The Virtual Observatory: concepts, facilities, challenges

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INAF-OATS and INAF-SI

Chair , International Virtual Observatory Alliance

Trieste, 18 February 2009

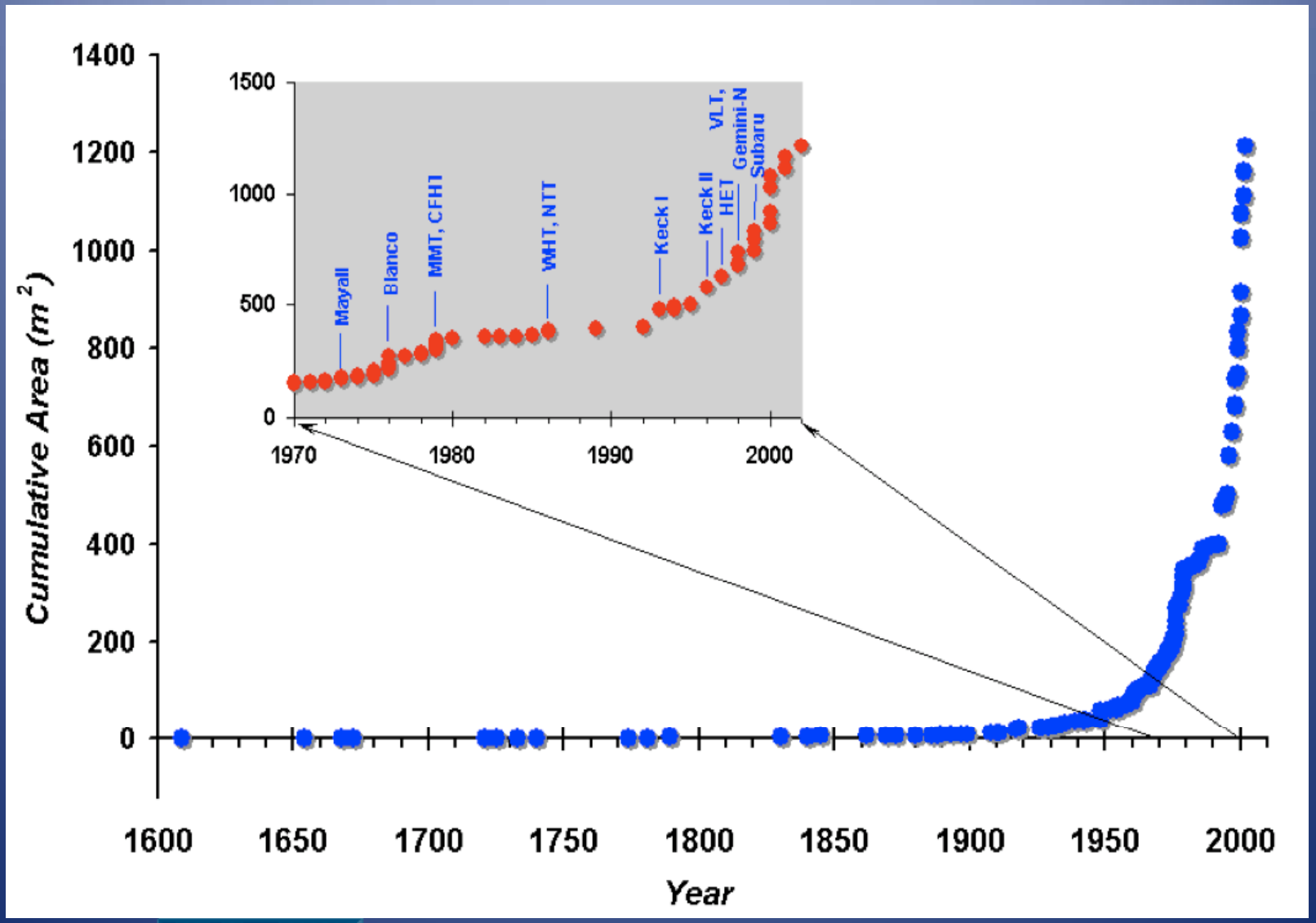
Outline

- Data Archives for Astronomy
- The Virtual Observatory (definitions)
- The International Virtual Observatory Alliance
- The VObs from a project's perspective: the EURO-VO experience
- VObs tools and services (examples)
- Data processing in the VObs
- VObs for science

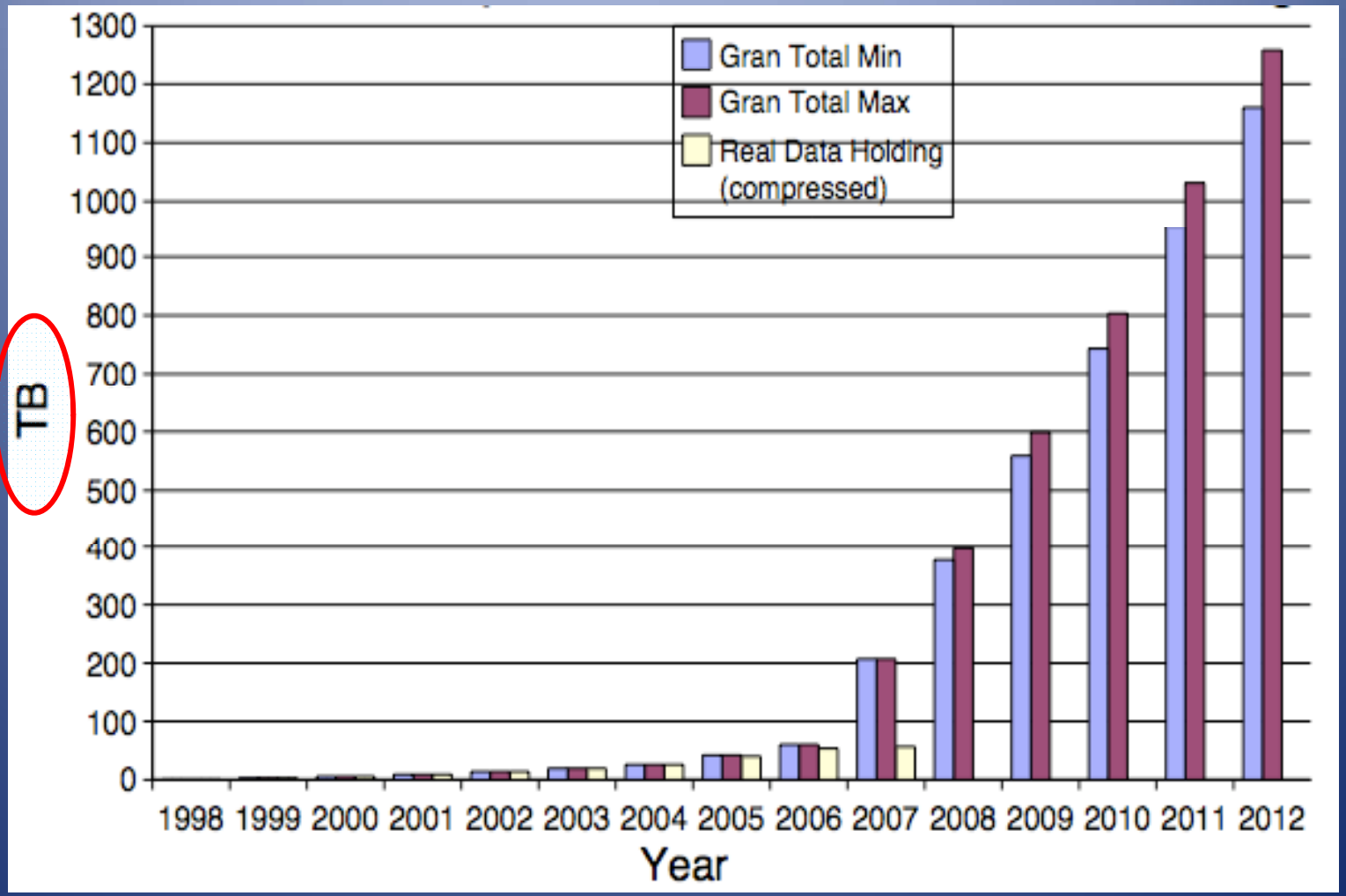
Need for Archives

- Monitor time variability of phenomena
- Need to reprocess raw data given better knowledge of instrumental effects
- Compare phenomena in different bands (multi-λ astronomy)
- Increase return for investment (data re-use, educational, outreach, ...)
- Statistical analysis / mining of large quantities of data
- Cope with data avalanche

Telescope Collecting Area Increase

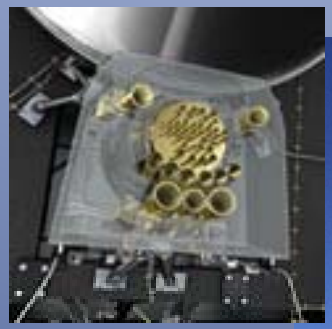
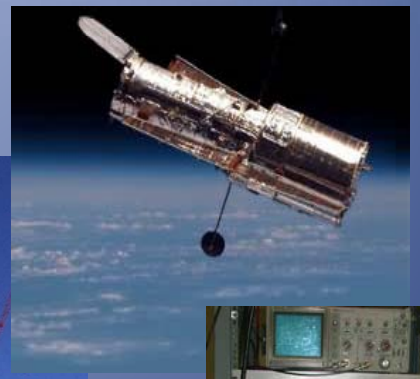
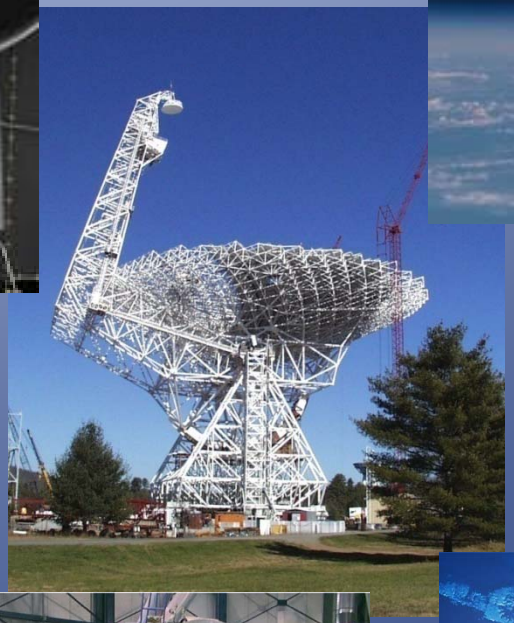


Archive Growth (e.g. ESO)



Multiple sources of Astro data

- Telescopes (ground- and space-based, covering the full electromagnetic spectrum)
- Instruments (telescope/band dependent)

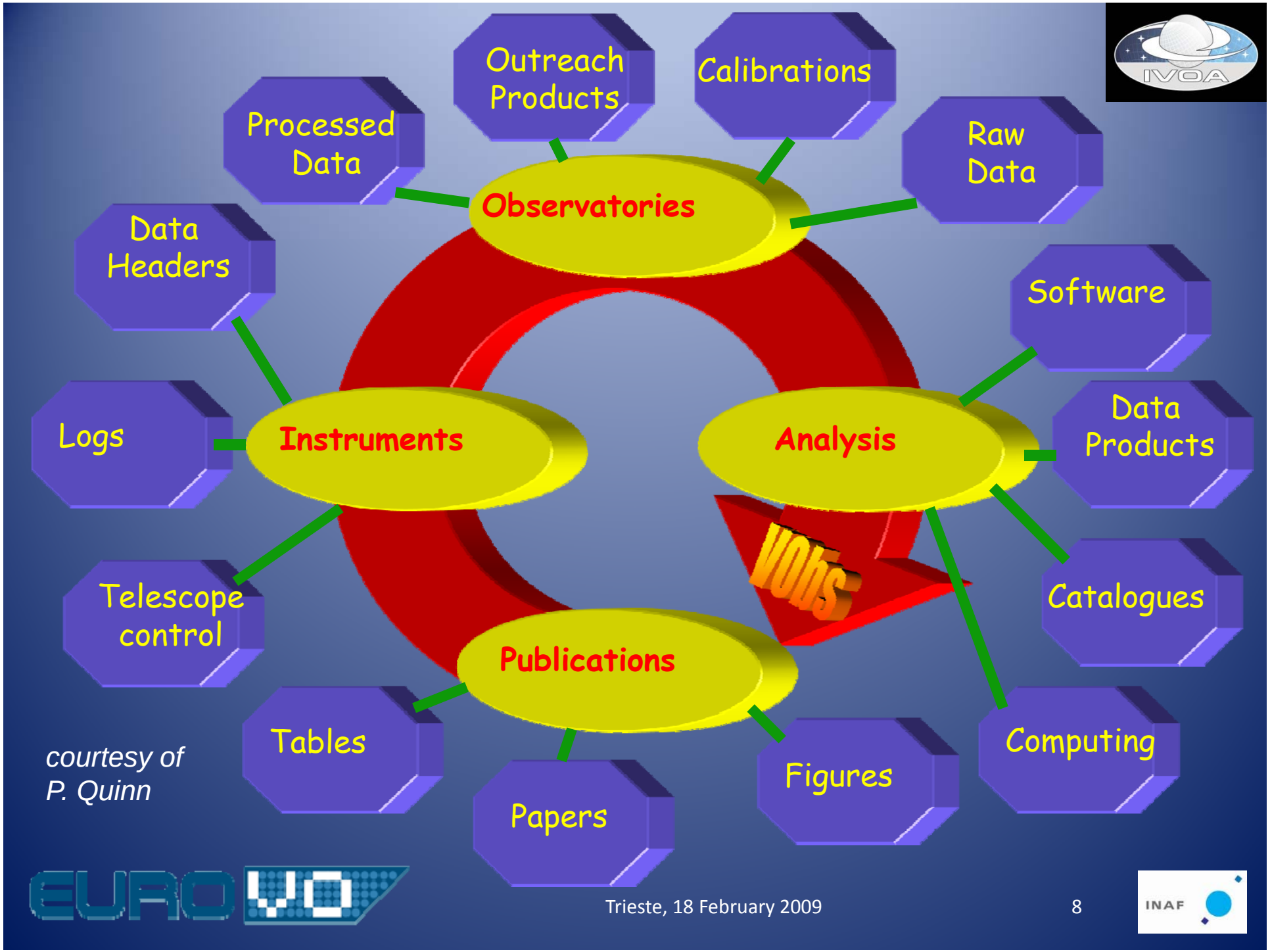









The way Astronomy works

- Telescopes (ground- and space-based, covering the full electromagnetic spectrum) ⇒ Observatories
- Instruments (telescope/band dependent) ⇒ Observatories/Consortia
- Data analysis software (instrument dependent) ⇒ Observatories/Consortia/Researchers
- Active Archives ⇒ Observatories/Agencies
- Publications ⇒ Journals
- Data curation (metadata + tables & catalogues) ⇒ Data curators
- … and Public Outreach ⇒ Observatories/Agencies


