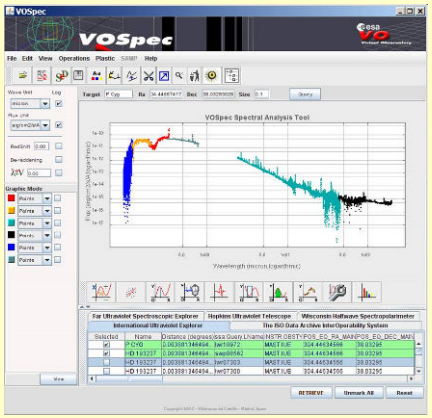
Virtual Observatory Science Gateways in Astronomical and Astrophysics



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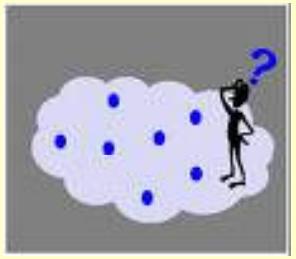
Science Operations Department

ESA/ESAC – Madrid, Spain

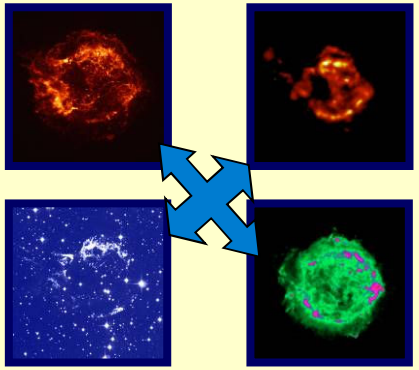
The VObs Concept for Astronomy

- WEB : all documents in the world inside your PC
- VObs : all astronomical data in the world inside your PC

- What the VObs is NOT:
  - A centralized database of all astronomical data
  - A “monolith” software system
  - A peer-to-peer system



- The VObs framework
  - Agreed *standards*
  - Inter-operable *data collections*
  - Inter-operable *software modules*



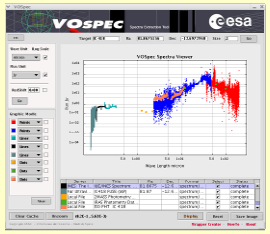
VObs : What is needed ?

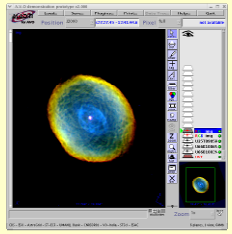
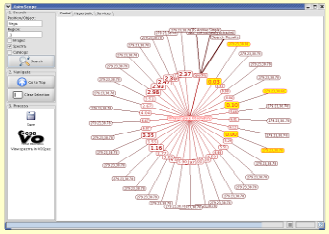
- Global standards
  - Transparent inter-operability for the end users

- Well funded data centres
  - Space agencies, Ground based telescope, Labs

- Working data services
  - Data and *Metadata* remains the key !

- VObs aware client tools and portals
  - Bring the data to the users



- VObs aware data mining services
  - New way of making science

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Defining Standards for the A&A VObs

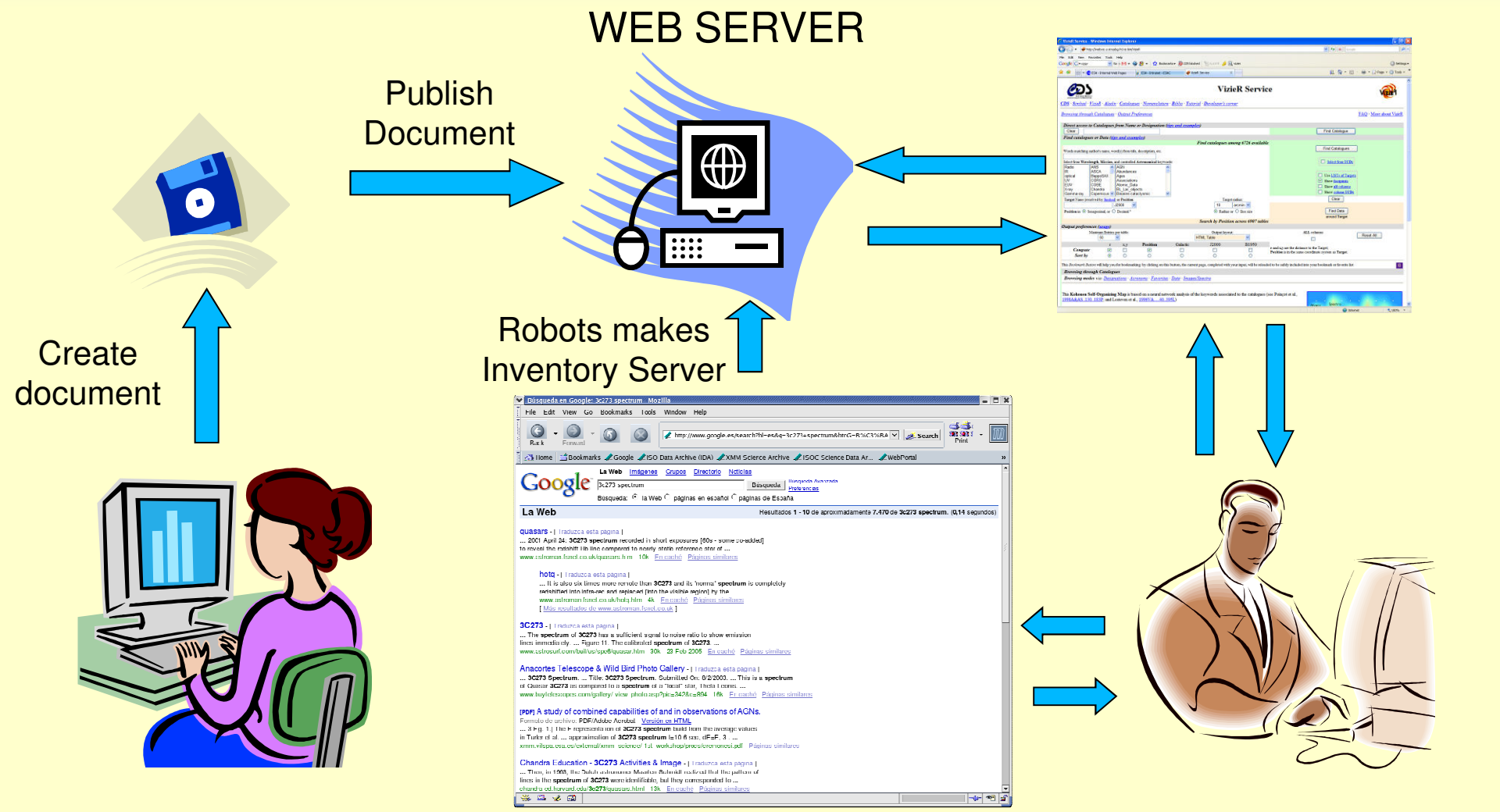
- Working Groups defining interoperability standards for the VObs
  - Data Access Layer
  - Data Model
  - VO Query Language
  - Registry of VObs Resources
  - VOTable
  - Semantics
  - Grid and Web Services

