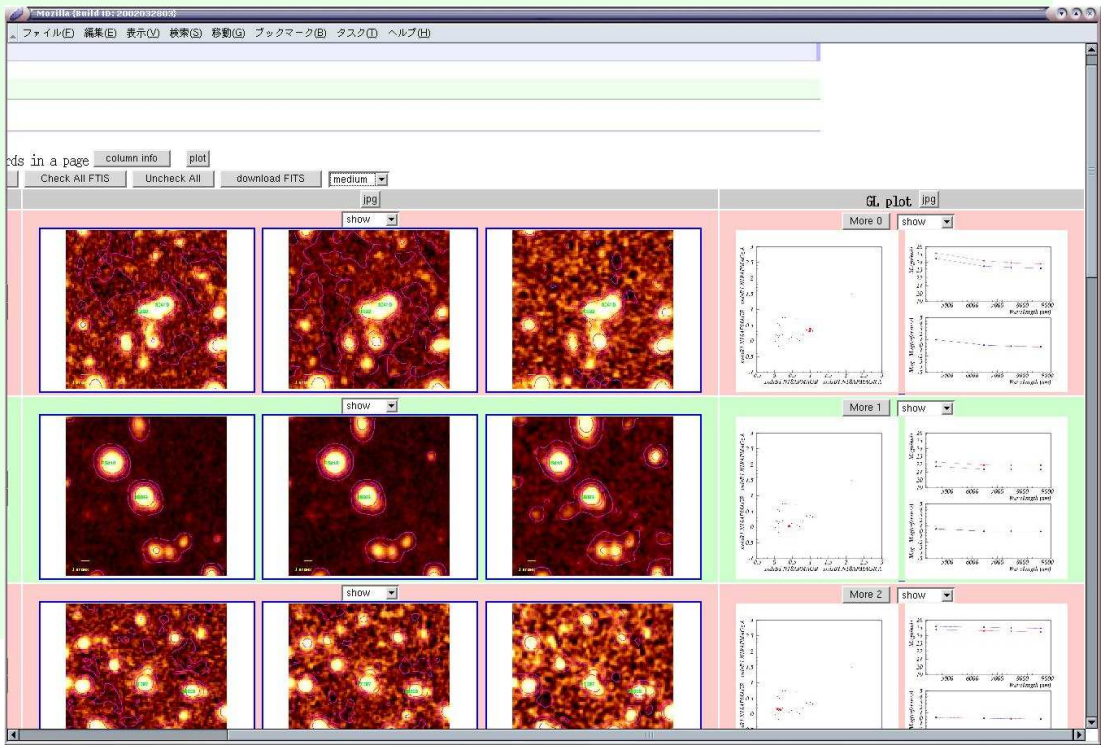
- GUT theory predicts the production of a cosmic string at very early universe $t \sim 10^{-35}$ s,
- Width < 10^{-22}m,
- Length ~ size of the Universe.
- Mass of 10 km string ~ the Earth