Outreach Products
Calibrations
Processed Data
Raw Data
Observatories
Data Headers
Software
Logs
Instruments
Analysis
Data Products
VObs
Telescope control
Catalogues
Publications
Tables
Computing
Papers
Figures
courtesy of P. Quinn

Good and Bad News

- Observational data and catalogues normally stored in *astronomical archives*, freely available *on-line* after ~ 1 year
- Results published in academic journals, all *available on-line* (one *single entry point for journals*: ADS) with *pointers* to data archives
- Analysis software *maintained* and made available *on-line* by Observatories/Archives
- Different astronomical archives have *widely different access/search interfaces and standards/conventions*; serving mainly raw data
- Widely specialized, *complex analysis software* for various sub-branches; *steep learning curve*, but multi-wavelength is now the norm to produce science
- Publication - Archive links often point to *raw, unprocessed data*
- Object *metadata not homogeneously defined*; links with archives and publications not complete

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A&A 424, 545–559 (2004)
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Astronomy & Astrophysics

Discovery of optically faint obscured quasars with Virtual Observatory tools

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Abstract. We use Virtual Observatory (VO) tools to identify optically faint, obscured (i.e., type 2) active galactic nuclei (AGN) in the two Great Observatories Origins Deep Survey (GOODS) fields. By employing publicly available X-ray and optical data and catalogues we discover 68 type 2 AGN candidates. The X-ray powers of these sources are estimated by using a previously known correlation between X-ray luminosity and X-ray-to-optical flux ratio. Thirty-one of our candidates have high estimated powers ($L_x > 10^{44}$ erg/s) and therefore qualify as optically obscured quasars, the so-called "QSO 2". Based on the derived X-ray powers, our candidates are likely to be at relatively high redshifts, $z \sim 3$, with the QSO 2 at $z \sim 4$. By going ~3 mag fainter than previously known type 2 AGN in the two GOODS fields we are sampling a region of redshift – power space which was previously unreachable with classical methods. Our method brings to 40 the number of QSO 2 in the GOODS fields, an improvement of a factor ~ 4 when compared to the only 9 such sources previously known. We derive a QSO 2 surface density down to 10^{-15} erg cm^{-2} s^{-1} in the 0.5–8 keV band of $\gtrsim$330 deg^{-2}, ~30% of which is made up of previously known sources. This is larger than current estimates and some predictions and suggests that the surface density of QSO 2 at faint flux limits has been underestimated. This work demonstrates that VO tools are mature enough to produce cutting-edge science results by exploiting astronomical data beyond "classical" identification limits ($R \lesssim 25$) with interoperable tools for statistical identification of sources using multiwavelength information.

Key words. astronomical data bases: miscellaneous – methods: statistical – galaxies: quasars: general – X-rays: galaxies

16 Member Organizations

The IVOA: http://ivoa.net

- **Mission:** *"To facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating virtual observatory"*
- Works by telecons, "TWiki" pages, and bi-annual meetings (after Trieste [May 2008], one in Baltimore [October 2008], next in Strasbourg [May 2009])
- **Needs:** standardization of data/metadata/sw, data interoperability methods, and list of available data and computing services (provided by projects)
- **Slow convergence on standards: personal / project competition**
- Structure:
  - ✓ IVOA Executive Board includes representatives from all VObs projects
  - ✓ Working and Interest Groups (400-500 individuals involved)

The IVOA: http://ivoa.net

- Organization: working groups to tackle various aspects
  - ✓ Applications (VObs software)
  - ✓ Data Access Layer (VObs standards for remote data access)
  - ✓ Data Modelling (data characterization)
  - ✓ Data Curation and Preservation (long-term preservation of data)
  - ✓ Grid and Web Services
  - ✓ Resource Registry (VObs resources: “yellow pages”)
  - ✓ Semantics (meaning/interpretation of words, sentences, etc. in astronomy)
  - ✓ VOEvent (definition of immediate event [e.g., GRB])
  - ✓ VObs Query Language (to be used by applications)
  - ✓ VOTable (XML format for VObs data exchange)
- plus Theory and Astronomical Grid (OGF) Interest Groups

ESFRI and ASTRONET statements

- ESFRI (multi-disciplinary)
  - focus on networking, capability & throughput computing, grid architectures, software, data management and curation
- ASTRONET (Astronomy & Astrophysics)
  - recognised as must-haves to tackle the challenges of the future (priority in assignment of resources):
    - computing (capacity AND capability)
    - theory & simulations
    - virtual observatory
    - laboratories

Organisation for Economic Co-operation and Development (OECD) comments on the VObs

- Findings
  - The Virtual Observatory concept is a bold community-led response to the challenges the astronomical community faces in data management and storage. Impressive progress has been made and the momentum of the International Virtual Observatory Alliance will ensure sustained progress, provided the agency level support and funding is available.
- Recommendations
  - New projects and facilities must take the data management, storage, maintenance, and dissemination into account at the earliest planning stages, consulting potential users in the process. Agencies should recognise that this is an important long term issue and should co-ordinate plans, provide adequate funding on a long-term basis, and support development and maintenance of the needed infrastructure. *Agencies should encourage the broadening of the existing VObs collaboration into a fully representative global activity*.

Data Centres in the VObs Era

- The VObs needs data ⇒ astronomical data centres lie at its foundation
- The VObs is more than a system: also a “frame of mind” ⇒ modern access to better data
- The VObs is “convenient” for data centres as well. Various reasons:
  1. old technology has hard time keeping up with current data volume and complexity
  2. broadens user base
  3. exposes highly processed data in a direct way through VObs protocols

What is a VObs-compliant archive?

The VObs cannot (and does not) dictate how to manage archives

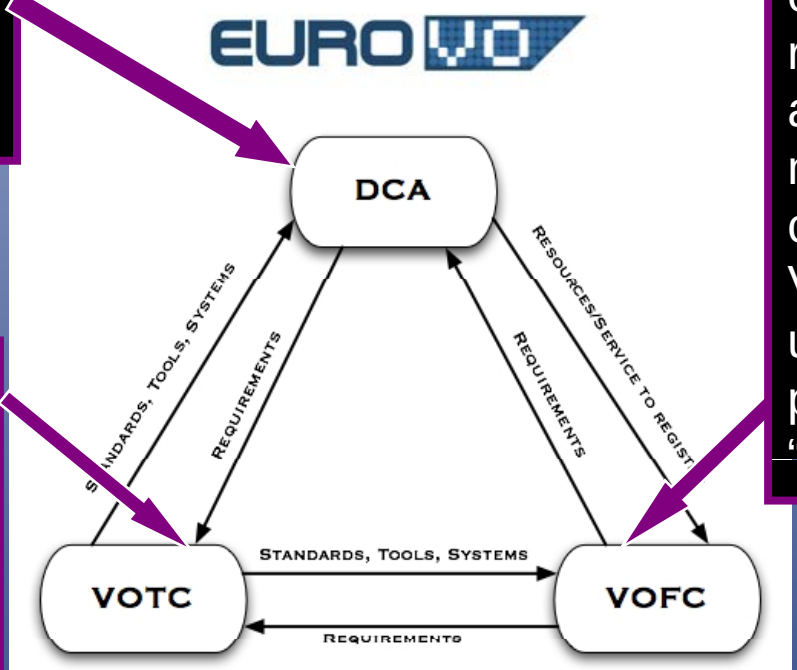
- The VObs requires data centres to have a "VObs layer" to:
  - ✓ "translate" any locally defined parameter to the standard (IVOA compliant) ones (e.g., RA can be called in many different ways)
  - ✓ hide any observatory/telescope/instrument specific detail and work in astronomical units: e.g., *wavelength range/band* (not grism or filter name), *spectral resolution, signal-to-noise ratio, field of view, limiting magnitude* ⇒ provide the correct meta-data (i.e. data about data, data description)
- The VObs will work at best with high level "science-ready" data ⇒ data centres should make an effort to provide such data

A project's perspective: the EURO-VO

http://www.euro-vo.org

- Successor to the Astrophysical Virtual Observatory (AVO), which was a 5 M€, Phase A study (2001 - 2004/5) on the scientific requirements and technology for building the VObs in Europe, *50%* funded by European Community (Fifth Framework Programme [FP5])
- Includes 8 partners: ESO, European Space Agency (ESA), plus six national nodes: INAF (Italy), INSU (France), INTA (Spain), NOVA (Netherlands), PPARC (UK), and MPG (Germany)
- Partly funded by the EC, but substantial (~ 50%) partner support
- Has three components: Data Centre Alliance, Technology Centre, Facility Centre

An alliance of European data centres who populate the EURO-VO with data, provide the physical storage and computational fabric and who publish data, metadata and services to the EURO-VO using VObs technologies



An operational organization, that provides the EURO-VO with a persistent, centralized registry for resources, standards and certification mechanisms as well as community support for VObs technology take-up and scientific programs. EURO-VO's "public face"

A distributed organization that coordinates a set of research and development projects on the advancement of VObs technology, systems and tools in response to scientific and community requirements

The EURO-VO Project (I)

- Data Centre Alliance co-funded by the EC (EuroVO-DCA) at 1.5 M€ level (FP6) for 2.5 yrs since Sept. 2006; *8.5 FTE/yr*. Lead by CDS, Strasbourg, France.
  - Workshops for astronomers and for developers ; coordination
- Technical Centre co-funded by the EC (VO-TECH) at the 3.3 M€ level (FP6) for 4.5 years since Jan. 2005; *21 FTE/yr*. Lead by AstroGrid, UK.
  - "Design Studies", meetings every 6 months
- Facility Centre (FC), located at ESO, co-managed by ESO & ESA; support at "best-effort" level [~ *2 FTE/yr*], until successful FP7 proposal (EuroVO-AIDA) was approved
  - Workshops, Web pages, Research Initiative
  - Selection of EURO-VO Science Advisory Committee

The EURO-VO Project (II)

- The EURO-VO proposal "Astronomical Infrastructure for Data Access (EuroVO-AIDA)" approved within the EC first Framework Programme 7 (FP7) Infrastructure call INFRA-2007-1.2.1 "Scientific Digital Repositories" funded with 2.7 M€; same partners as the EURO-VO. Started Feb 2008.
- Ensures continuation of European-wide VObs activities until 2010
- AIDA is a combination of DCA, TC, and FC activities
- AIDA aims at
  - unifying the digital data collection of European astronomy
  - integrating their access mechanisms with evolving e-technologies
  - enhancing the science extracted from these data-sets
  - provide outreach and educational support
- *VObs is moving worldwide from development to operations*