- Strong involvement of Europe through
  - National institutions
  - International organizations (ESA, ESO)
  - EC funded project – EuroVO AIDA

EURO VO AIDA Astronomical Infrastructure for Data Access

- Link with other science communities
  - Planetary, Solar Systems

Publishing Data on the Internet



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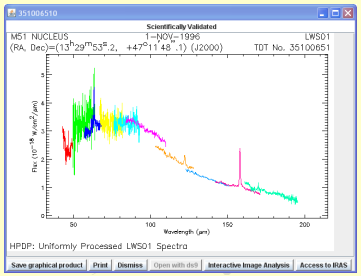
Publishing Data in the VObs

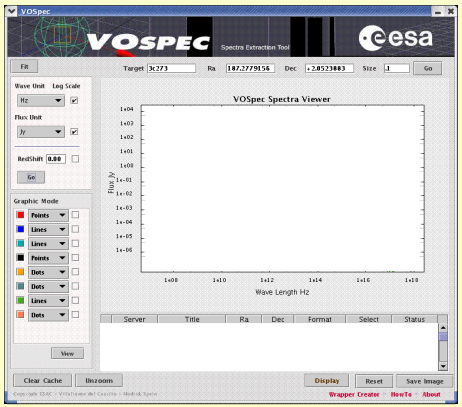


Create
VObs Service

Vobs Spectra
Data Model

VObs Spectra
SERVERS

VObs Spectra
Access Protocol



Produce
Data

Find List of
VObs Services

Register
VObs Service

Euro-VO Registry
of VObs resources

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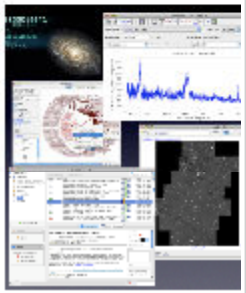
VObs Science Ga

EURO FACILITY CENTRE

The Euro-VO projects: VOTECH Eur

Science

- Software
- Recipes User Manual
- Scientific Workflows
- AIDA Research Initiative
- Scientific Papers
- Science Advisory Committee

