



The Spanish-VO and the VO-Science

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CAB / SVO (INTA-CSIC)

Suffolk University

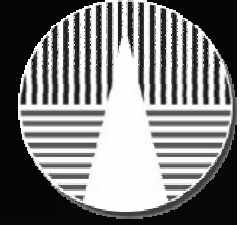


The Spanish-VO (SVO)



- **IVOA** was created in June 2002 with the mission to facilitate the international coordination and collaboration.
- Organized in working groups, IVOA is the forum where the standards, tools, roadmap,... are defined.





The Spanish-VO

SVO - <http://svo.cab.inta-csic.es>

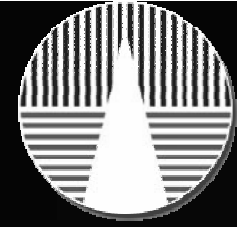
- Officially started in June 2004.
- Development of a VO infrastructure in Spain.
- Coordination of the activities of the Spanish institutes in the VO framework.
- Contact-point for the international VO-projects.

The screenshot shows the Spanish Virtual Observatory website. At the top, there is a navigation bar with the SVO logo, the text "Spanish Virtual Observatory", and a "Home Help Desk" link. Below the navigation bar, the website is organized into a grid of content blocks:

- The SVO**: A text block describing the SVO's mission and listing participants and FAQs.
- The CAB Scientific Data Centre**: A block listing various astronomical data centers and projects like Calar Alto, COROT, DUNES, GASP, Gaudi, GTC, INES, OMC, Protostars, X-exoplanets, and CMC-15.
- Theoretical Data Server**: A block listing theoretical models and evolutionary tracks.
- Services**: A block listing services like VOSA, VOSED, TESELA, and Filter Profile Service.
- VO Science**: A block with a "Projects" link and a small image of a star field.
- Data Mining**: A block with a "Projects" link and a small image of data plots.
- Education & Outreach**: A block listing outreach activities like Near Earth Asteroids Recovery, Pro-Am collaborations, and teaching astronomy.
- Miscellanea**: A block listing various resources like papers, presentations, press releases, and job opportunities.



The Spanish-VO




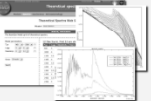
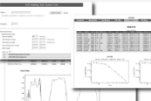
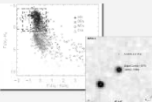
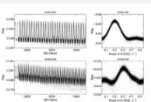


SVO - <http://svo.cab.inta-csic.es>

- Led by E. Solano (CAB / INTA-CSIC)



- Network of almost 200 researchers from 33 institutes
- Funded by the INTA, the Spanish Government and the EU.



<p>The SVO</p> <p>The Spanish Virtual Observatory (SVO) officially started in June 2004. Its purpose is to coordinate the VO activities at national level and act as a contact point for the other VO initiatives. The SVO core team is hosted at Centro de Astrobiología (INTA-CSIC).</p> <ul style="list-style-type: none"> SVO participants VO FAQs 	<p>The CAB Scientific Data Centre</p>  <ul style="list-style-type: none"> Calar Alto DUNES GASPS GTC OMC X-exoplanets CMC-15 COROT DSS-63 GAUDI INES Protostars Other archives in the SVO Network 	<p>Theoretical Data Server</p>  <ul style="list-style-type: none"> Stellar Spectra theoretical models Evolutionary Synthesis Models Isochrones and evolutionary tracks Asteroseismology 	<p>Services</p>  <ul style="list-style-type: none"> VOSA VOSED TESELA Filter Profile Service
<p>VO Science</p>  <ul style="list-style-type: none"> Projects 	<p>Data Mining</p>  <ul style="list-style-type: none"> Projects 	<p>Education & Outreach</p>  <ul style="list-style-type: none"> Near Earth Asteroids Precovery Pro-Am collaborations Teaching Astronomy with the VO Undergraduate & graduate projects SVO schools and meetings 	<p>Miscellanea</p>  <ul style="list-style-type: none"> Papers Presentations Press Releases SVO in the media Job opportunities Summer school GREAT-ITN School



The Spanish-VO

The CAB Scientific Data Center

The CAB Scientific Data Centre




- Calar Alto
- DUNES
- GASPS
- GTC
- OMC
- X-exoplanets
- CMC-15
- COROT
- DSS-63
- GAUDI
- INES
- Protostars
- Other archives in the SVO Network




The Spanish-VO

The CAB Scientific Data Center

The CA




...



INES

IUE Newly Extracted Spectra



INES Principal Centre

Welcome to the INES Principal Centre operated by the
Laboratory for Space Astrophysics and Theoretical
Physics (LAEFF)

INES stands for "IUE Newly Extracted Spectra". The purpose of the INES System is to reach the maximum number of scientists and to provide IUE spectra in a form that does not require a detailed knowledge of the instrumental characteristics. INES data have been obtained through processing of the IUE Final Archive output products. The INES distribution system is structured in three levels: a Principal Centre (and its Mirror), several National Hosts and unlimited End Users [more...].

► [Access to the INES data server](#)

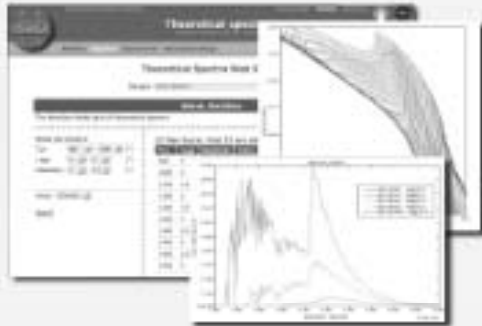
- Cala
- DUN
- GAS.
- GTC
- OMC
- X-exoplanets
- CMC-15

- INES
- Protostars
- Other archives in the SVO Network



The Spanish-VO Theoretical Data Server

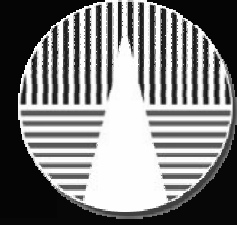
Theoretical Data Server



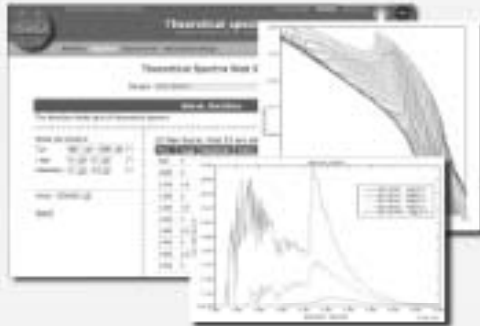
- Stellar Spectra theoretical models
- Evolutionary Synthesis Models
- Isochrones and evolutionary tracks
- Asteroseismology