European Virtual Observatory - Windows Internet Explorer
http://www.euro-vo.org/
http://www.euro-vo.org
The Euro-VO projects:
VOTECH
EuroVO-DCA
EuroVO-AIDA
Software
Scientific Workflows
AIDA Research Initiative
Scientific Papers
Science Advisory Committee
Acknowledging
Helpdesk
Technical
Software
Registries
Tutorials
IVOA Standards
Data Centres
Overview
Partners
Work Packages
Tutorials
Operations
Facility Centre
Data Centre Alliance
Technology Centre
The European Virtual Observatory EURO-VO
The EURO-VO project aims at deploying an operational Virtual Observatory (VO) in Europe. Its objectives are technology take-up and VO compliant resource provision, building the technical infrastructure and to support its utilization by the scientific community.
News & Highlights
The Virtual Observatory and Distributed Computing @JENAM 2009:
Wednesday 22 April, 2009. The section will be dedicated to emerging Virtual Observatory systems (e.g. The EURO-VO), advanced data pipe-lining and management systems designed to support the scientific exploitation of new missions from ESA and ESO, use of distributed compute grids to support e.g. numerical simulations, and significant new astronomy applications for use on the 'desktop'. Further, the session will highlight how astronomers can access the widest range of data and applications through the VO, via a variety of robust tools, offering a range of features. Deadline for submission of abstracts: Monday 9th March 2009. For more details, click here.
Euro-VO AIDA School 2009:
March 30 - April 2, 2009. The Virtual Observatory (VO) is opening up new ways of exploiting the huge amount of data provided by the ever-growing number of ground-based and space facilities. The goals of the School, held at ESO, in Garching near Munich, are to expose European astronomers to the variety of VO tools and services available today so that they can use them efficiently for their own research.
To achieve these goals, VO experts will lecture and tutor the participants on the usage of such tools. Real life examples
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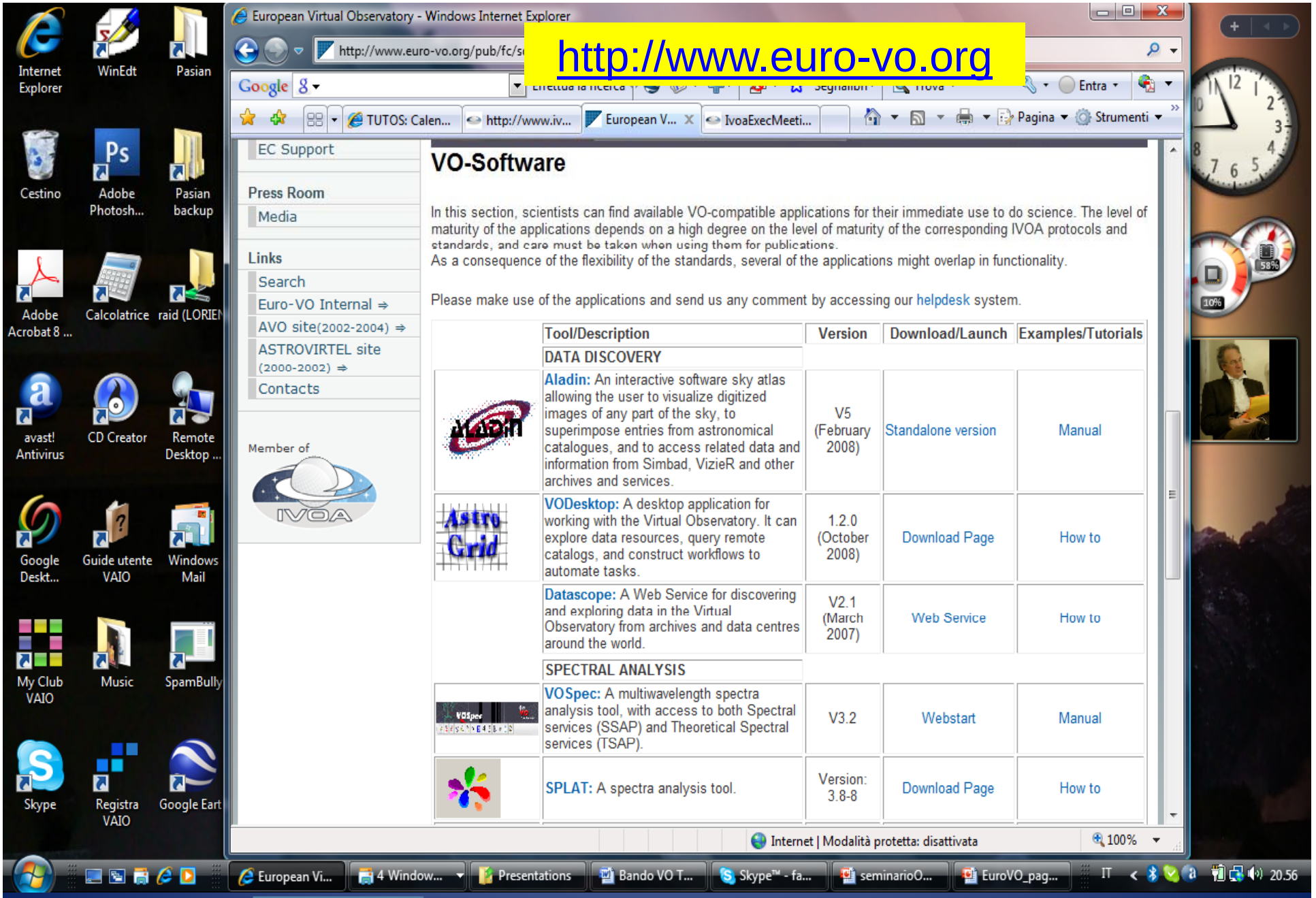
European Virtual Observatory - Windows Internet Explorer
http://www.euro-vo.org
http://www.euro-vo.org/pub/fc/s
TUTOS: Calen...
http://www.iv...
European V...
IvoaExecMeeti...
EC Support
Press Room
Media
Links
Search
Euro-VO Internal ⇒
AVO site(2002-2004) ⇒
ASTROVIRTEL site (2000-2002) ⇒
Contacts
Member of
IVOA
VO-Software
In this section, scientists can find available VO-compatible applications for their immediate use to do science. The level of maturity of the applications depends on a high degree on the level of maturity of the corresponding IVOA protocols and standards, and care must be taken when using them for publications.
As a consequence of the flexibility of the standards, several of the applications might overlap in functionality.
Please make use of the applications and send us any comment by accessing our helpdesk system.
Tool/Description
Version
Download/Launch
Examples/Tutorials
DATA DISCOVERY
Aladin: An interactive software sky atlas allowing the user to visualize digitized images of any part of the sky, to superimpose entries from astronomical catalogues, and to access related data and information from Simbad, VizieR and other archives and services.
V5 (February 2008)
Standalone version
Manual
VODesktop: A desktop application for working with the Virtual Observatory. It can explore data resources, query remote catalogs, and construct workflows to automate tasks.
1.2.0 (October 2008)
Download Page
How to
Datascope: A Web Service for discovering and exploring data in the Virtual Observatory from archives and data centres around the world.
V2.1 (March 2007)
Web Service
How to
SPECTRAL ANALYSIS
VOSpec: A multiwavelength spectra analysis tool, with access to both Spectral services (SSAP) and Theoretical Spectral services (TSAP).
V3.2
Webstart
Manual
SPLAT: A spectra analysis tool.
Version: 3.8-8
Download Page
How to
Internet | Modalità protetta: disattivata
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Presentations
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MySpace

PLASTIC

Helioscope

Topcat

EURO-3D

Astro Runtime

Web Service

VOSED

VOSpec

VOEventNet

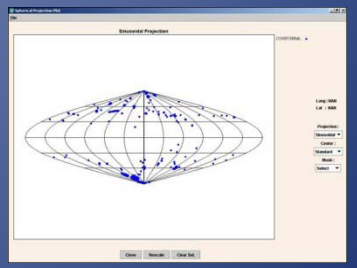
VObs Tools and Services

Specview

Datascope

SIA

VOPlot



Astrogrid Workbench

Workflow

VOTable

Registry

Open SkyQuery

ADS

SPLAT

STILTS

VO-Neural

Astroscope

Yafit

SSA

Dictionary

- Registry : the yellow pages of the VObs
- PLASTIC : PLatform for AStronomy Tool InterConnection
- Astro Runtime : Astrogrid Client Runtime (ACR), provides an interface to access functions from python
- MySpace : virtual space storage
- VOTable : data stored in XML format
- TAP : Table Access Protocol
- SIA : Simple Image Access (protocol)
- SSA : Simple Spectral Access (protocol)

Data Discovery	Spectral Analysis	Data visualisation and handling	SED building and fitting
Aladin	VOSpec	VOPlot	VOSED
Astroscope	SPLAT	Topcat	Yafit
VOExplorer	EURO-3D	VisIVO	easy-z
Datascope	Specview	STILTS	
			GOSSIP

Aladin	http://aladin.u-strasbg.fr/aladin.gml
ADS	http://adsabs.harvard.edu/abstract_service.html
Astrogrid Workbench	http://www2.astrogrid.org/desktop
Astroscope	
Datascope	http://heasarc.gsfc.nasa.gov/cgi-bin/vo/datascope/init.pl
EURO-3D	http://vo.obspm.fr/tools/Euro3D/
Helioscope	http://www2.astrogrid.org/software/astrogrid-component-descriptions/workbench/
Open SkyQuery	http://openskyquery.net/Sky/skysite/browse/Browse.aspx
Simbad	http://simbad.u-strasbg.fr/simbad/
Specview	http://www.stsci.edu/resources/software_hardware/specview/
SPLAT	http://star-www.dur.ac.uk/~pdraper/splat/splat-vo/
STILTS	http://www.star.bris.ac.uk/~mbt/stilts/
Topcat	http://www.star.bris.ac.uk/~mbt/topcat/
VisIVO	http://visivo.cineca.it/
VizieR	http://vizier.u-strasbg.fr/viz-bin/VizieR
VOEventNet	http://voeventnet.caltech.edu/
VOPlot	http://vo.iucaa.ernet.in/~voi/voplot.htm
VOSED	http://sdc.laeff.inta.es/vosed/jsp/form_search.jsp
VOSpec	http://esavo.esa.int/vospecapp
Yafit	http://www.star.bris.ac.uk/~mbt/yafit/

AstroGrid Workbench

http://www2.astrogrid.org/desktop

A desktop application for doing science in the Virtual Observatory.

With it, the user can discover and explore data resources, query remote catalogs, invoke remote processing tasks and construct workflows to automate tasks.

Workbench key features

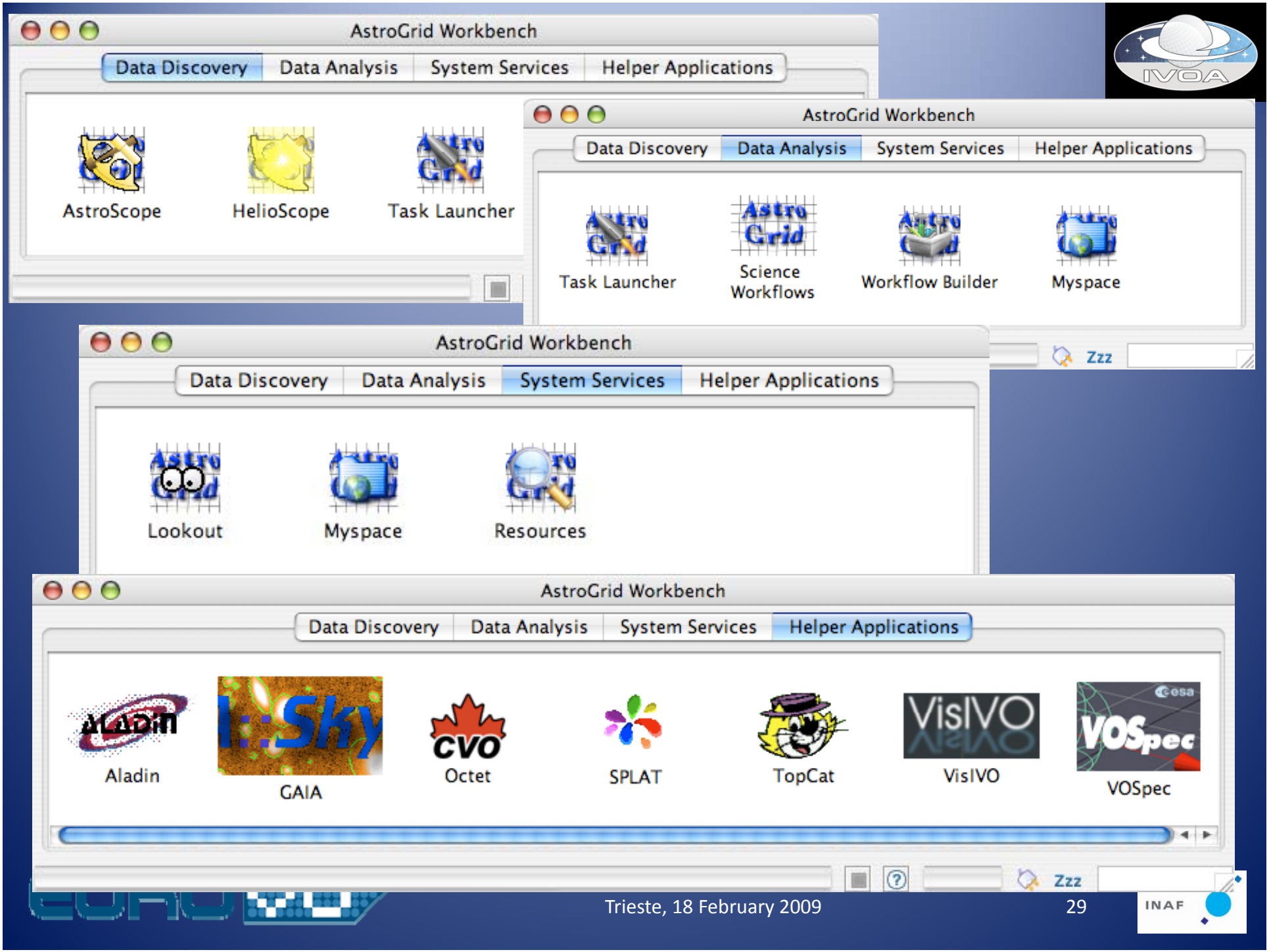
Astroscope answers the question - what data is there available for any patch on the night sky?

Helioscope answers the question - what Solar System data is available for a given time range?

Task Launcher provides an easy way to query a wide range of astrophysical databases. Thus one can retrieve all stars with a certain colour from the Sloan All Sky Survey, or Brown Dwarfs from the UKIDSS WFCAM infrared survey.