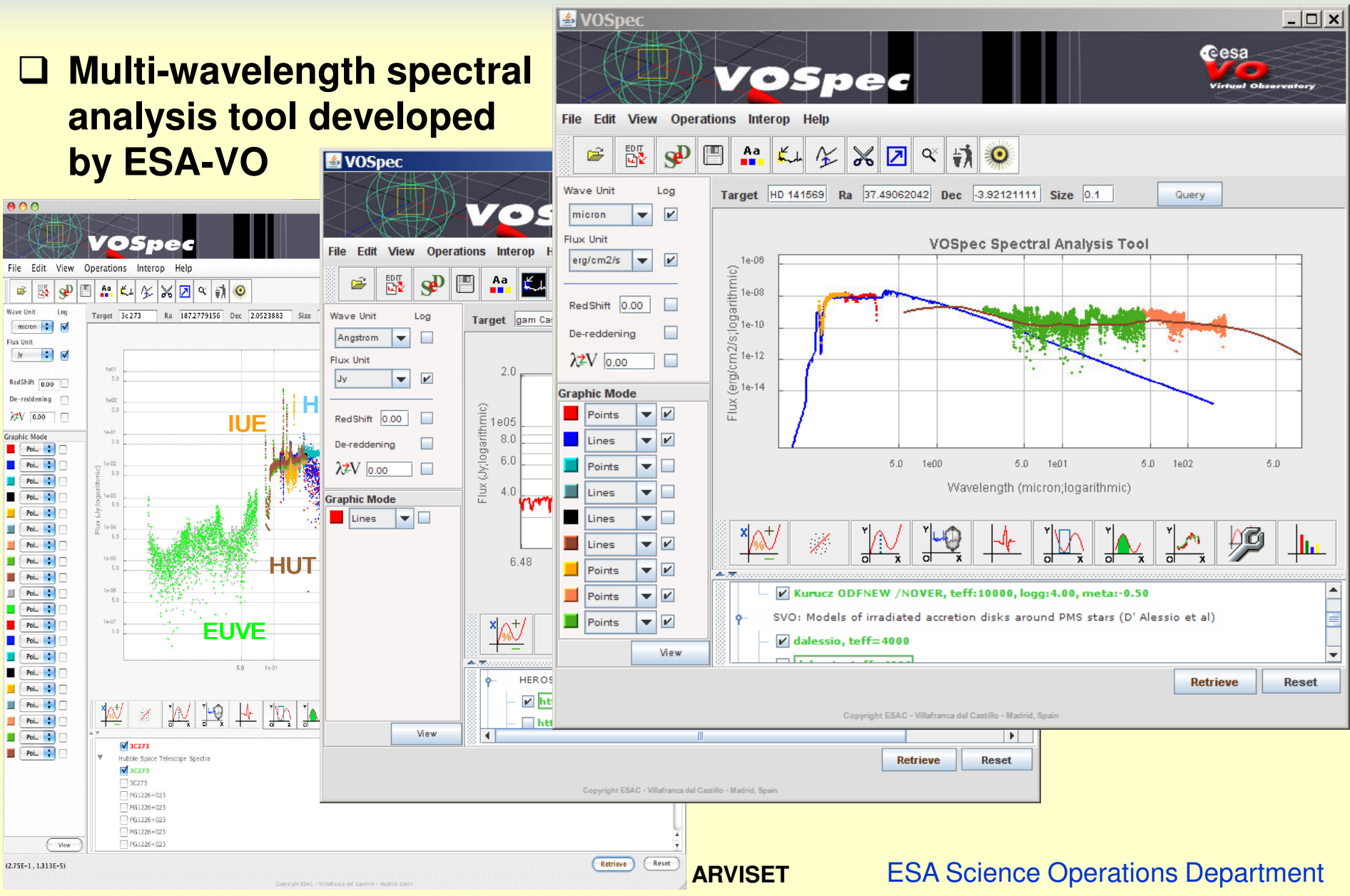


Application / Version (in alphabetical order)	Functionality	Other VO-complient tools
Aladin v6.011 (September 2009)	**Search for Images:** Aladin, Datascope, SkyView, VODesktop	DS9: Image visualiasation
Datascope v2.1 (March 2007)	**Search for Spectra:** Aladin, Datascope, SPLAT, Specview, VOServices, VOSpec	GOSSIP: SED fitting
Montage	**Search for Catalogues:** Aladin, Datascope, TOPCAT, VODesktop	Mirage: Table visualisation
Octet	**Image visualisation:** Aladin, SkyView	VirGO: Search for Images and Spectra
Open SkyQuery	**Spectra visualisation:** SPLAT, Specview, VOServices, VOSpec	**Browse the Registries**
SkyView	**Catalogues visualisation:** Aladin, TOPCAT, VOPlot	EURO-VO Registry
SPLAT 3.9.0 (May 2009)	**Cross-correlation:** Aladin, Open SkyQuery, STILTS, TOPCAT	AstroGrid Registry
Specview 2.14.4 (August 2009)	**Scatter, 3D plots and histograms:** TOPCAT, VOPlot	NVO Registry
TOPCAT/STILTS 3.4-3/2.0-4 (July 2009)	**Statistics:** VOStat	**Manuals, Tutorials, How-tos**
VisIVO 1.5.7.1 (May 2009)	**Footprint Service:** Aladin, VOServices	Aladin User manual
VOConvert 1.0 (June 2006)	**Table format conversion:** TOPCAT, VOConvert	Datascope how to
VODesktop 1.3 (June 2009)	**Filter curves:** VOServices	Montage help
VOEventNet	**SED building:** VOSA, VOSED, VOSpec	Open SkyQuery help
VOPlot 1.5 (May 2009)	**Fixing WCS:** Aladin, WCSFixer	SkyView documentation
VOStat 1.1 (November 2008)		Specview examples
VOSA 1.0.2 (March 2009)		SPLAT documentation
VOSED 1.3 (July 2009)		STILTS documentation
VOServices (Footprint, Spectrum, Filters, ...) 2.1.0.0		TOPCAT documentation
VOSpec V5.5 (September 2009)		VisIVO how to
WCSFixer		VODesktop how to
		VOSpec User manual