The Spanish-VO Theoretical Data Server



Theoretical Data Server



- Stellar Spectra theoretical models
- Evolutionary Synthesis Models
- Isochrones and evolutionary tracks
- Asteroseismology

Theoretical Models Web Server

Stellar Spectra Models

- ▶ **D'Alessio disk models:**
Models of irradiated accretion disks around pre-main sequence stars by D'Alessio et al. (1998,1999,2001).
- ▶ **Coelho Synthetic stellar library:**
Synthetic stellar library by P. Coelho, fully described in Coelho et al. (2005) (*Astron.and.Astroph.*, in press)
- ▶ **Allard, NextGen:**
The NextGen Model grid of theoretical spectra; Hauschildt, P.H., Allard, F., Baron, E., Schweitzer, A., *ApJ* 312, 377, 1999
- ▶ **Allard, COND 2000:**
The COND00 Model grid of theoretical spectra. (*Chabrier et al. 2000, ApJ, 542,464*)
- ▶ **Allard, DUSTY 2000:**
The DUSTY00 Model grid of theoretical spectra (*Allard et al. 2001, ApJ, 556, 357*)
- ▶ **Kurucz ODFNEW /NOVER models:**
ODFNEW /NOVER models. Newly computed ODFs with better opacities and better abundances have been used. (*The convective treatment is described in Castelli et al. 1997, AA 318, 841*)
- ▶ **Husfeld et al models for non-LTE Helium-rich stars:**
Husfeld et al models for non-LTE Helium-rich stars (*Husfeld et al. 1989 A%26A, 222, 150*)
- ▶ **TLUSTY BSTAR2006:**
TLUSTY BSTAR2006 Grid: Early B-type stars, $T_{\text{eff}} = 15000\text{K} - 30000\text{K}$ (*Lanz, T., Hubeny, I. 2007, ApJS, 169, 83*)
- ▶ **TLUSTY OSTAR2002:**
TLUSTY OSTAR2002 Grid: O-type stars, $T_{\text{eff}} = 27500\text{K} - 55000\text{K}$ (*Lanz, T., & Hubeny, I. 2003, ApJS, 146, 417*)
- ▶ **TLUSTY OSTAR2002+BSTAR2006:**
TLUSTY OSTAR2002+BSTAR2006 Grid, The merged files use the BSTAR2006 models for effective temperatures up to 30,000 K and the OSTAR2002 models for higher temperatures. (*TLusty web page*)

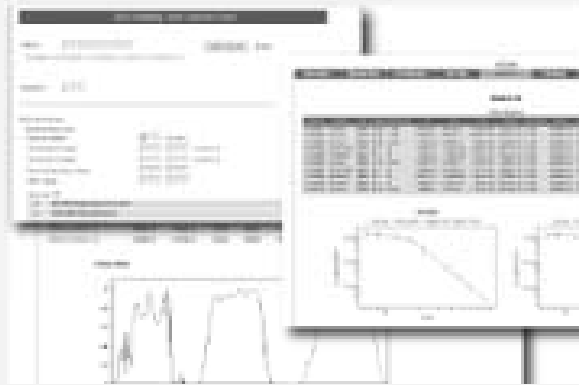




The Spanish-VO Services



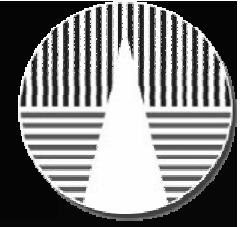
Services



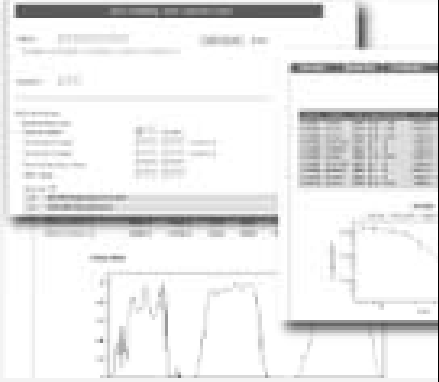
- VOSA
- VOSED
- TESELA
- Filter Profile Service



The Spanish-VO Services



Services



- VOSA
- VOSED
- TESELA
- Filter Profile Service

SVO theoretical services Documents Models Services Email: Pass: Login (?) Register



Email:
Pass:

[Register](#)

VOSA (VO Sed Analyzer) is a tool designed to perform the following tasks in an automatic manner:

- Read user photometry-tables.
- Query several photometrical catalogs accessible through VO services (increases the wavelength coverage of the data to be analyzed).
- Query VO-compliant theoretical models (spectra) and calculate their synthetic photometry.
- Perform a statistical test to determine which model reproduces best the observed data.
- Use the best-fit model as the source of a bolometric correction.
- Provide the estimated bolometric luminosity for each source.
- Generate a Hertzsprung-Russel diagram with the estimated parameters.
- Provide an estimation of the mass and age of each source

(Take a look to the VOSA Help)

You need a username and password to use the application because it keeps a number of files and database entries with your results and we need to be able to identify which results belong to each user so that you can recover them in future sessions. If you don't have a username and password yet, please feel free to register.

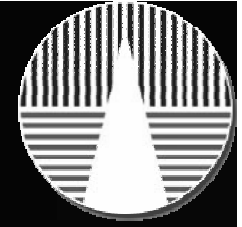
Acknowledging VOSA in publications:

Please include the following in any published material that makes use of VOSA:

This publication makes use of VOSA, developed under the Spanish Virtual Observatory project supported from the Spanish MICINN through grant






The Spanish-VO Services



SVO theoretical services Documents Models Services Email: Pass: Login (?) Register

Se

 **TESELA**  

TESELA

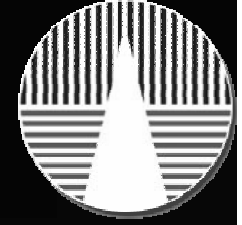
The most important advantage of widefield cameras is, precisely, the "widefield", since this offers the observers the possibility of obtaining vast amounts of data in a much shorter observing time. However, for a reliable data interpretation, it is necessary a proper data calibration. Concerning the flatfielding of images, many times it is required to obtain several integrations in blank regions (sky patches without bright sources) nearby to the science target areas.

TESELA is a service developed to provide access to a catalogue of blank regions, based on the application of the Delaunay triangulation of the sky. The present implementation of **TESELA** uses as source for the star coordinates the Tycho-2 Catalogue (Hog et al. 2000), or the USNO_B Catalogue (Moret et al. 2003).