Task Launcher also enables a scientist to run a wide range of applications, such as Sextractor & Pegase, and return results in standard VObs formats (such as VOTable)

Results may be saved to the user's MySpace, or to their local disk. For seamless analysis of results, Workbench can pass data, via **PLASTIC** to viewers such as **TopCat**, **Aladin** & **VOSpec**

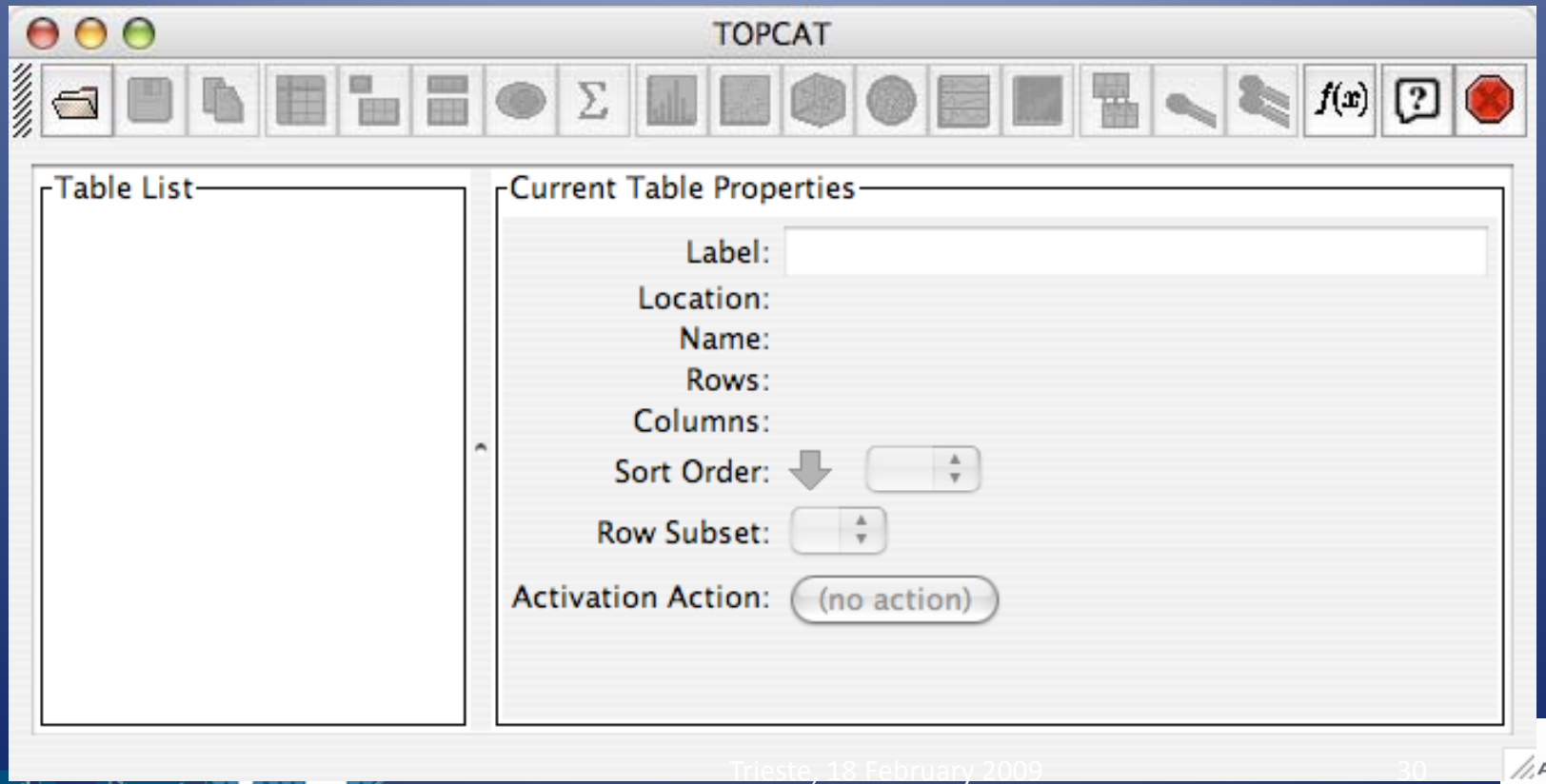

AstroGrid Workbench
Data Discovery
Data Analysis
System Services
Helper Applications
AstroScope
HelioScope
Task Launcher
AstroGrid Workbench
Data Discovery
Data Analysis
System Services
Helper Applications
Task Launcher
Science Workflows
Workflow Builder
Myspace
Zzz
AstroGrid Workbench
Data Discovery
Data Analysis
System Services
Helper Applications
Lookout
Myspace
Resources
AstroGrid Workbench
Data Discovery
Data Analysis
System Services
Helper Applications
Aladin
GAIA
Octet
SPLAT
TopCat
VisIVO
VOSpec
Zzz

Topcat

http://www.star.bris.ac.uk/~mbt/topcat/

TOPCAT: Tool for OPerations on Catalogues And Tables

TOPCAT is an interactive graphical viewer and editor for tabular data.



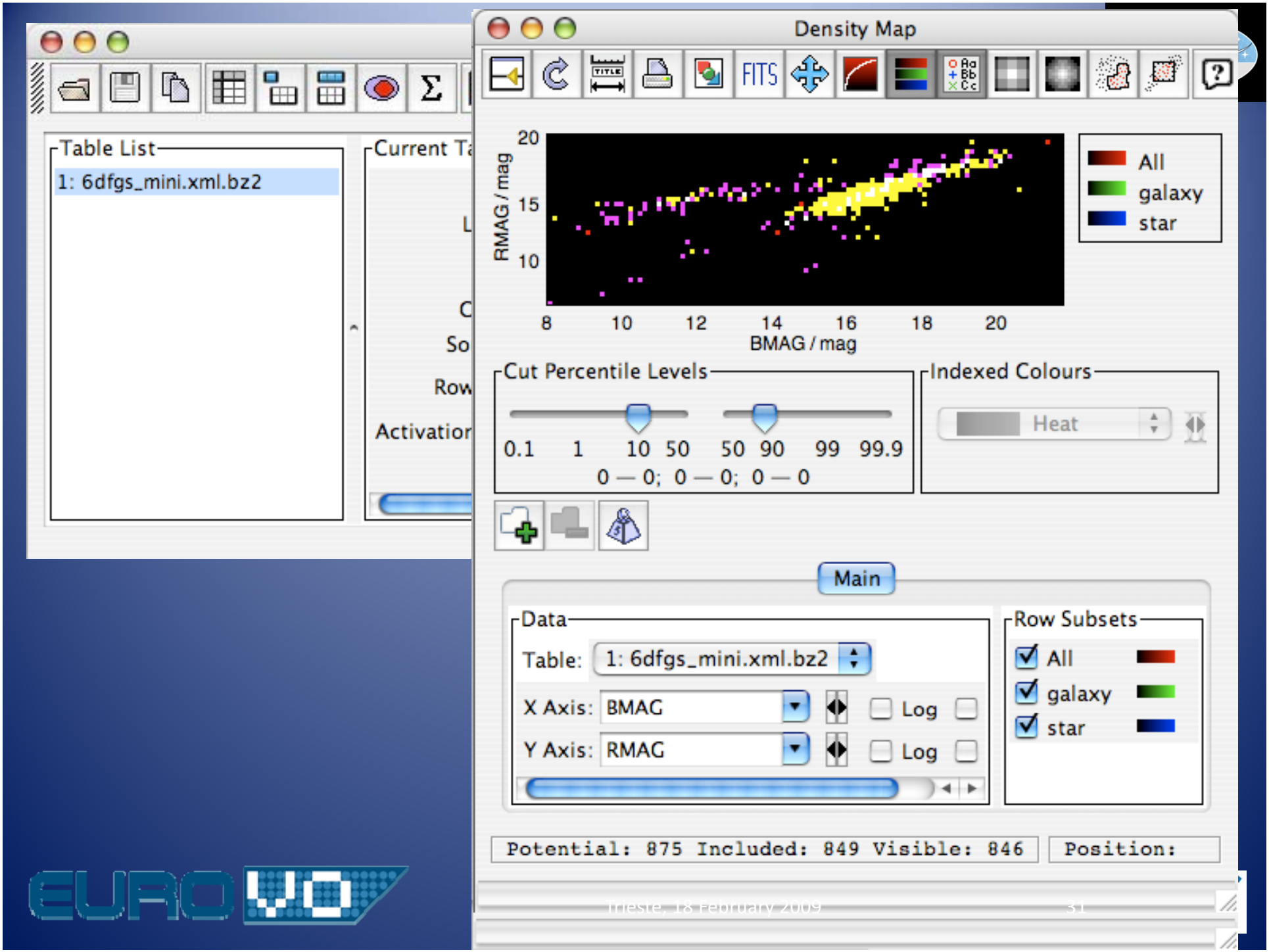


Table List
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RMAG / mag
BMAG / mag
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Data
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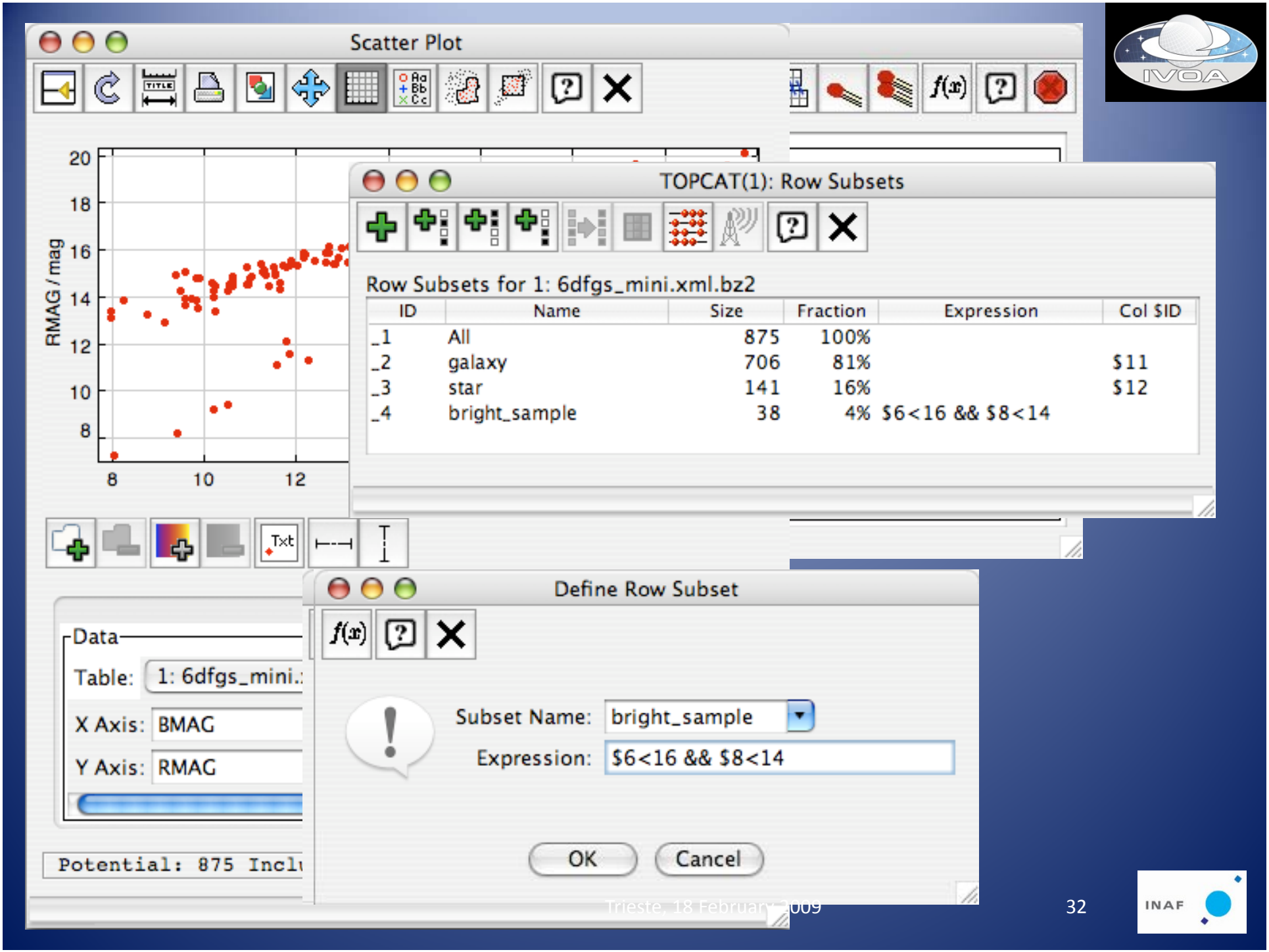
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12
TOPCAT(1): Row Subsets
Row Subsets for 1: 6dfgs_mini.xml.bz2
ID Name Size Fraction Expression Col $ID
_1 All 875 100%
_2 galaxy 706 81% $11
_3 star 141 16% $12
_4 bright_sample 38 4% $6<16 && $8<14
Txt
Define Row Subset
Data
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X Axis: BMAG
Y Axis: RMAG
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Subset Name: bright_sample
Expression: $6<16 && $8<14
OK
Cancel

h

Yaf

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Usage: fit [-help] [-del
           model=<model
           [modelfmt=ym
           obs=<obs-fil
           [smoother=sq
           [scale=true|
           [fitcalc=chi
           [gui=true|fa
           [summary=<ou
           [bestfits=<o
           [bestfitsfmt