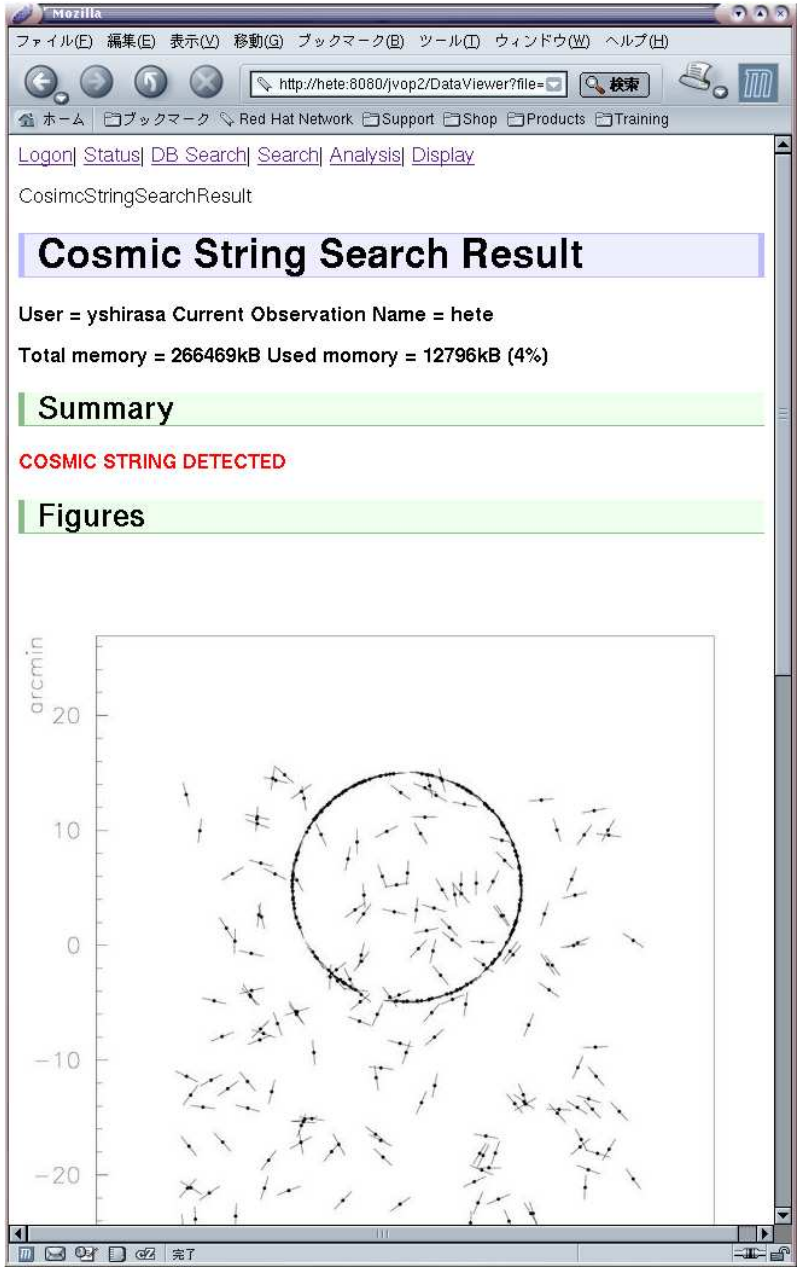
Deep Wide field image:
Subaru/Suprim-Cam
Wide field Survey: SDSS

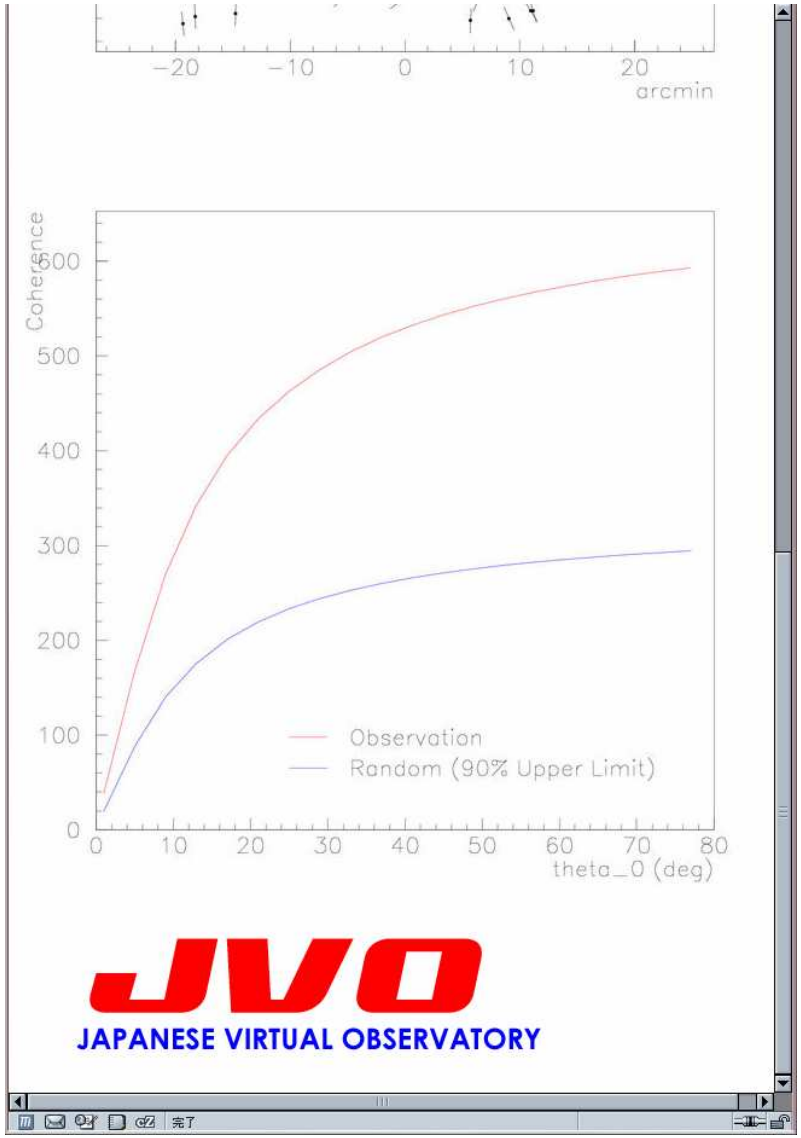
Search for Gravitational Lenses produced (?) by Cosmic Strings

- SXDS data observed by Subaru
- Results were obtained less than 5 min, displaying SEDs
- It has been proven that VO can accelerate researches.