Resources

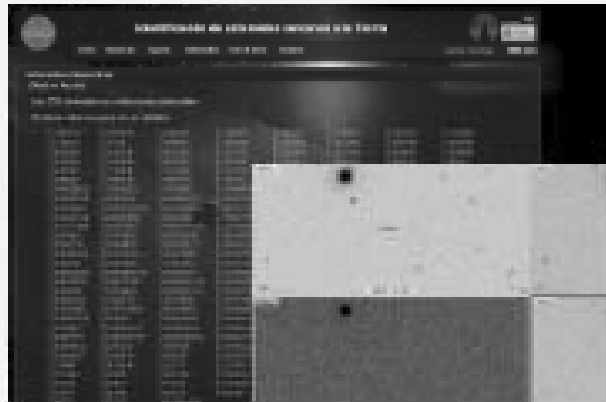
- ▶ Search Form for Tycho-2 Blank Fields (6-11 mag)
- ▶ Search Form for USNO-B Deep Blank Fields (15-18 mag)
- ▶ Short list of selected deep blank fields at the northern and southern hemisphere

This publication makes use of VOSA, developed under the Spanish Virtual Observatory project supported from the Spanish MICINN through grant



The Spanish-VO Education & Outreach

Education & Outreach



- Near Earth Asteroids Precovery
- Pro-Am collaborations
- Teaching Astronomy with the VO
- Undergraduate & graduate projects
- SVO schools and meetings



The Spanish-VO Education & Outreach

Education



- Near Earth
- Pro-Am
- Teaching
- Undergr
- SVO so



Identificación de asteroides cercanos a la Tierra

Inicio Registro Ayuda Asteroides Email: Pass: Login  

Hall of fame Créditos

Bienvenidos al programa de recuperación de Asteroides Cercanos a la Tierra. Este es un programa educativo coordinado por el Observatorio Virtual Español, cuyo principal objetivo es ofrecer a estudiantes, astrónomos aficionados y al público en general la posibilidad de identificar en archivos astronómicos asteroides que pueden impactar contra la Tierra.

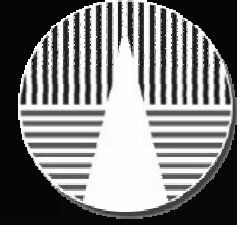
Si quieres saber más sobre la identificación de asteroides, haz click en "Ayuda". Si quieres participar en este programa, haz click en "Registro". Si ya te has registrado, introduce tu correo y tu contraseña y haz click en "login". Una vez esto, haz click en "Asteroides" para empezar a utilizar el sistema.

Vídeo de introducción al proyecto (2 minutos)

Trailer: Conoce a tu enemigo: Asteroides peligr...



0:00 / 2:31



The Spanish-VO Education & Outreach

Dedicated VO-school around Spain

SVO Meetings

Talleres

- Máster MTAF. Universidad de Granada. Granada. Abril 2012
- RoPACS VO School. Madrid. 28 noviembre, 2011
- Cuarto Curso de la Red Temática SVO. Barcelona. 18-19 noviembre, 2010
- Tercer Curso de la Red Temática SVO. Madrid. 8-9 junio, 2010
- Segundo Curso de la Red Temática SVO. La Laguna, Marzo, 2010
- Primer Curso de la Red Temática SVO. Granada, Octubre, 2009

- Segunda Escuela de la Red Temática SVO. Madrid, Febrero 12-13, 2007
- Primera Escuela de la Red Temática SVO. Madrid, Noviembre 27-28, 2006

Reuniones de la Red

- Primera Reunión de la Red Temática SVO. Madrid, Abril 6-7, 2006

Otras reuniones y cursos

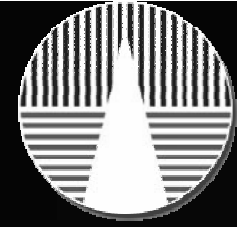
- Escuela VO. Universidad Católica del Norte. Antofagasta, Chile. Abril 2012
- First International Meeting on Astrostatistics. Valparaíso. Chile. Mayo 2013



The Spanish-VO Education & Outreach

Dedicated VO-school around Europe


- 3/2009 Garching, EuroVO-AIDA Hands-on workshop <http://cds.u-strasbg.fr/twikiAIDA/bin/view/EuroVOAIDA/VOSchool09/WebHome>
- 6/2009 Madrid, EuroVO-AIDA Workshop on How to Publish Data in the VO <http://cds.u-strasbg.fr/twikiAIDA/bin/view/EuroVOAIDA/AidaVOWS2009/WebHome>
- 1/2010 Strasburg, EuroVO-AIDA School <http://cds.u-strasbg.fr/twikiAIDA/bin/view/EuroVOAIDA/VOSchool10/WebHome>
- 3/2011 Strasburg, EuroVO-ICE School 2011 Strasburg <http://cdsweb.u-strasbg.fr/voschool2011/index.html>
- 2/2013 Madrid, EuroVO-COSADIE VO School <http://www.laeff.cab.inta-csic.es/projects/cosadie/main/index.php>



The Spanish-VO Education & Outreach

Dedicated VO school around Europe



- [3/2 str](#)
- [6/2 str](#)
- [1/2 str](#)
- [3/2 str](#)
- [2/2 CS](#)



EUROVO
CoSADIE Collaborative and Sustainable Astronomical Data Infrastructure for Europe


Home Program Registered Applicants Accepted Applicants Waiting List
Venue Accomodation Feedback Participant Use Cases

Email: Pass:

CoSADIE VO School

Madrid,
2013 February 5-7



Presentation

Important dates

- First announcement : 30 November 2012
- Deadline for workshop registration: 21 December 2012
- Workshop: 5,6,7 February 2013.

Purpose & Goals

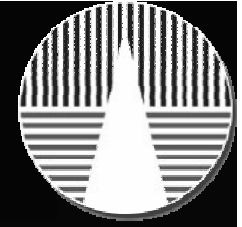
The CoSADIE project is organising an international Virtual Observatory school at the Centro de Astrobiología, Madrid, Spain.

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, as well as by computer simulations. The goal of the school is 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.

Workshop format

To achieve these goals, VO experts will lecture and tutor the participants on the usage of such tools. **Real life examples of scientific applications** will be given, some of them selected from the science cases that participants will be asked to submit at the time of registration. A large fraction of the time will be dedicated to **hands-on exercises**, which will allow participants to become fully familiar with the VO capabilities on their own laptops.