Usage: plotmodel [-help
                 in=<mo
                 [ifmt=

Usage: plotobs [-help]
               in=<obs-
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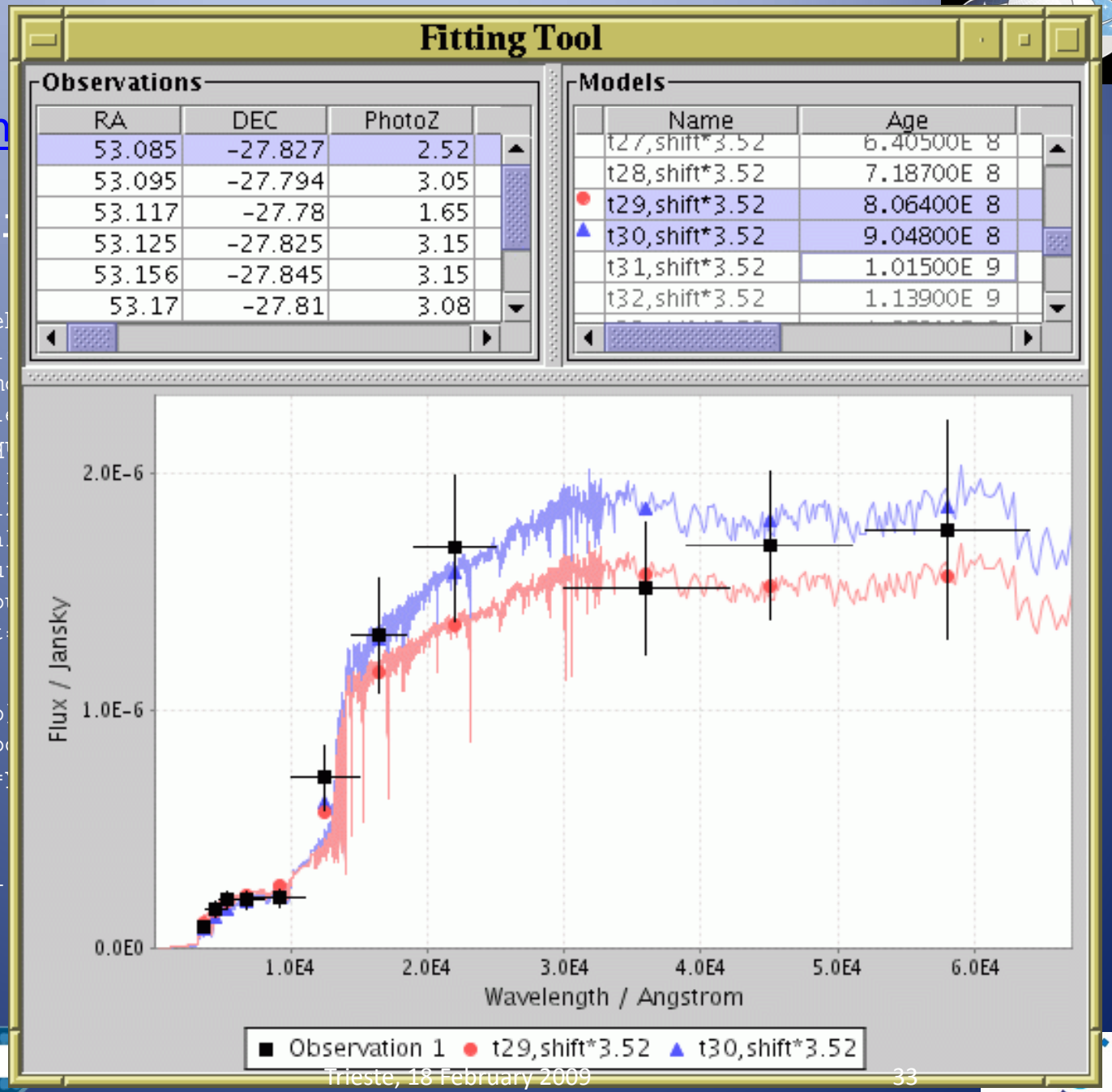
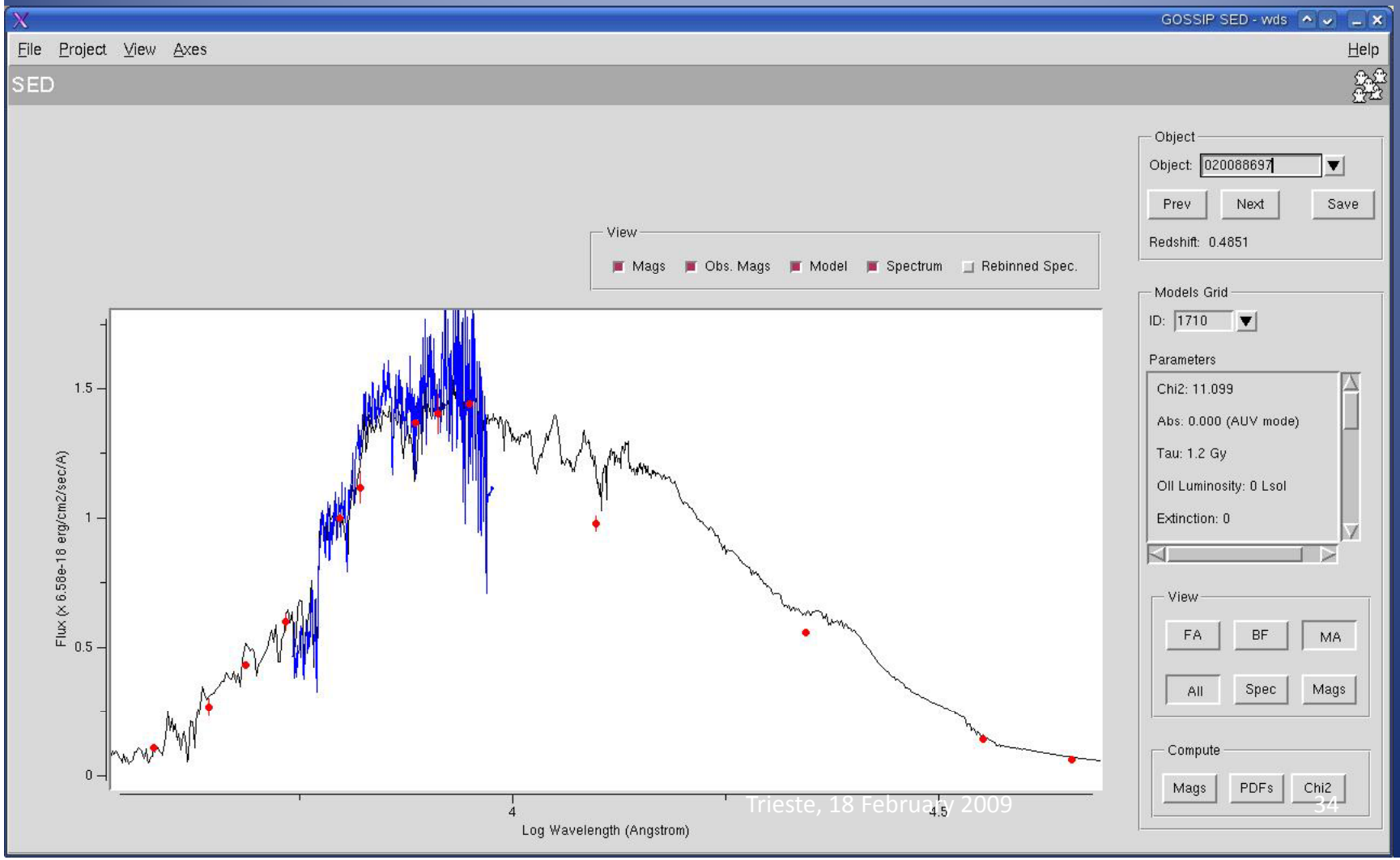


GOSSIP

GOSSIP: Galaxy Observed Simulated SED Interactive Program



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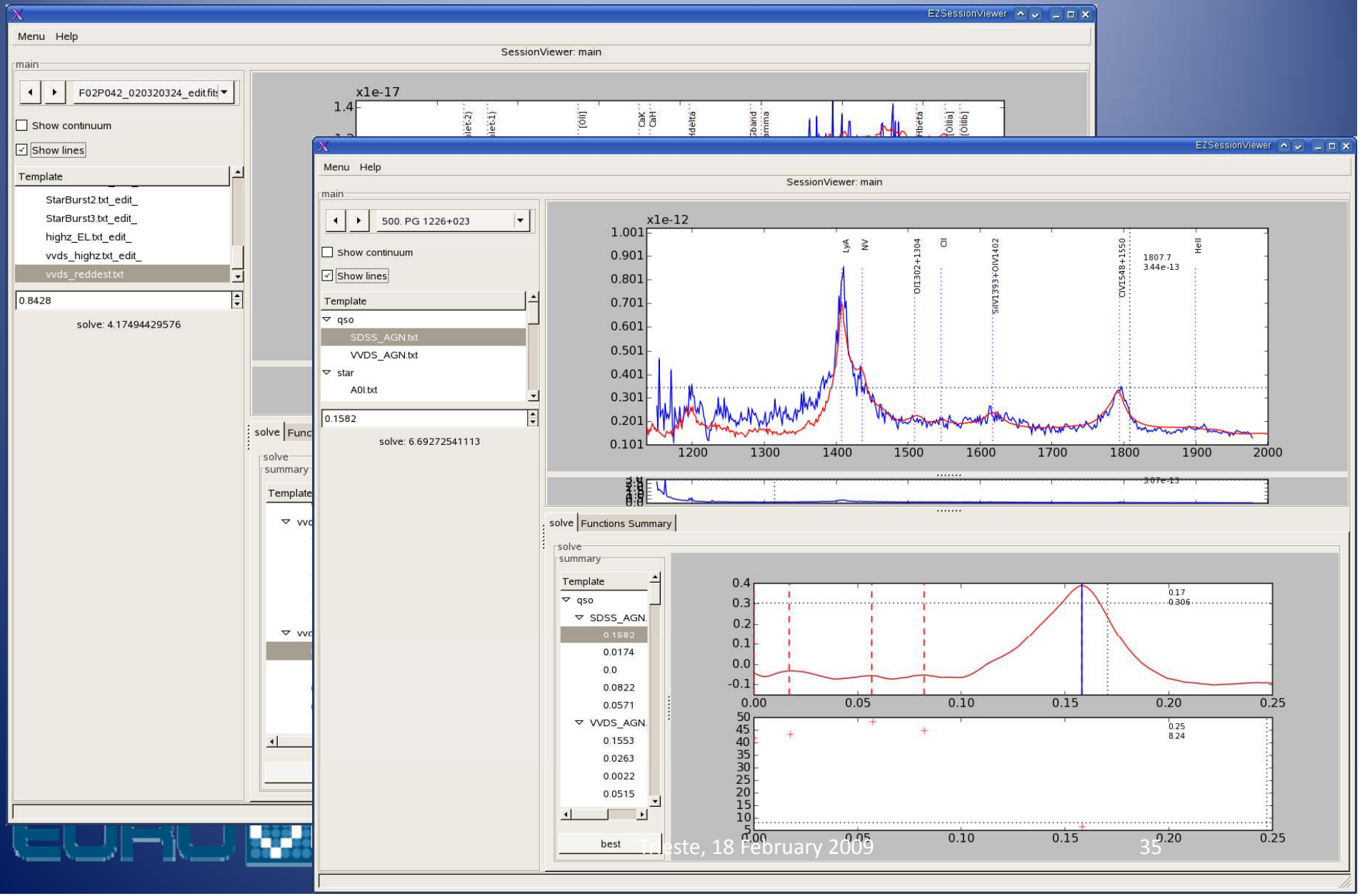
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Menu Help
SessionViewer: main
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Show continuum
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StarBurst3.txt_edit_
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EZSessionViewer
Menu Help
SessionViewer: main
main
500. PG 1226+023
Show continuum
Show lines
Template
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VVDS_AGN.txt
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x1e-12
LyA
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OI1302+1304
CII
SiIV1393+OIV1402
CIV1548+1550
1807.7
3.44e-13
HeII
solve
Functions Summary
solve
summary
Template
qso
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VVDS_AGN.
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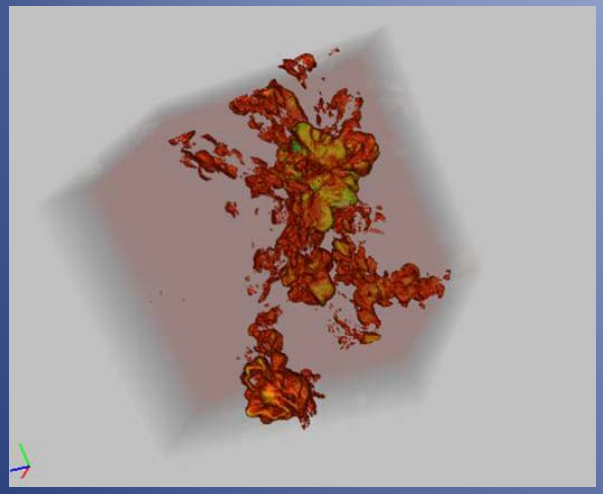
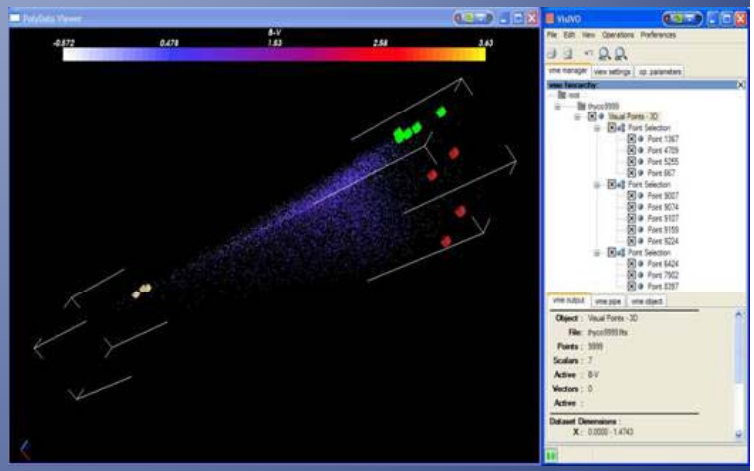
8.24