http://www.euro-vo.org/pub/fc/software.html

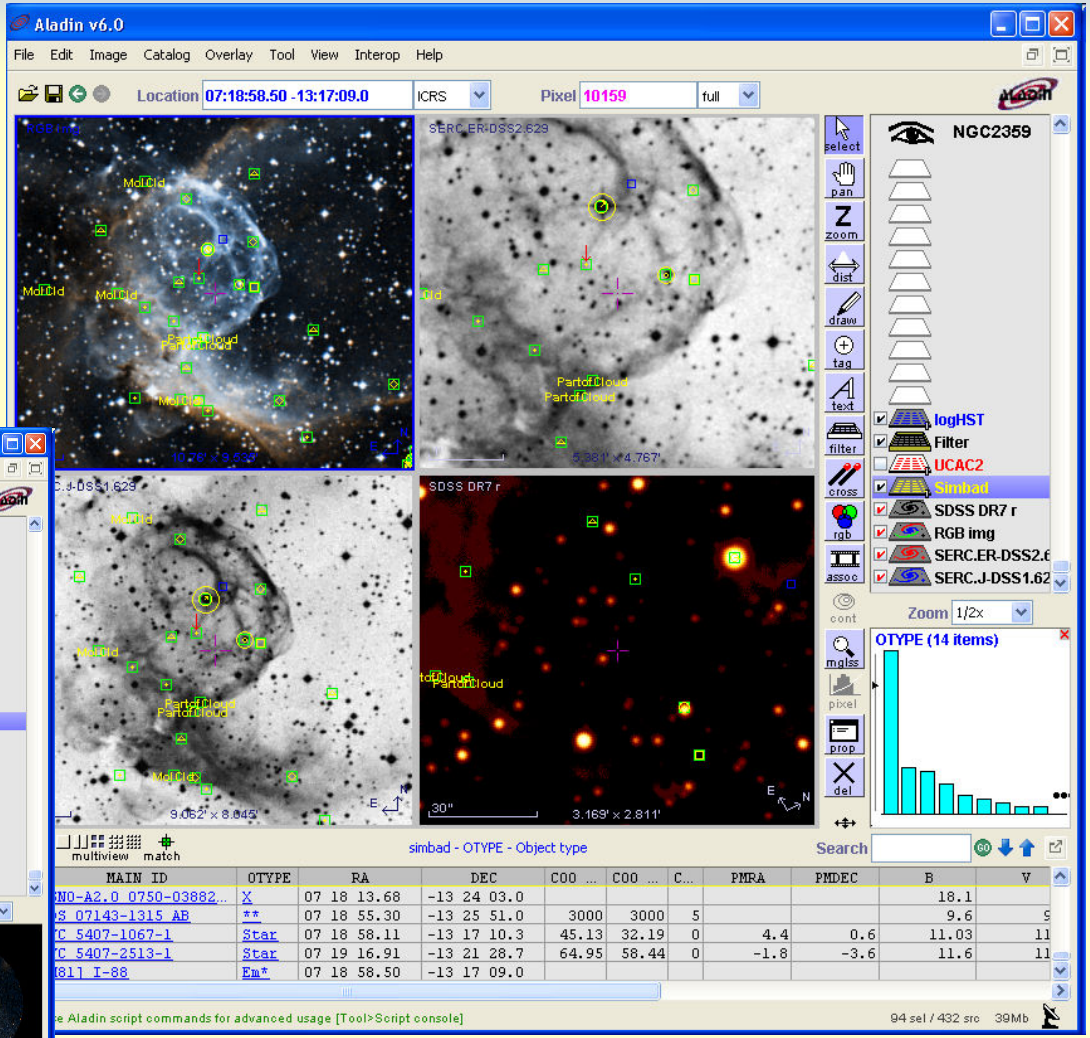
ESA VOSpec : Spectral Analysis Tool

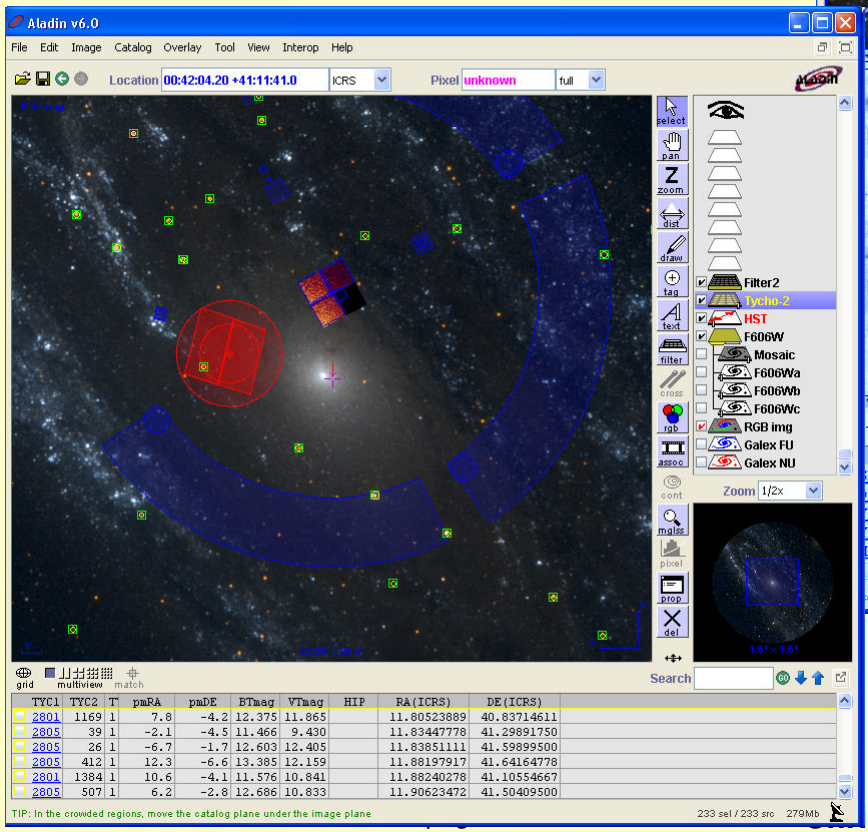
- **Multi-wavelength spectral analysis tool developed by ESA-VO**