Cosmic String Search Result





Science Use Case 2
QSO/Galaxy Clustering Study

QSO & Galaxies clustering study

- Origin of the large scale structure
  - QSO is a tracer of high density regions in the universe ← hierarchical clustering model
  - Comparison between the observation and theoretical prediction is required.
- Origin of the QSO activity
  - Why is the QSO so powerful.
  - Test of the galaxy merger model

Workflow for studying the QSO/Galaxy clustering

1. Select QSO coordinates from the QSO catalog → Query to the Skynode Catalog Database.
2. Search deep imaging data which covers the QSO regions → Query to the Skynode of Subaru Image Database
3. Create catalog from the imaging data → Invoke the SExtractor Web service.
4. Estimate the distance to the objects around the QSO → Invoke the HyperZ Web service
5. Try Clustering Analysis → Invoke the clustering analysis web service.


QSO-Galaxies Search - Mozilla Firefox
ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)
QSO-Galaxies Search
Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout
⇒ Query | Catalog | PhotoZ
Data Search
Search
ID for your query
Observation Name
Region
RA: 189.2062 [deg]
Dec: 62.21611 [deg]
Radius: 0.2 [deg]
Image Size: 1.0 [arcmin]
Brightness
V_mag between 10.0 [mag] and 20.0 [mag]
Redshift
z between 0.0 [mag] and 2.0 [mag]
QSO Catalog Search
Service For QSO
ivo://ivo/misc
Table For QSO
qso veron 2003
Image Data Service Search
Service For Image
ivo://ivo/test/smoka
Table For Image
spcam img
Search
User ID
User Name
Group
Last Login
yshirasa
Yuji Shirasaki
jvo
Sat Mar 12 21:36:49 JST 2005

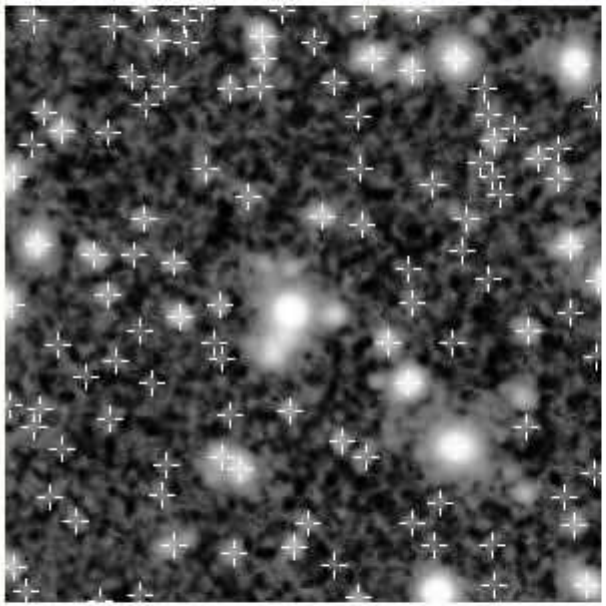
Image Viewer - Mozilla Firefox

ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)

Image Viewer

Status | Registry | Search | Result | Database | QSO Se

Name	Origin	Scale
fits0	http://grido.dc.nao..	hist



User ID	User Name	Group
yshirasa	Yuji Shirasaki	jvo

Total memory = 266403kB Used momory = 161

JVO
JAPANESE VIRTUAL OBSERVATORY

votable-viewer - Mozilla Firefox

ファイル(F) 編集(E) 表示(V) 移動(G) ブックマーク(B) ツール(T) ヘルプ(H)

VOTable Viewer

Status | Registry | Search | Result | Database | QSO Search | Image Viewer | Logout