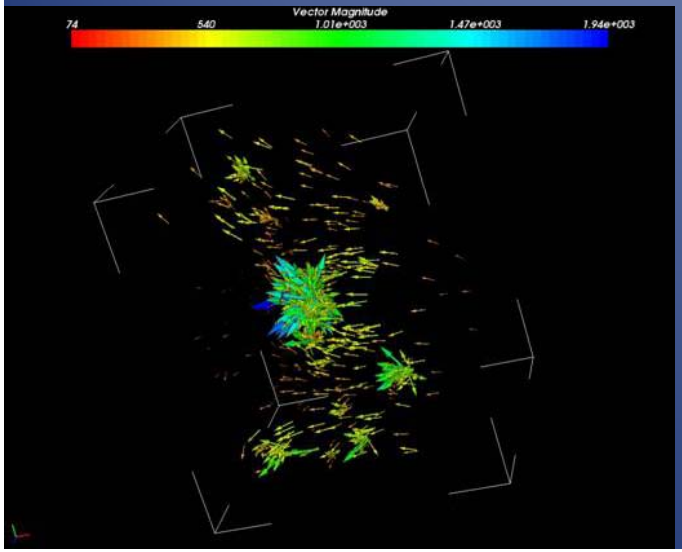
VisIVO

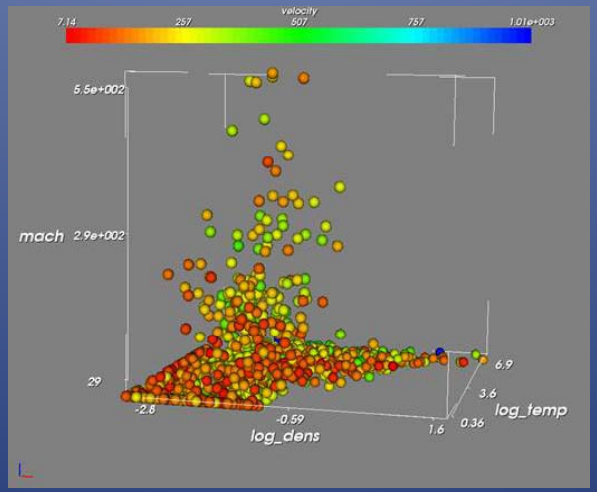
VisIVO : Visualisation Interface to the Virtual Observatory

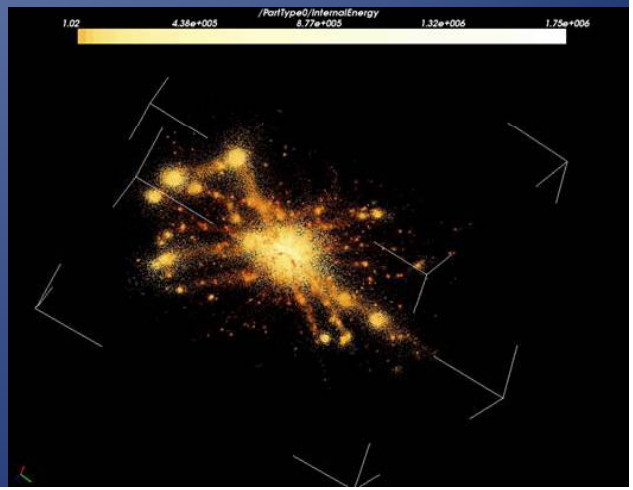


Different methods of data rendering (volume, points, isosurfaces, particles, vectors, markers, ...)





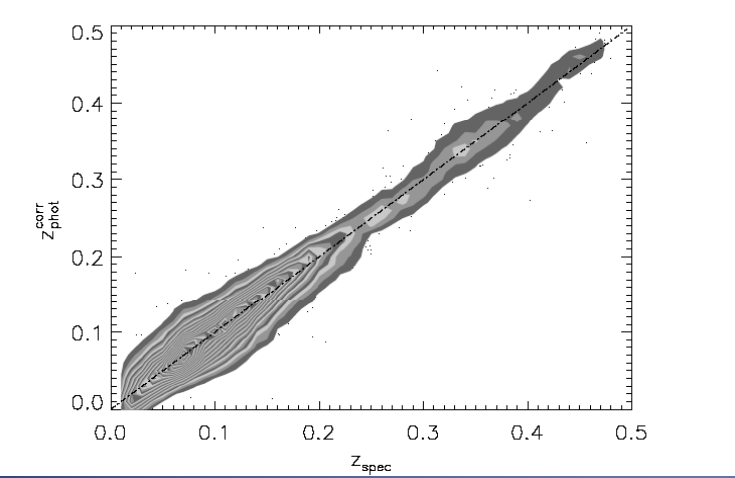




Data mining

VO-Neural / DAME

DAME – DAta Mining and Exploration
California Institute of Technology - Università degli Studi Federico II



Trend of spectroscopic versus photometric redshifts for the spectroscopic datasets in the Main Galaxy sample (i.e. all galaxies regardless they are LRG's or not). Due to the large number of points to be displayed we show them as isocontours.

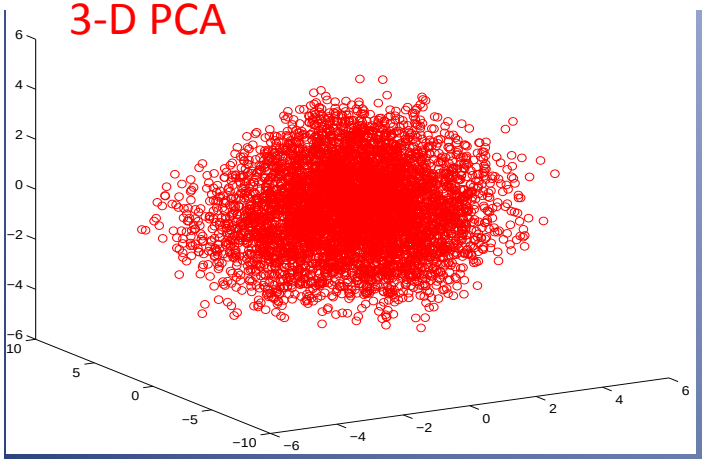
Evaluation of photometric redshifts using neural networks

Exploit the data wealth of the Sloane Digital Sky Survey to train a super-vised neural network to recognize photometric redshifts.

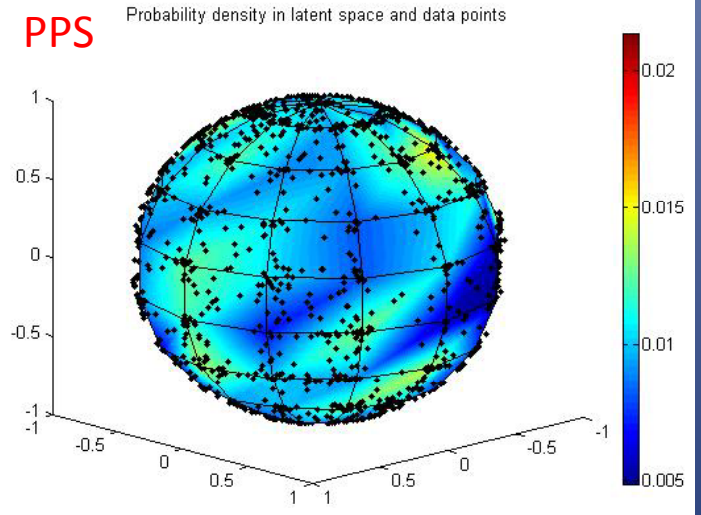
Given the size of the dataset (30 M galaxies) and the complexity of computations, the campus Grid developed at UniNA within the SCoPE project is used to perform the computations, triggered by the user through a GUI

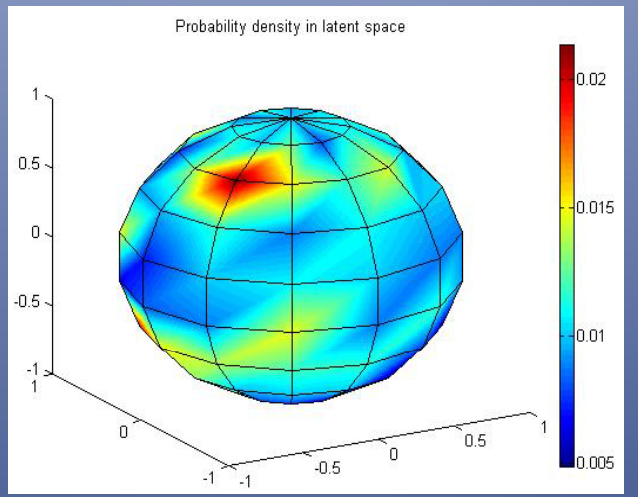
Looking for AGN candidates in SDSS+UKIDS

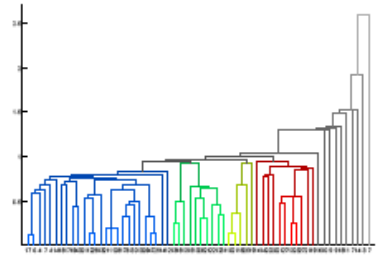
3-D PCA

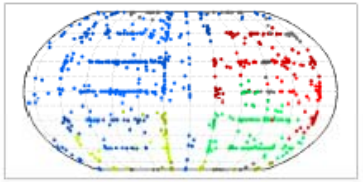


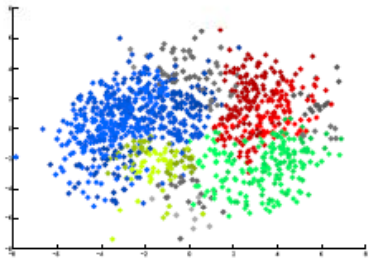
PPS









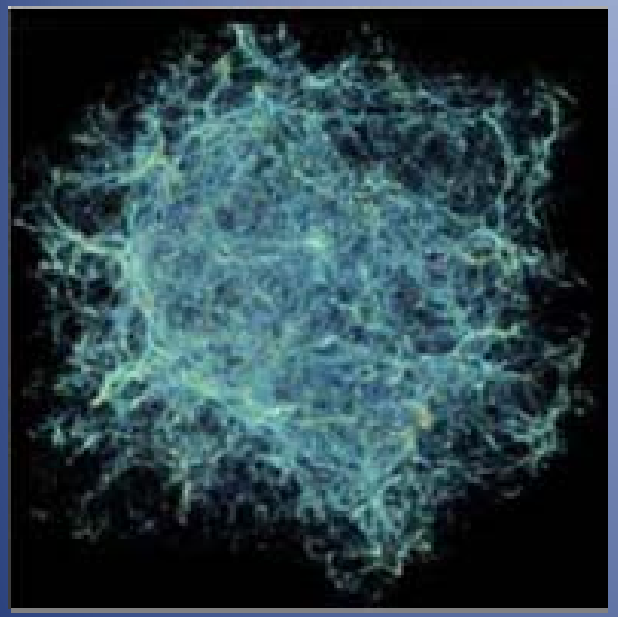


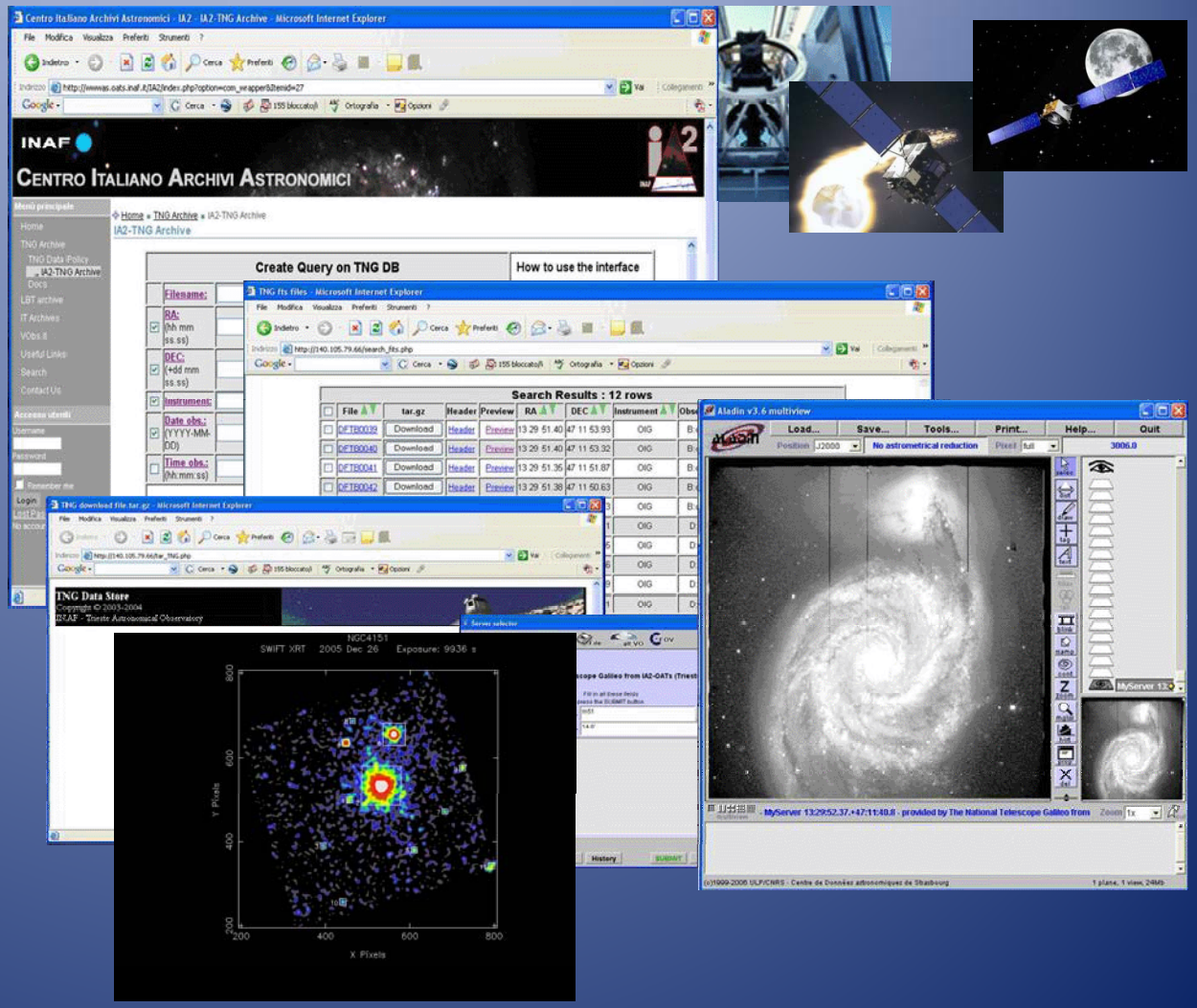
c)

Figure 9. NEC colored dendrogram.PPS 2-dimensional map and labeling.MDS 2-dimensional projection and labeling.