Aladin (CDS)

- Interactive software sky atlas
- Visualize digitized astronomical images,
- Superimpose entries from astronomical catalogues





US NVO DataScope

National Virtual Observatory

NVO Portal: DataScope Response

NVO Home | New Query | Help | Contact Us

Hosted by: HEASARC NASA/GSFC

Data found(376) No data (5397) Errors(30) Waiting(0) 100% complete

Position:m31 Resources/hits: 5803/344330 Cache age:19.472 hours

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

Matching Resources

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

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

When the number after the name is given as *nn/mm* you have selected *nn* of the *mm* files indexed in that resource. Click on the resource name to select files within such resources.
Download selected resources from the Summary tab.

Major Multiwavelength Services					
	NED(images) (0/136) ?	NED(sources) (1490) ?	Simbad (4291) ?	SkyView (0/39) ?	
Images (Data in one or more FITS files)					
Multi	CADC (0/3177) ?	CADC/HST (0/452) ?	DSS ESO (0/8) ?	HST/SIAP/PREVIEW (0/445) ?	MAST Scrapbook (0/129) ?
	MAST-Scrapbook (0/80) ?				
Optical	CADC/CFHT (0/2710) ?	DSS (0/1) ?	DSS1B (0/1) ?	DSS1R (0/1) ?	DSS2 (0/3) ?
	HAlpha (0/1) ?	HST Previews (0/734) ?	NEAT (0/1) ?	NOAO (0/168) ?	
Radio	GB6 (0/1) ?	NVAS (0/46) ?	NVSS (0/1) ?	VLSS (0/1) ?	WENSS (0/1) ?
Infrared	2MASS (0/3) ?	2MASS ASKY AT (0/18) ?	2MASS QL (0/18) ?	CADC/IRIS (0/4) ?	IRAS (0/4) ?
	IRIS (0/4) ?	ISSA (0/4) ?	LGA (0/3) ?	MSX (0/4) ?	SFD100m (0/1) ?
	SFDdust (0/1) ?				
UV	EUVE (0/4) ?	GALEX (0/2) ?	GALEX_Atlas (0/2) ?	GalexFar (0/1) ?	GalexNear (0/1) ?
	HST.maoz_atlas (0/1) ?	UIT (0/15) ?	WFC (0/2) ?		
X-ray	Chandra (0/250) ?	HRI (0/1) ?	PSPC1 (0/1) ?	PSPC2 (0/1) ?	PSPC2cnt (0/1) ?
	PSPC2exp (0/1) ?	RASS (0/1) ?	RASS3 (0/3) ?	RASSALL (0/3) ?	ROSAT SIA (0/899) ?
Other	CADC/JCMT (0/11) ?	HST/SIAP/PREVIEW (0/445) ?	ISO SIAP (0/34) ?	XMM-Newton SIAP (0/34) ?	voparis (2) ?
Lists of Observations (Data in one VOTable)					