[11/index.html](#)



The Spanish-VO Education & Outreach

Dedicated VO school around Europe



- 3/2 str
- 6/2 str
- 1/2 str
- 3/2
- 2/2 CS

Collaborative and Sustainable Astronomical Data Infrastructure for Europe

Home
Program
Registered Applicants
Accepted Applicants

Venue
Accommodation
Feedback
Participant Use Cases

CoSAD

2013

Presentation

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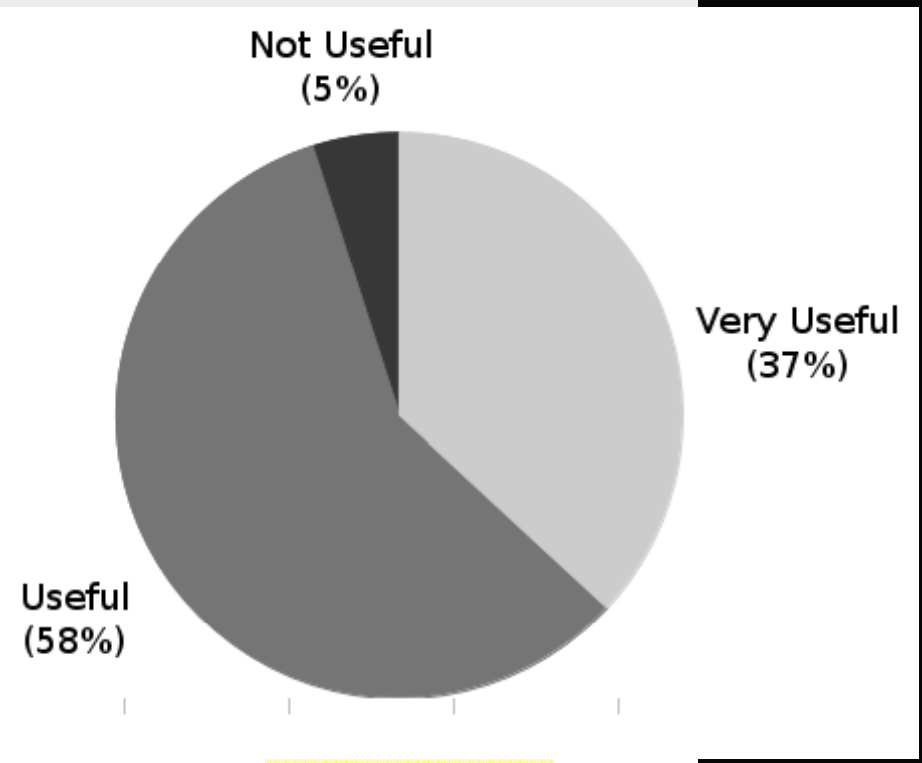
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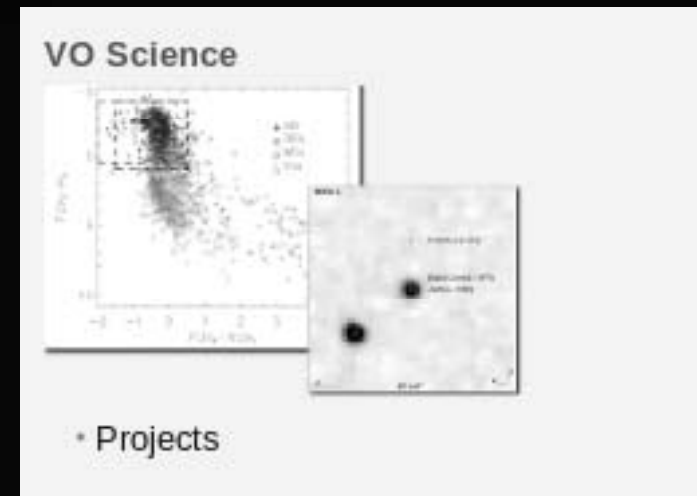




The Spanish-VO VO Science

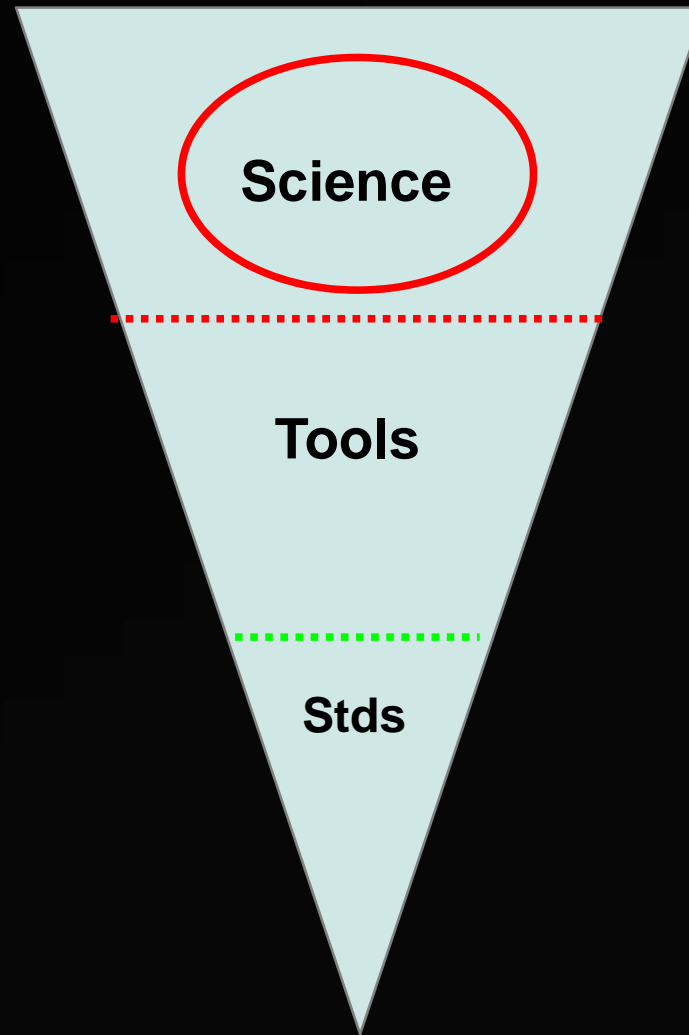
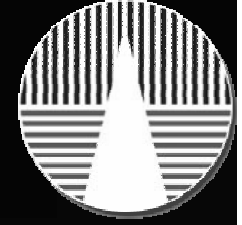


- Foster the VO-Science among the Spanish astronomers
- SVO is one of the most active groups around the world in VO-science.
- Since Jan 2012, around 50 VO papers
 - ✓ 20% with participation of the SVO.



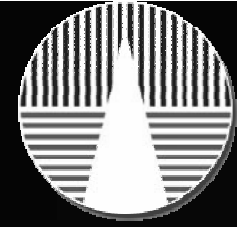


VO Science





VO Science



Archives: Fundamental tools for modern astrophysics.