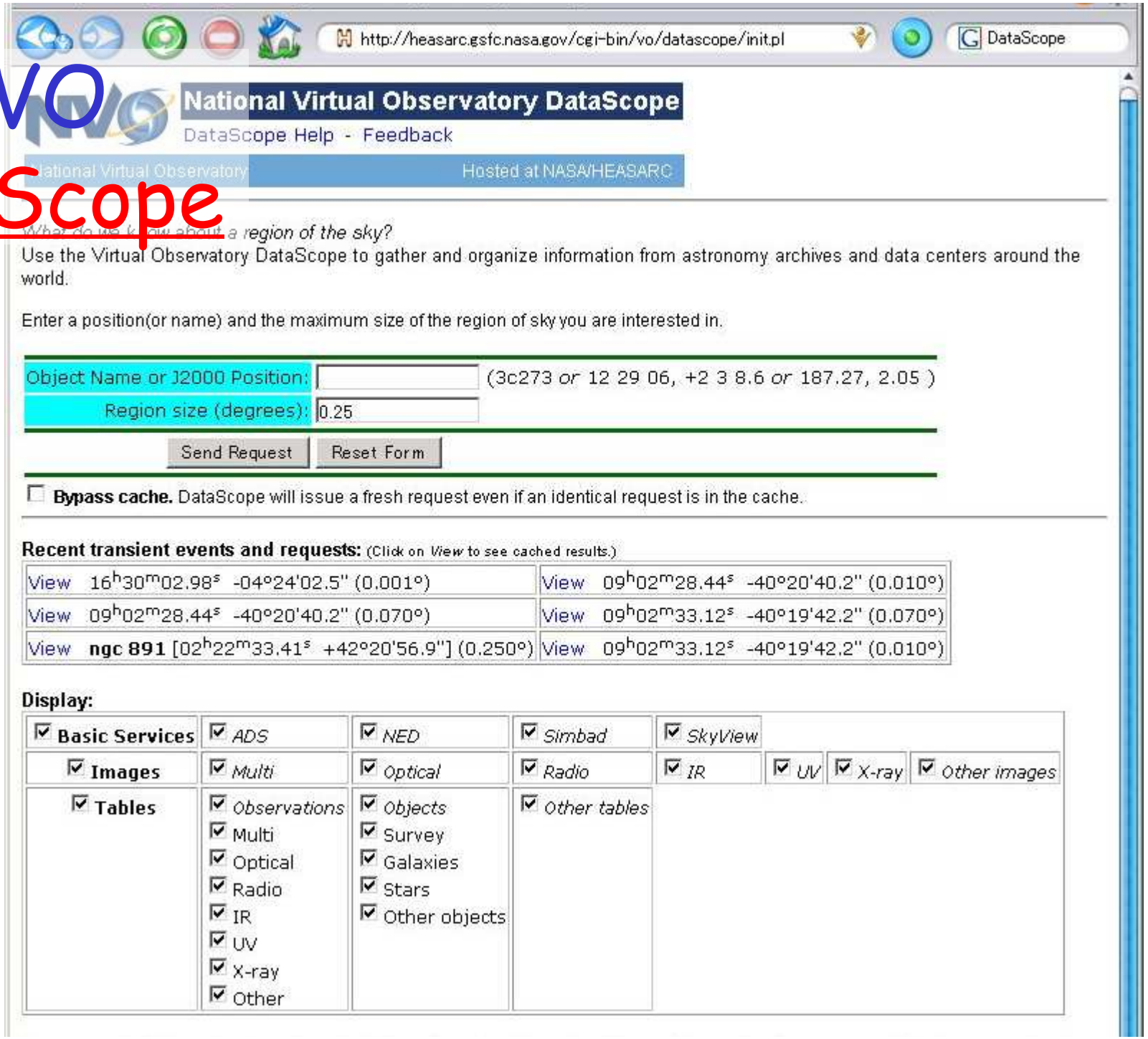
Obs. Name :
Proc. Name :