US NOAO VObs Portal

>sky< time xmatch siap query cart log in

persistence: on

contents tutorial faq email us

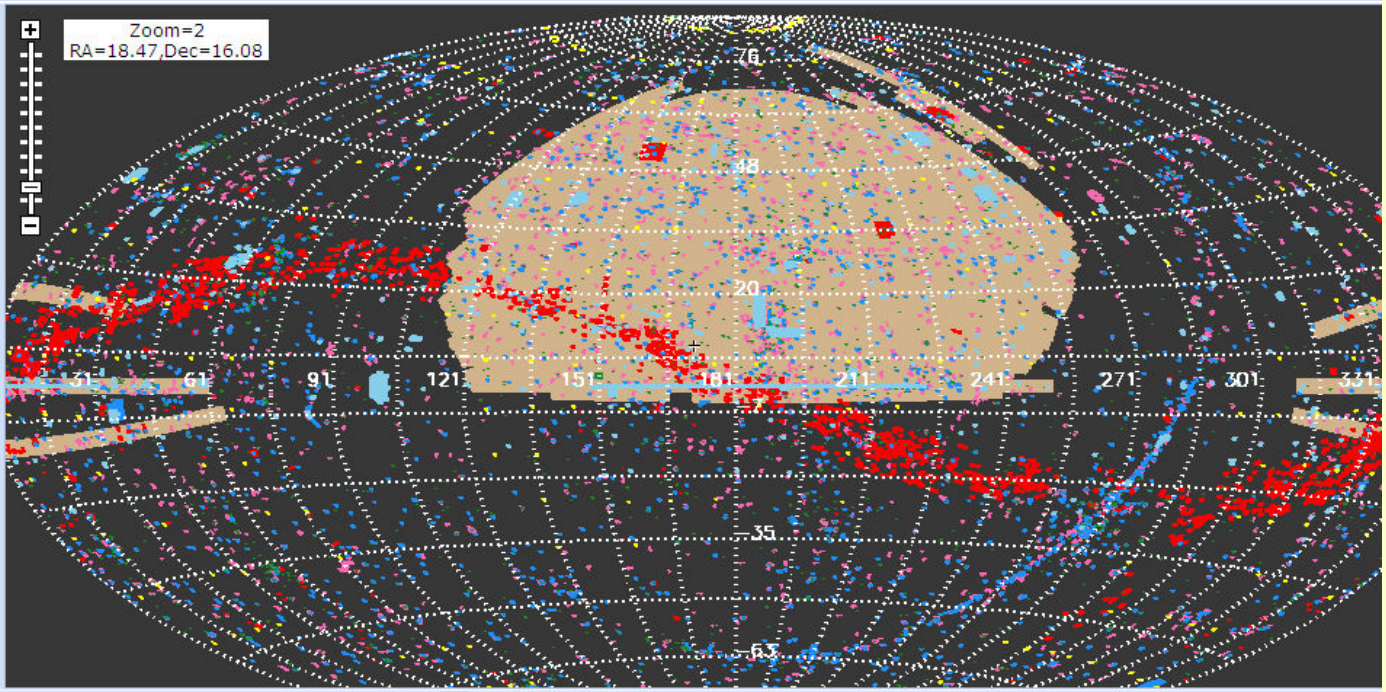
NOAO VO Portal v6.0.4
A web application for the VO

- Description
- Add a Marker and Crossmatch
- Zoom to Object, Region or Sky Coordinate
- Display and Search by Archive

Cart
SDSS
CHANDRA
NSA
XMM
HST
INT
GALEX

Search

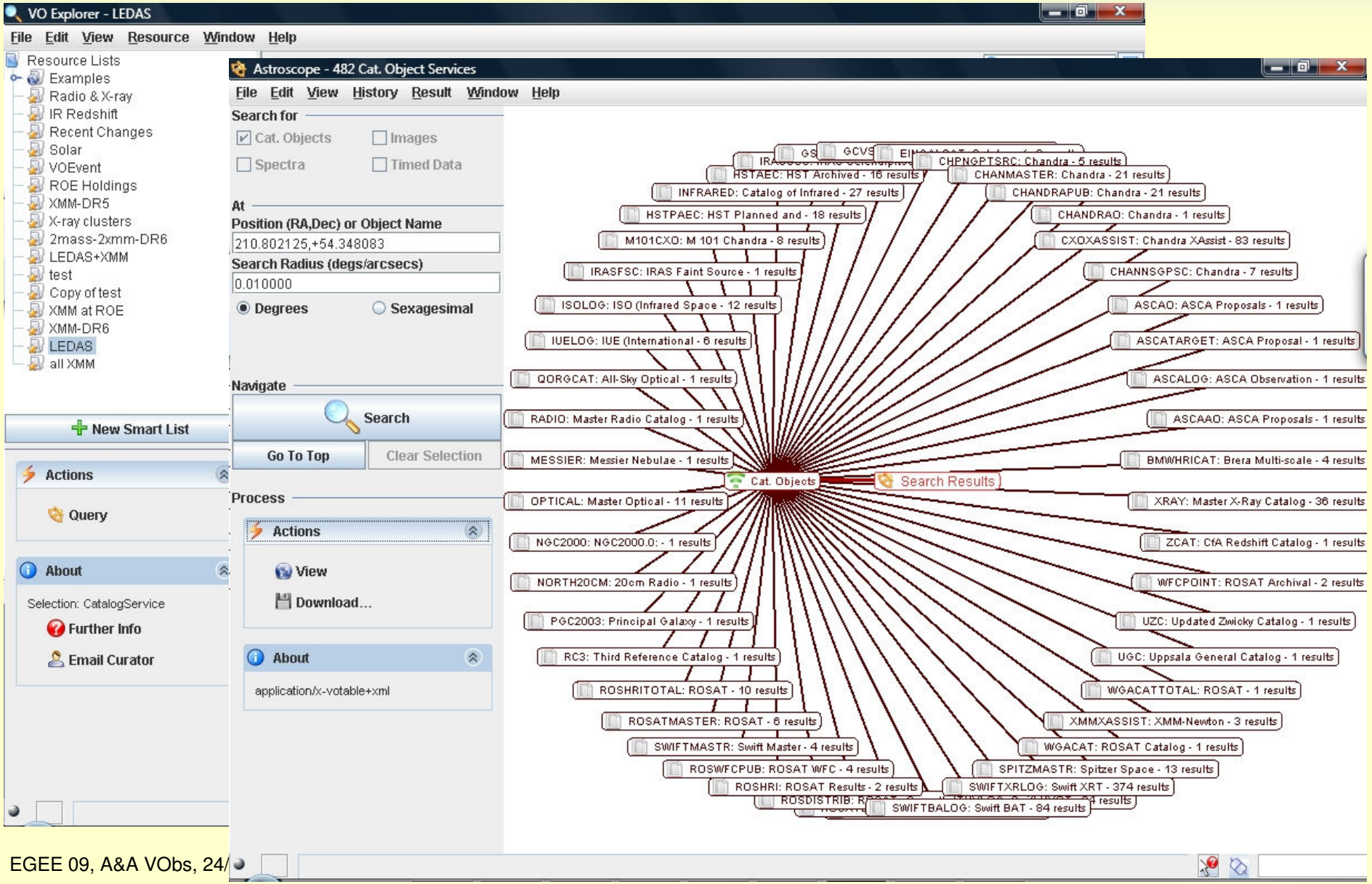
Search Region on the Sky:
0.00 < RA < 360.00
-90.00 < DEC < 90.00