VO Science



Weak point #1: Data everywhere!!



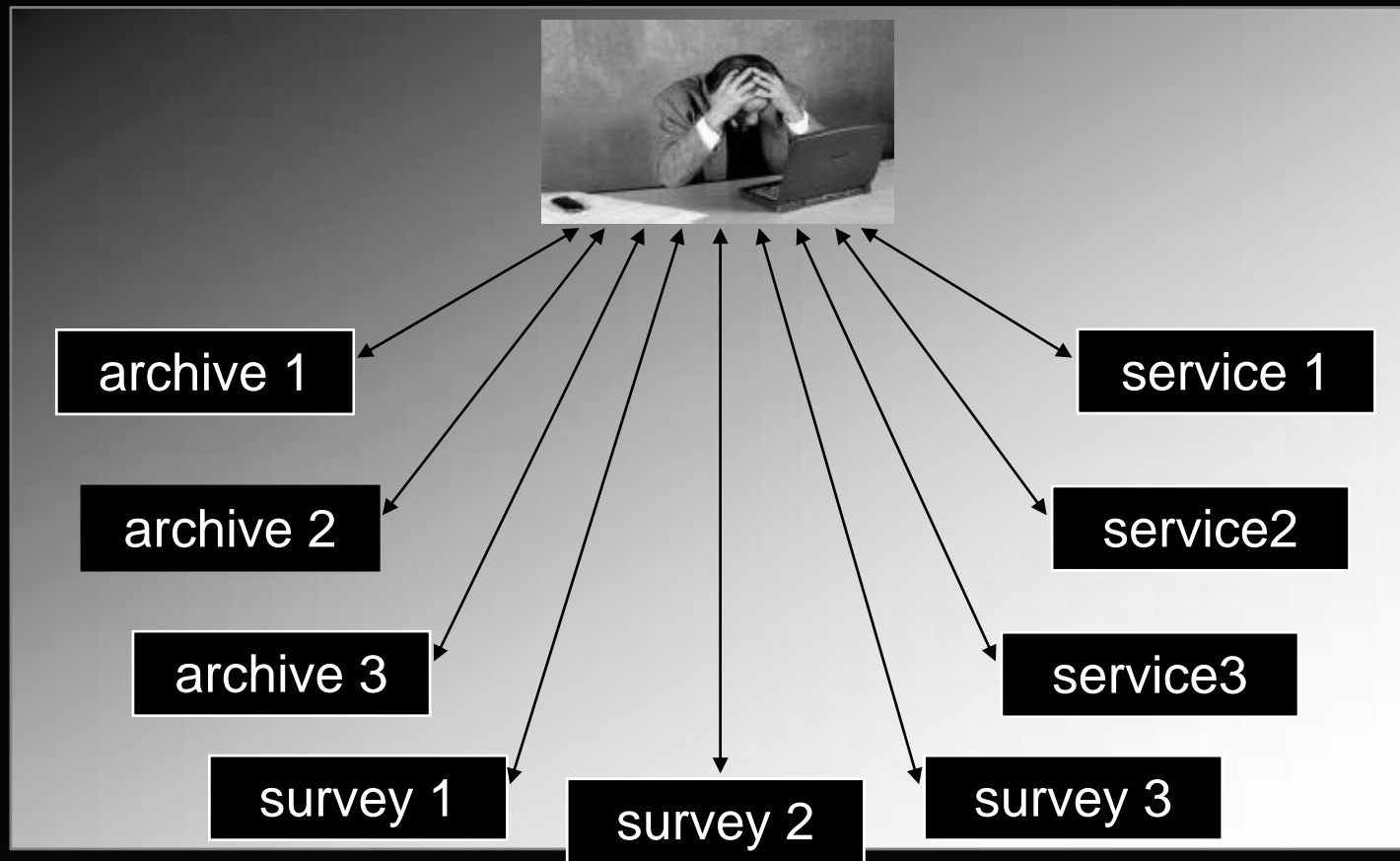
Where are the data I am interested in?