Trieste, 18 February 2009

Theory in the Virtual Observatory



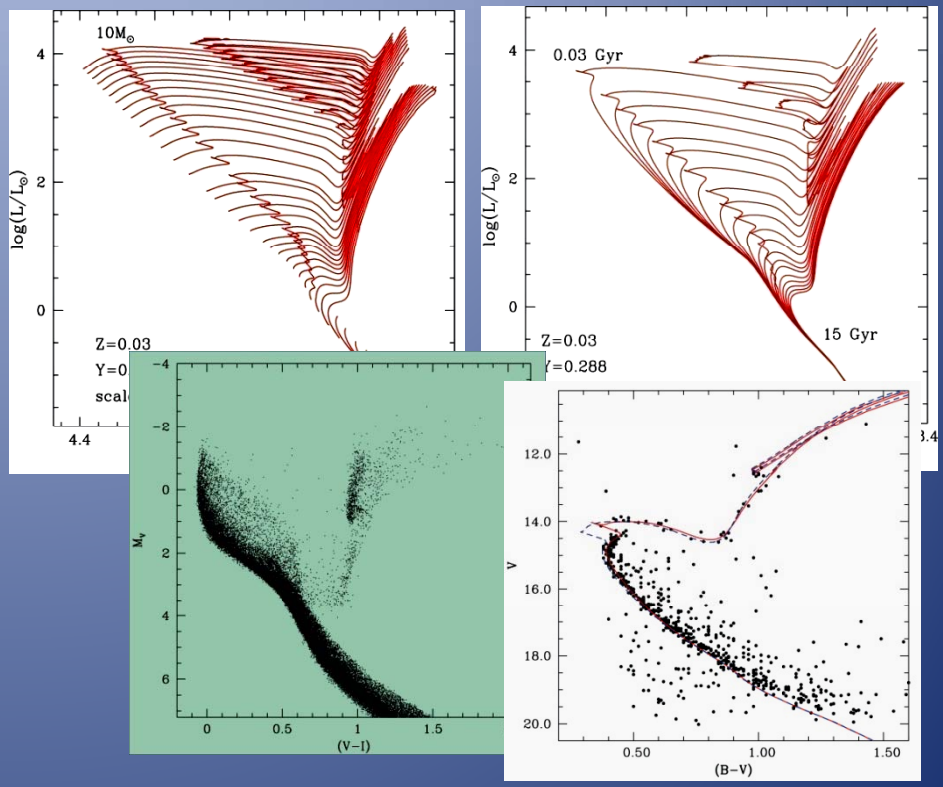


Comparing numerical simulations with observations from ground-based instruments or space-borne experiments

Models on demand (I)

BaSTI – VObs-compliant tool providing numerical models for evolutionary tracks, isochrones, luminosity functions, synthetic color-magnitude diagrams, tables with relevant data.

BaSTI is also a database/ centre, which provides numerical models on request to astro users. Model production can be computationally heavy.

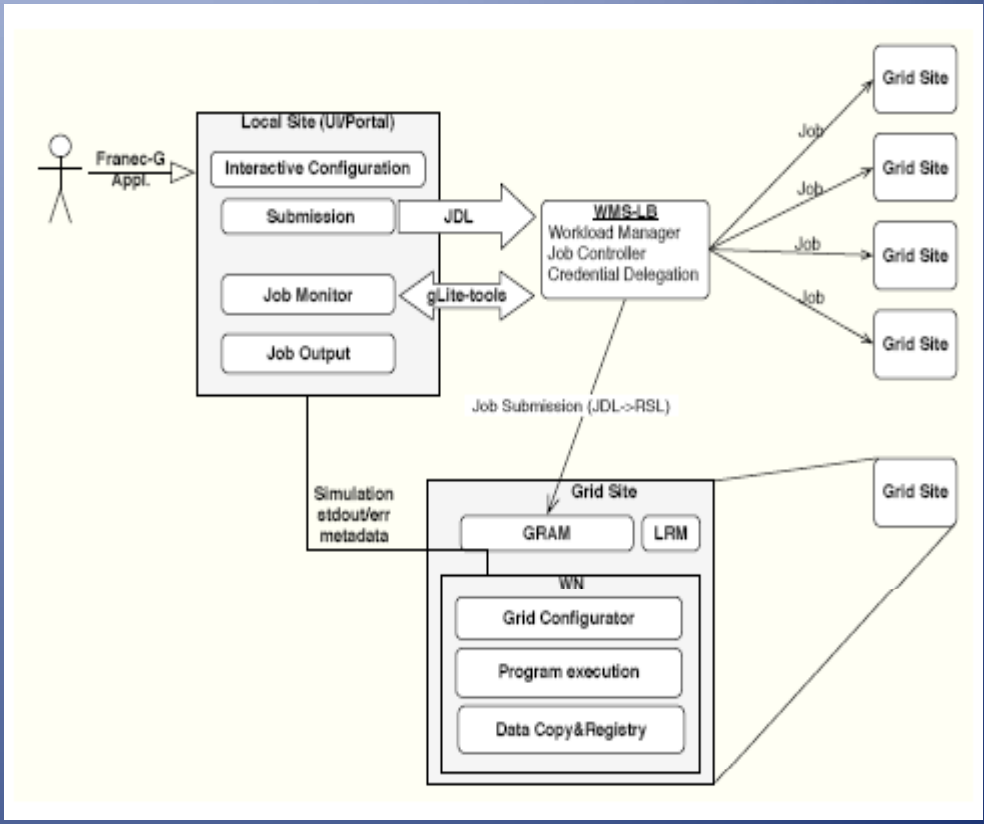


The Virtual Observatory meets the EGEE Grid

Models on demand (II)

FRANEC extensively used for computing models of Stars for a wide range of mass and chemical composition, and in all their evolutionary stages.

The user can decide the physical parameters to use (e.g. the equation of state of the star, the opacity, the metallicity, etc.) and select one or more stellar masses to simulate.



The application (FRANEC-G) is designed to hide the complexity of the GRID job submission procedure.

VObs-Grid Integration

implementation on top of

VObs

- Single-sign-on
- VOSpace
- Workflows
- Information System (Registries)

⇒

Grids

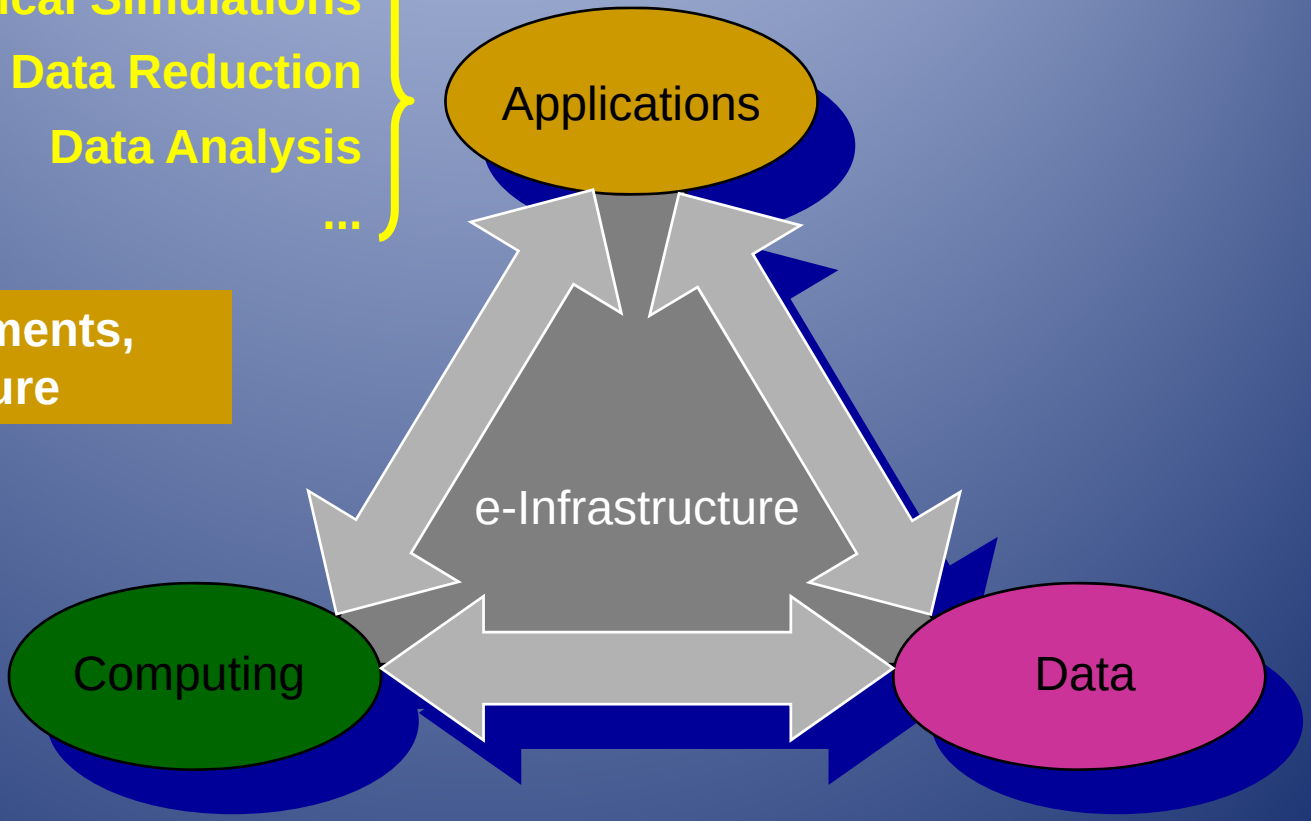
- Authentication & Authorization
- Data Management
- Job Management
- Information system

... plus development of a “native” way of accessing databases from the Grid through a Query Element (similar in structure to the CE).

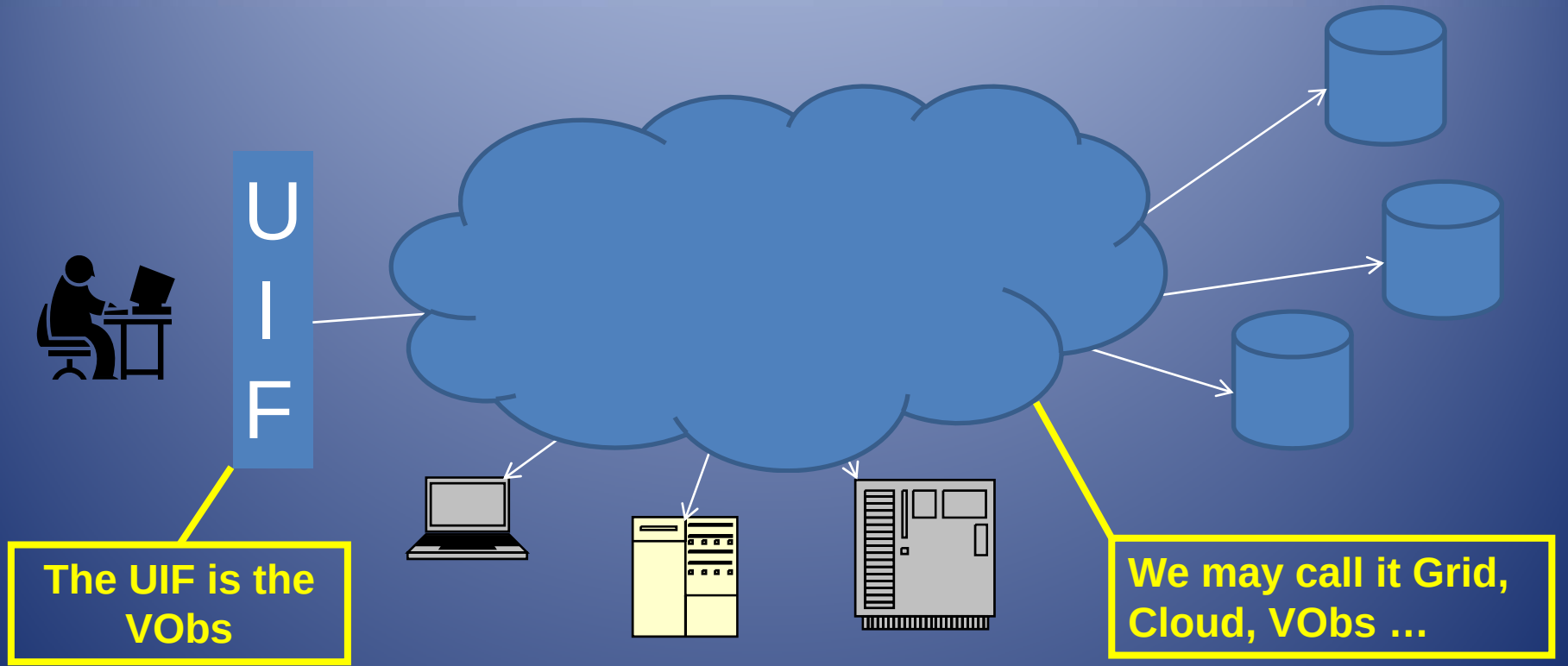
e-Infrastructure: conceptual schema

Theory
Numerical Simulations
Data Reduction
Data Analysis
...