Current coordinate format: decimal degrees
Add selected rows to cart | View selected rows in VOPlot | See Data Grid as VOTable

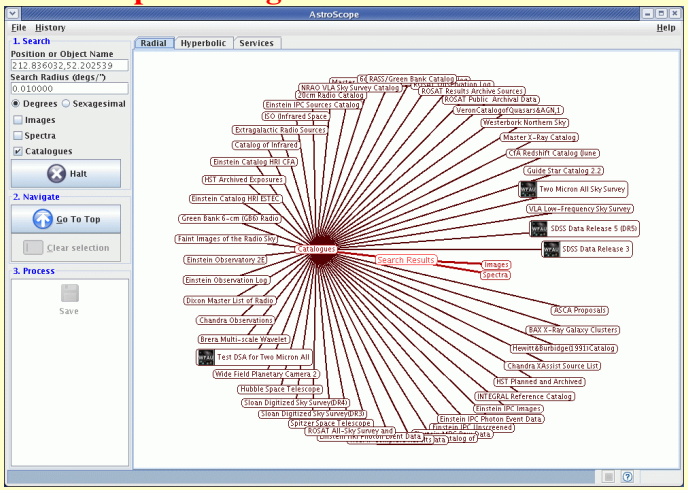
(0) + - ! *	URL	Preview	Live Query	RA	Dec	Filter	Obs. Date	Telescope	Survey	Instrument	Archive	Seeing	Depth	Exp. Time
☐	Retrieve	Preview	Search	153.151993	11.3709002	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.7	300.0
☐	Retrieve	Preview	Search	153.151993	11.2203999	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.6	300.0
☐	Retrieve	Preview	Search	153.151993	11.0683002	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.6	300.0
☐	Retrieve	Preview	Search	153.151993	10.9177999	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.4	300.0
☐	Retrieve	Preview	Search	152.848999	11.3625002	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.5	300.0
☐	Retrieve	Preview	Search	152.848007	11.2117004	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.6	300.0
☐	Retrieve	Preview	Search	152.848007	11.0591002	r prime Mosaic	unknown	KPNO 4.0 meter tel	Deep Ecliptic	CCDMosaThin1	NSA	1.4	23.9	300.0