VO Science



Weak point #2: Lack of standardization

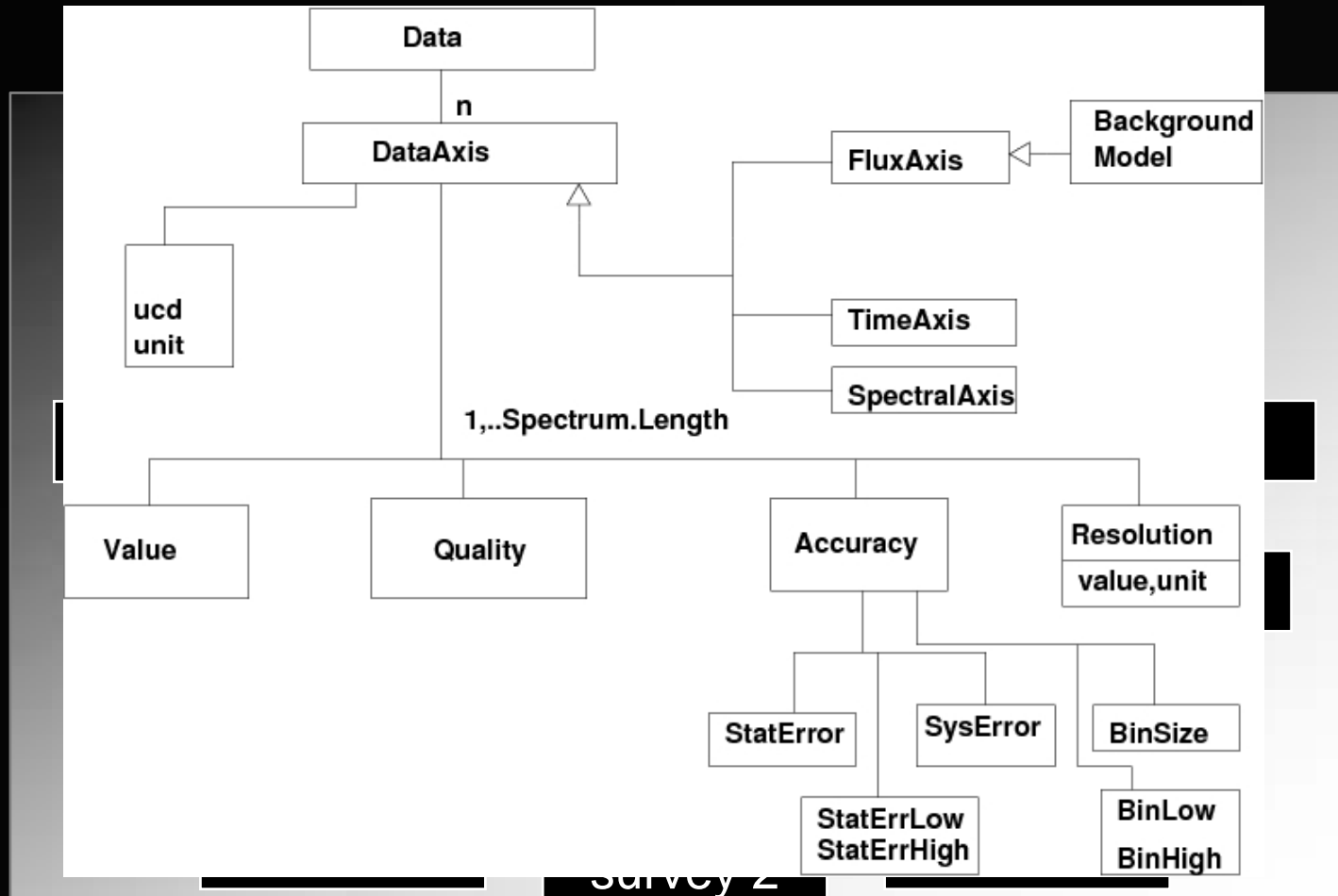




VO Science

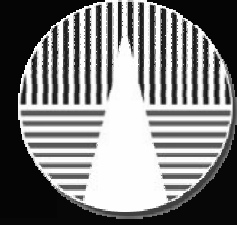


Weak point #2: Lack of standardization

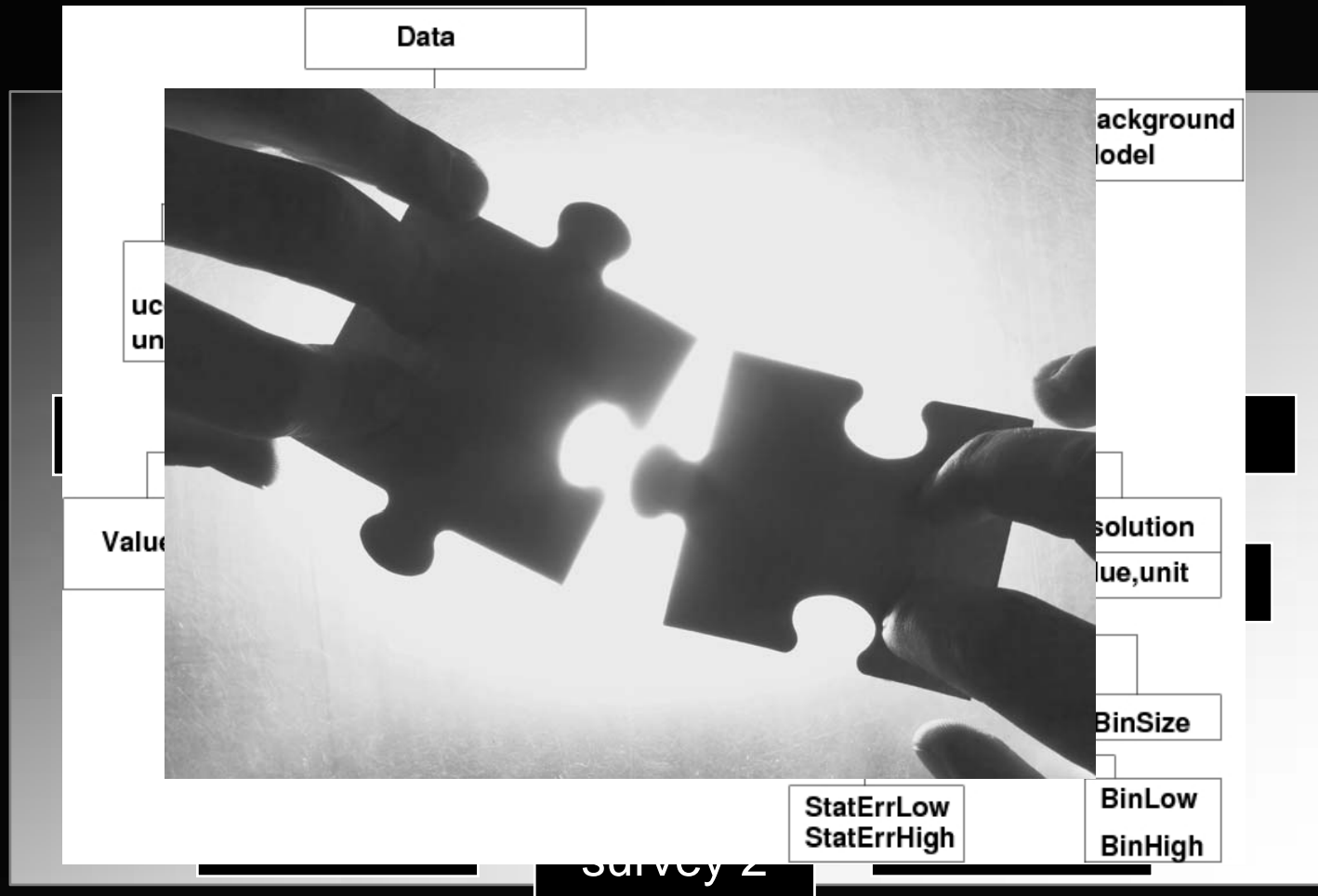




VO Science



Weak point #2: Lack of standardization





VO Science



Weak point #3: Data volume

Today: 1 Petabyte in archives.

✓ Rate: 0.5 PB/yr





VO Science



Weak point #3: Data volume

Today: 1 Petabyte in archives.

✓ Rate: 0.5 PB/yr

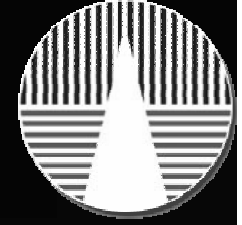
LSST, ALMA, SKA

→ 60 PB in 15-20 years.