Show Selected Images | Reset

Photometric Redshift

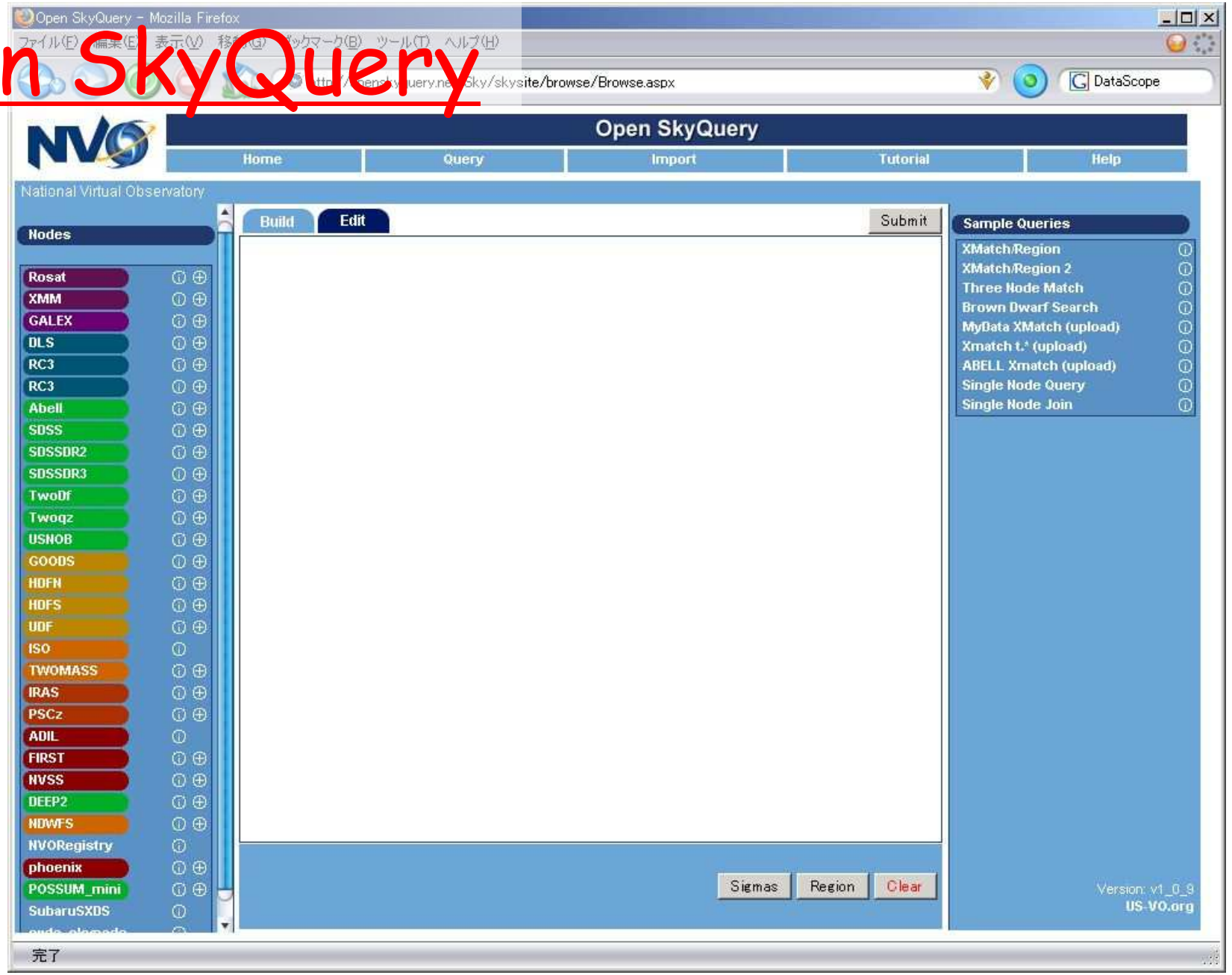
#	check	download	id	z_phot	chi2	P	SpT	N_age	ag
0			1	1.860	4.255	0.19	2	35	3.
1			2	2.360	1.270	27.92	1	26	0.
2			3	2.440	1.762	13.34	1	25	0.
3			4	1.860	1.131	33.97	2	35	3.
4			5	2.355	1.772	13.14	1	24	0.
5			6	2.355	17.794	0.00	1	26	0.
6			7	1.150	2.682	2.98	1	16	0.
7			8	1.910	0.683	60.36	1	27	0.
8			9	2.355	2.727	2.76	1	25	0.
9			10	1.860	3.909	0.35	2	35	3.
10			11	2.440	5.152	0.04	1	20	0.
11			12	0.220	32.600	0.00	1	5	0.
12			13	0.220	29.832	0.00	1	5	0.
13			14	1.860	0.803	52.33	1	25	0.
14			15	2.355	2.094	7.87	1	24	0.
15			16	2.440	7.487	0.00	1	24	0.
16			17	1.850	3.041	1.62	1	27	0.
17			18	1.330	2.856	2.22	1	23	0.

NVO DataScope



NVO

Open SkyQuery



Comparison among the major VO portals

	JVO Portal	DataScope	Open SkyQuery
Catalog	○	○	○
Image	○	○	X
Spectrum	○	○	X
Cross Match	○	X	○
Storage	○	X	○
Analysis	○	X	X

Road map of the JVO