UK AstroGrid VODesktop

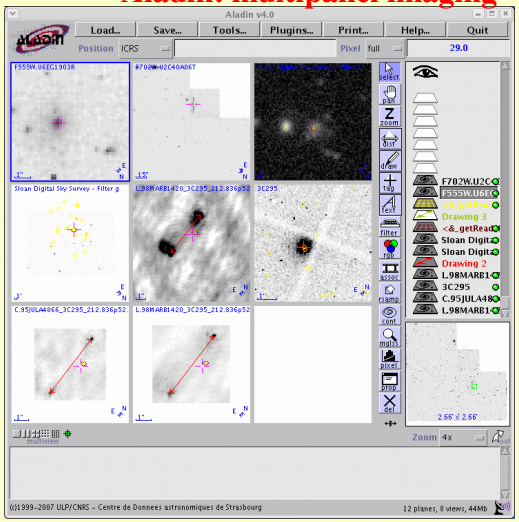


The power of applications interoperability in the VObs

AstroScope: catalogue search

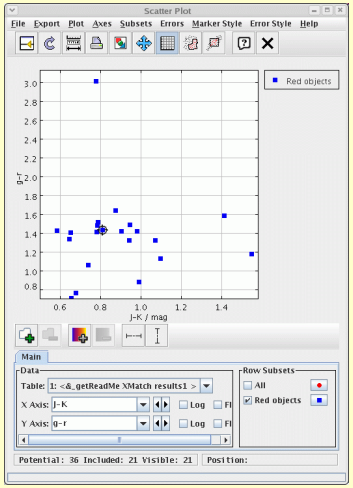


Aladin: multipanel imaging

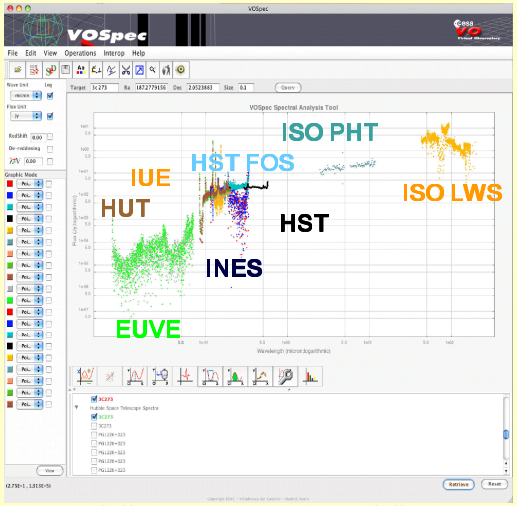


(SAMP)

Simple Application Messaging Protocol

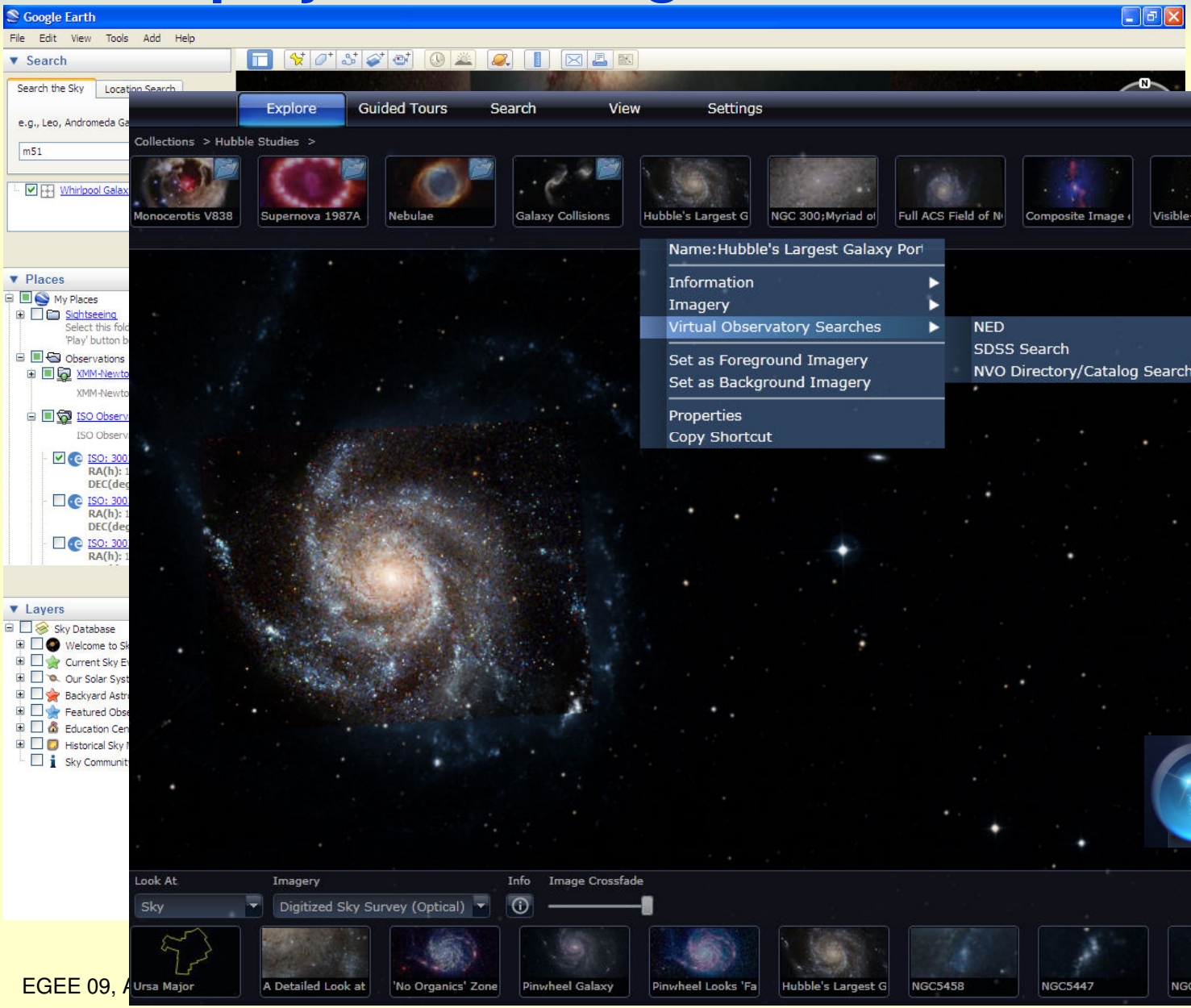


TOPCAT: tabular data plotting/manipulation



VOSpec: generation of SEDs

New “players” in the game ?



Conclusions

- VObs requires international standards for interoperability between astronomical resources
- Data Centres remain the key as they provide data, metadata and services
- VObs Science Gateways bring these transparently to the end users enabling new Science !

- Special thanks to VObs applications developers and scientists