VO Science

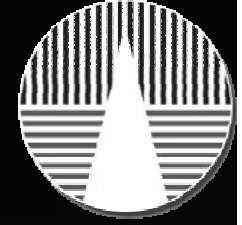


Astronomy with archives

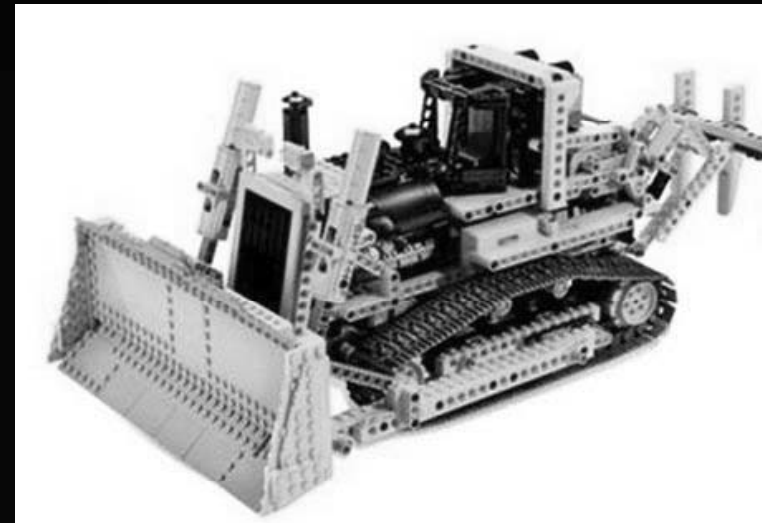




VO Science



Astronomy with archives

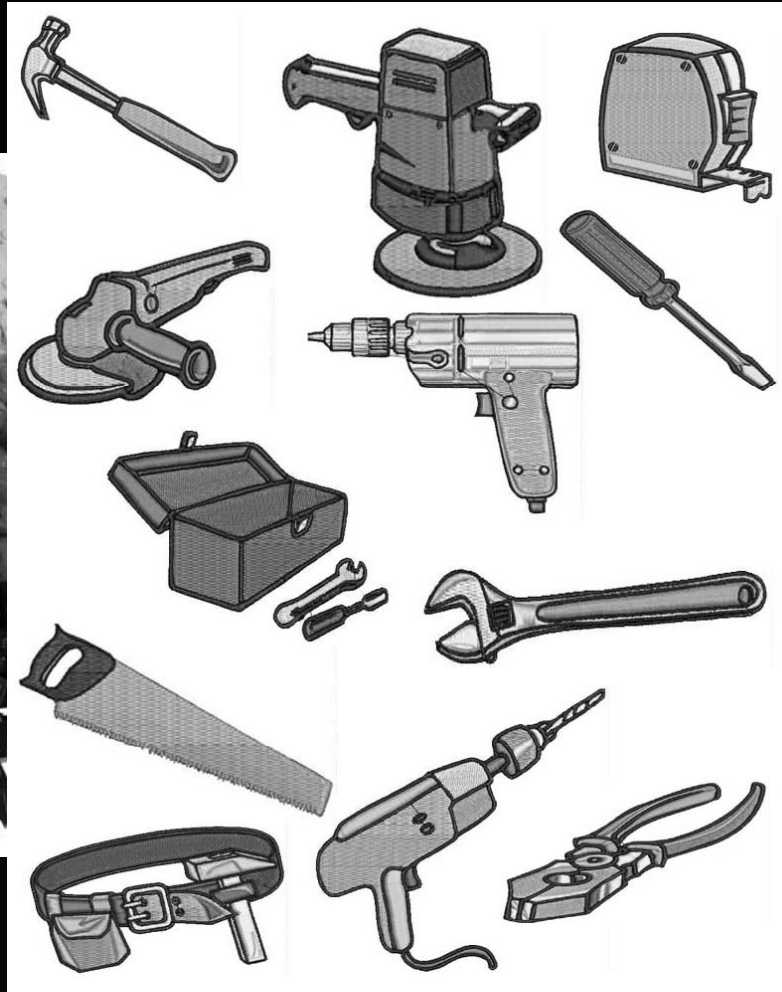
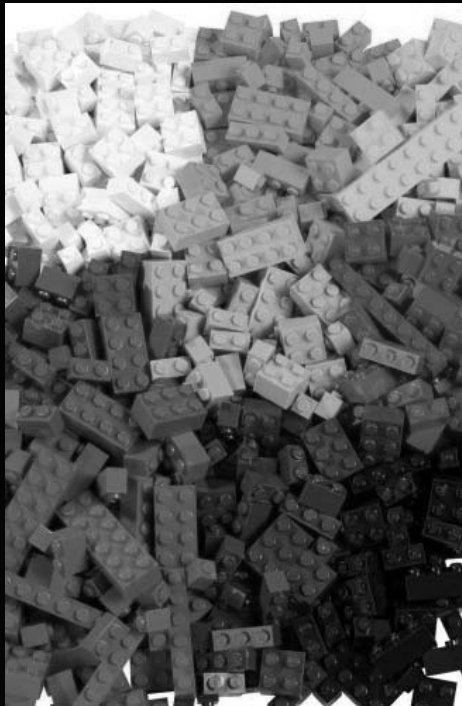




VO Science



Astronomy with archives





VO Science

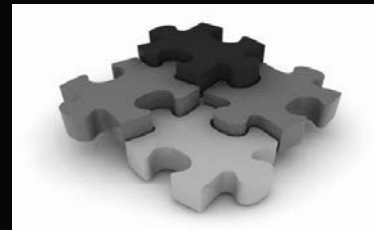


What do I expect from VO tools?

✓ Data discovery



✓ Data retrieval



✓ Data analysis





VO Science. Case I



Preparation of observations



DUNES: DUst around NEarby Stars A Herschel Key Programme

- ✓ Systematic survey for faint, cold debris disks (similar to Kuiper belt) around nearby stars.
 - ✓ 239 IV-V stars. Sample is volume-limited ($d < 25$ pc; Hipparcos)
- The detailed analysis of faint cold disks require a good knowledge of the stellar properties, like e.g. T_{eff} , luminosity, age, metallicity or activity.



VO Science. Case I



Preparation of observations

The screenshot displays the VO Science interface. The main window is titled "Server list" and contains a menu bar (File, Edit, Image, Catalog, Overlay Tool, View, Interop, Help) and a toolbar. A "Location" field is visible. Below the toolbar, there are radio buttons for "Optical", "IR", "UV", "Radio", "DSS", "Simbad", and "NED".

Overlaid on the main window is a "Server selector" dialog box. It features a "VO discovery tool" section with a "Target (ICRS, name)" field and a "Radius" field set to "14'". There are checkboxes for "Images", "Catalogs", and "Spectra". A "Detailed list..." button is also present. The dialog includes a "SUBMIT" button and a "Close" button.