different requirements, same infrastructure



User's viewpoint

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EURO VO
FACILITY CENTRE
The Euro-VO projects: VOTECH EuroVO-DCA EuroVO-AIDA
Science
Recipes User Manual
AIDA Research Initiative
Scientific Papers
Science Advisory Committee
Acknowledging
Helpdesk
Technical
Software
Registries
Tutorials
IVOA Standards
Data Centres
Overview
Partners
Work Packages
Tutorials
Operations
Guidelines for Scientists
Here astronomers can find answers to some of the most common "how to" questions they might have on finding data in a VO context.
Finding data for a given source
This thread illustrates how to answer a typical VO question: what sort of data do exist for an astronomical sources? And how do I find them and access them? We use Aladin to answer this question and accomplish this task with just a few mouse clicks.
Finding images for a given source
This thread illustrates how to answer a typical VO question: do images in a given wavelength range exist for an astronomical source? If so, how do I find them and display them?? We use Aladin to answer this question and accomplish this task with just a few mouse clicks.
How to generate the Spectra Energy Distribution of a source in an image
This thread illustrates how to answer a typical VO question: do spectra in a given wavelength range exist for source in my field-of-view? Can I seamlessly build their Spectral Energy Distribution? The interoperability between Aladin (catalogue browsing, image visualization) and VOSpec (Spectral Energy Distribution visualization and analysis) allows you to answer these questions and accomplish these tasks with just a few mouse clicks.
How to generate and analyze Spectral Energy Distributions
This recipe shows how to generate and display a Spectral Energy Distribution with VOSpec, combining spectra from various observatories in different energy bands, as well as user-produced spectra uploaded from the local disk. It also
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Presentations
Bando VO T TD....
Skype™ - fabio....
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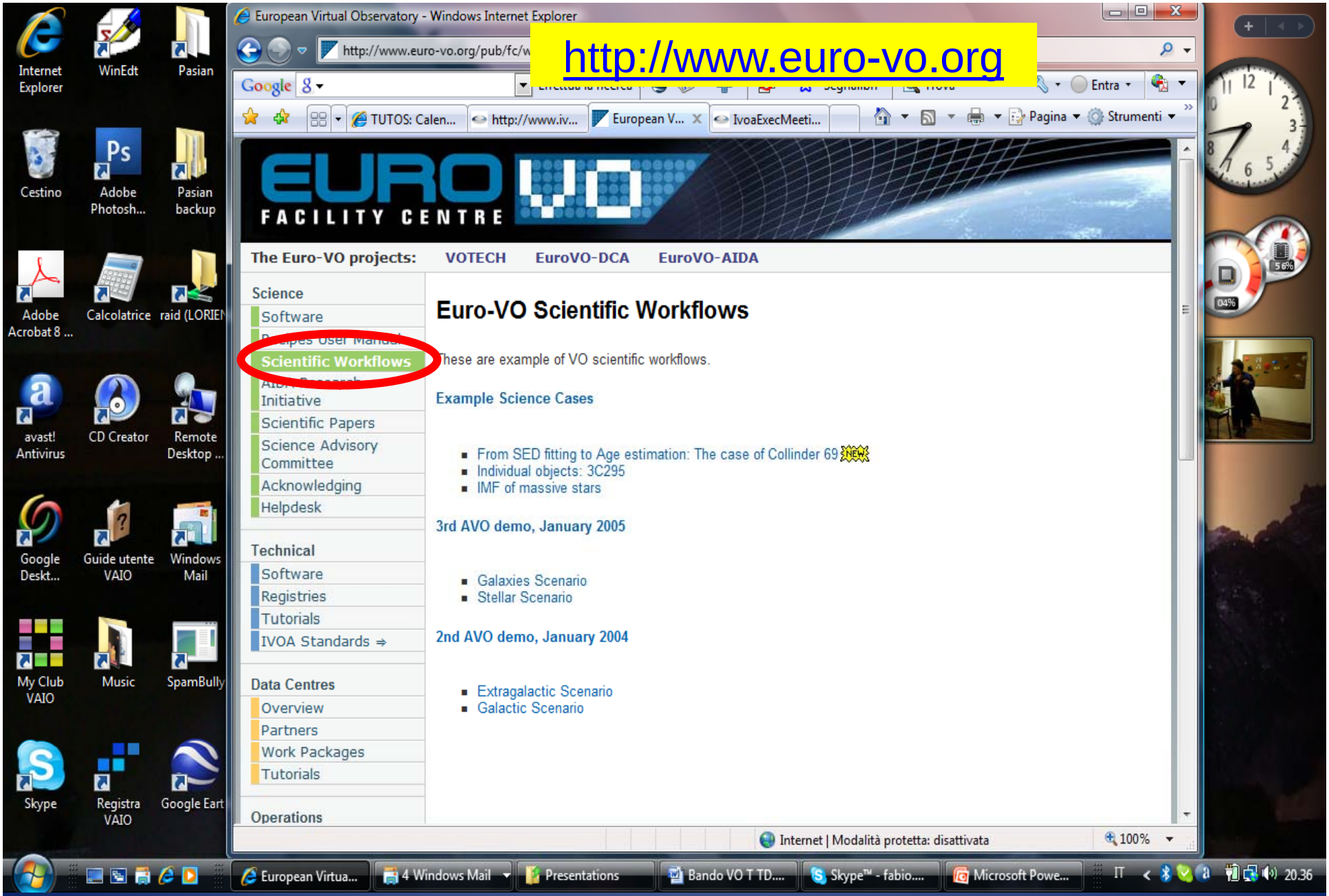
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Science
Software
Scientific Workflows
Initiative
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Science Advisory Committee
Acknowledging
Helpdesk
Technical
Software
Registries
Tutorials
IVOA Standards
Data Centres
Overview
Partners
Work Packages
Tutorials
Operations
Euro-VO Scientific Workflows
These are example of VO scientific workflows.
Example Science Cases
From SED fitting to Age estimation: The case of Collinder 69 NEW
Individual objects: 3C295
IMF of massive stars
3rd AVO demo, January 2005
Galaxies Scenario
Stellar Scenario
2nd AVO demo, January 2004
Extragalactic Scenario
Galactic Scenario

http://www.euro-vo.org

European Virtual Observatory - Windows Internet Explorer

EURO VO FACILITY CENTRE

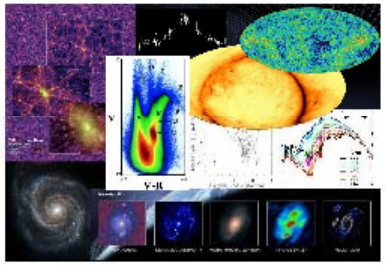
The Euro-VO projects: VOTECH EuroVO-DCA EuroVO-AIDA

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

Technical
- Software
- Registries
- Tutorials
- IVOA Standards ⇒

Data Centres
- Overview
- Partners
- Work Packages
- Tutorials

Operations



First EuroVO-AIDA Research Initiative

This call is now closed

16 April 2008

Application Deadline: 15 June 2008

CALL FOR PROPOSALS

Within the framework of AIDA (Astronomical Infrastructure for Data Access), the European Virtual Observatory (EURO-VO) project is seeking proposals from teams carrying out archival astronomical research or projects that could benefit from the Virtual Observatory concept. The Virtual Observatory tools and applications allow seamless access to most of the world's large data archives such as ESO, ESA or HST. They also allow users to access a huge variety of reduced multiwavelength data and catalogues and to perform high-level analysis of images, spectra and large tabular datasets. Successful applicants will receive support from EURO-VO astronomers in using the VO facilities and software to complete their projects. No direct funding is awarded in this programme, but support for travel to VO centres may be available if justified by the project.

VObs Research Initiatives

- Call for Proposals issued Feb. 2007 by EURO-VO project, through the ESO/ESA managed Facility Centre
- Aimed to support astronomical projects driven by the VObs concept and making use of VObs tools and applications
- Nine proposals received, three selected by EURO-VO Science Advisory Committee (with EURO-VO technical input):
  1. *Dust Evolution as a tracer of Environmental Changes* (Sauvage et al.)
  2. *Quantifying visible and hidden star-formation in galaxies* (Franzetti et al.)
  3. *Triggered massive star formation in the Galaxy* (Deharveng et al.)
- Selected teams received scientific support and technical contact points to complete their projects
- Similar initiative carried out by NVO (USA)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Operations
VO-enabled Scientific Papers
Scientific publications mainly enabled by VO tools or about VO tools and methods.
Refereed publications
The TVO Archive for Cosmological Simulations: Web Services and Architecture
Costa A. et al., 2008, PASP, 120, 933
Gonzalez-Solares E. et al., 2008, MNRAS, 388, 89
Young stars and brown dwarfs surrounding Alnilam (eps Ori) and Mintaka (del Ori)
Caballero J.A. & Solano E., 2008, A&A, 485, 931
SDSSJ124155.33+114003.7 -- a Missing Link Between Compact Elliptical and Ultracompact Dwarf Galaxies
Chilingarian I.V. & Mamon G.A., 2008, MNRAS, 385, 83
Invisible sunspots and rate of solar magnetic flux emergence
Dalla S., Fletcher L., Walton, N. A., 2008, A&A, 479, L1
Stars and brown dwarfs in the σ Orionis cluster: the Mayrit catalogue
Caballero J.A., 2008, A&A, 478, 667
Fossil Groups in the Sloan Digital Sky Survey
Santos W.A., Mendes de Oliveira C., Sodre L. Jr, 2007, AJ, 134, 1551


The TVO Archive for Cosmological Simulations: Web Services and Architecture - Windows Internet Explorer
http://esoads.eso.org/abs/2008PASP..120..933C
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Title: The TVO Archive for Cosmological Simulations: Web Services and Architecture
Authors: Costa, A.; Manzato, P.; Becciani, U.; Comparato, M.; Costa, V.; Gasparo, F.; Gheller, C.; Grillo, A.; Molinaro, M.; Pasian, F.; Taffoni, G.
Affiliation: AA(INAF-Osservatorio Astrofisico di Catania, Italy; alessandro.costa@oact.inaf.it) AB(INAF-SI / Osservatorio Astronomico di Trieste, Italy; manzato@oats.inaf.it), AC(INAF-Osservatorio Astrofisico di Catania, Italy), AD(INAF-Osservatorio Astrofisico di Catania, Italy), AE(INAF-Osservatorio Astrofisico di Catania, Italy), AF(INAF-SI / Osservatorio Astronomico di Trieste, Italy), AG(CINECA-Casalecchio di Reno, Italy), AH(INAF-Osservatorio Astrofisico di Catania, Italy;), AI(INAF-SI / Osservatorio Astronomico di Trieste, Italy), AJ(INAF-SI / Osservatorio Astronomico di Trieste, Italy), AK(INAF-SI / Osservatorio Astronomico di Trieste, Italy)
Publication: The Publications of the Astronomical Society of the Pacific, Volume 120, Issue 870, pp. 933-944. (PASP Homepage)
Publication Date: 08/2008
Origin: UCP
PASP Keywords: Data Analysis and Techniques
Abstract Copyright: (c) 2008: The Astronomical Society of the Pacific. All rights reserved. Printed in U.S.A.
DOI: 10.1086/591285
Bibliographic Code: 2008PASP..120..933C
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A selection of VO-based astronomical papers

- List of VO-based papers at http://www.euro-vo.org/pub/fc/papers.html
- Papers which make “heavy” use of VObs tools and services
- Lower limit to papers which are VObs-related
- Selected (almost randomly) *recent* results to show diversity of problems which can be tackled with VObs tools:
  1. *Using VO tools to investigate distant radio starburst hosting obscured AGN in the HDF(N) region,* Richards et al., A&A, 2007, 472, 805
  2. *Albus 1: a very bright White Dwarf candidate*, Caballero & Solano, ApJ, 665, L151 (2007)
  3. *Flare productivity of newly-emerged paired and isolated solar active regions,* Dalla, Fletcher, & Walton, A&A, 468, 1103 (2007)
  4. *Radio-loud Narrow-Line Type 1 Quasars,* Komossa et al., AJ, 132, 531 (2006)
  5. *Luminous AGB stars in nearby galaxies. A study using VO tools,* Tsalmantza et al., A&A, 447, 89 (2006)

Summary

- Astronomy has changed and grown considerably
  ⇒ archives needed
- Some work is required to integrate and make the various data archives interoperable ⇒ the Virtual Observatory
- Goal: all astronomical databases “one click away”
  ⇒ democratization of Astronomy!
- To make sense, the Virtual Observatory needs to be an international effort, which requires involvement at the *project* but also at the *data centre* level
- The Virtual Observatory concept can be re-used in different domains
- The final goal is **Science**

The path forward

- Converge within IVOA on the interoperability standards still missing and issue (FAST !)
- Provide stable and sustainable operations
- Pervasively disseminate information within the community
- Provide support to science users

Thanks to:

- P.Padovani, E.Hatziminaoglou (ESO), C.Arviset (ESAC), F.Genova (CDS), G.Rixon (AstroGrid) ⇒ Euro-VO
- C.Loomis (CERN), M.Mazzucato (INFN), R.Barbera (Univ. Catania) ⇒ EGEE
- R.Smareglia, P.Manzato, M.Molinaro, C.Knapic, M.Ramella, G.Iafrate, C.Vuerli, M.Sponza, G.Taffoni, F.Gasparo, U.Becciani, S.Cassisi, B.Garilli (INAF), C.Gheller (CINECA), G.Longo (Univ. Napoli "Federico II"), P.Benvenuti (Univ. Padova) ⇒ VObs.it + DRACO2

Thank you for your attention!

pasian@oats.inaf.it


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