Another "Server list" dialog box is overlaid on the right side of the main window. It has a title bar and a "Check/uncheck the servers concerned by the ALL VO discovery mode" section with "Select all", "Unselect all", and "Filter:" buttons. Below this is a list of servers with checkboxes and question mark icons:

- 1) The Aladin image server (CDS/Strasbourg) - DSS/MA...
- 2) The UKIRT Infrared Deep Sky Survey
- 3) SDSS DR7 images
- 4) Multimission Archive at STScI (MAST)
- 5) Hubble Legacy Archive Footprint Data (HLA)
- 6) Canadian Astronomical Data Center (CADC)
- 7) Hubble press release images
- 8) VO-Paris Southern Atlas (VOPSAT)
- 9) Generic SIA query
- 10) The XMM-Newton Science Archive InterOperability Sys...
- 11) The ISO Data Archive InterOperability System
- 12) The Integral Science Data Archive InterOperability Syst...
- 13) SkyView Virtual Observatory
- 14) SuperCOSMOS Sky Surveys SSS SIAP Cutout Service
- 15) UKIDSS DR1 SIAP Service
- 16) UKIDSS DR2 SIAP Service
- 17) The Extended IRAS Galaxy Atlas
- 18) Spitzer First Look Survey (FLS) -- NOAO ELAIS N1 -- R
- 19) Spitzer First Look Survey (FLS) -- NOAO Extragalactic -- R



VO Science. Case II



Discovering new objects of a given class

**New ultracool subdwarfs identified in large-scale surveys using
Virtual Observatory tools ★ ★★**

Part I: UKIDSS LAS DR5 vs SDSS DR7

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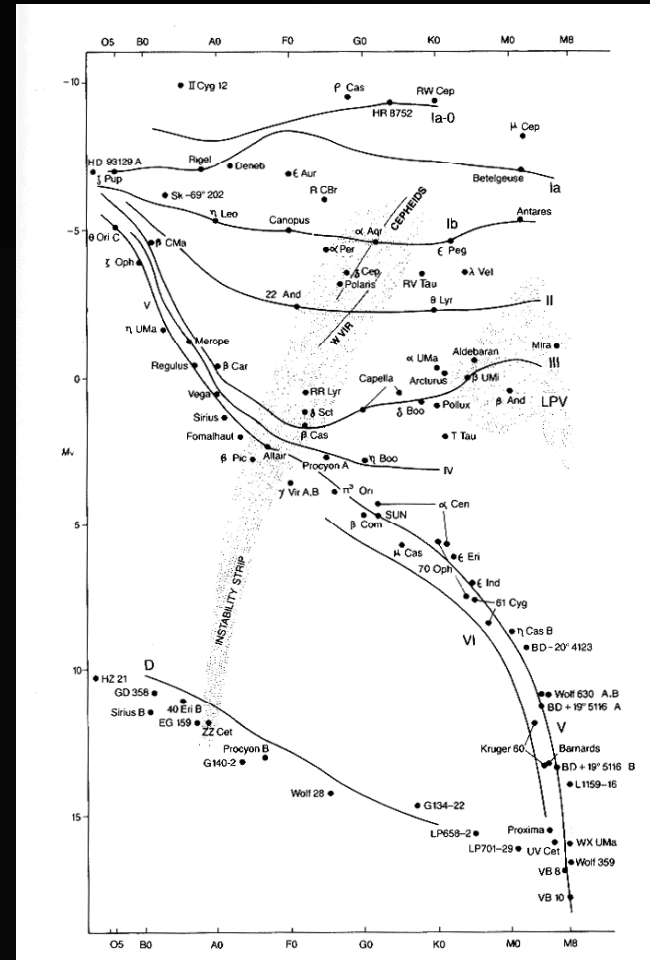


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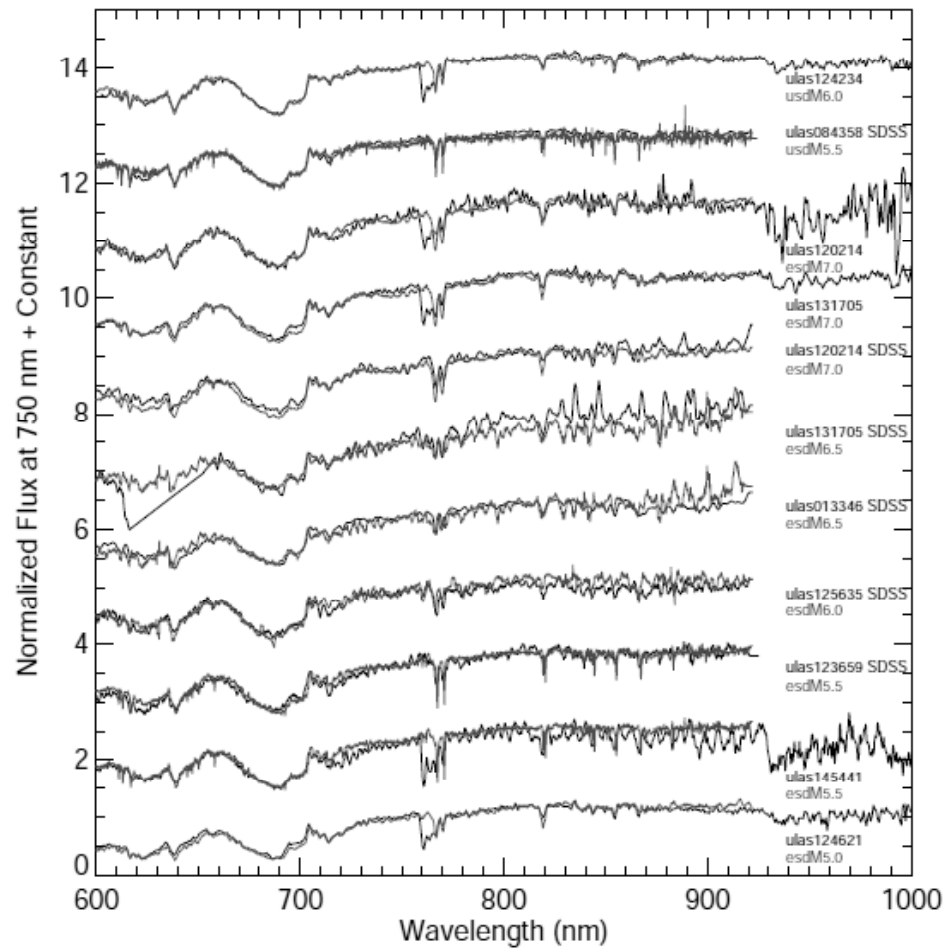
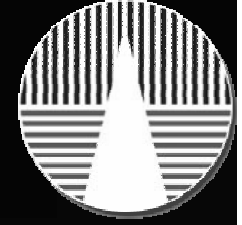
Discovering new objects of a given class

- ✓ Metal-poor dwarfs with spectral type later than M7.
- ✓ Hotter than their solar metallicity counterparts.
- ✓ Population II. Useful tracers of the Galactic chemical history.
- ✓ Known around fifty in 2011.



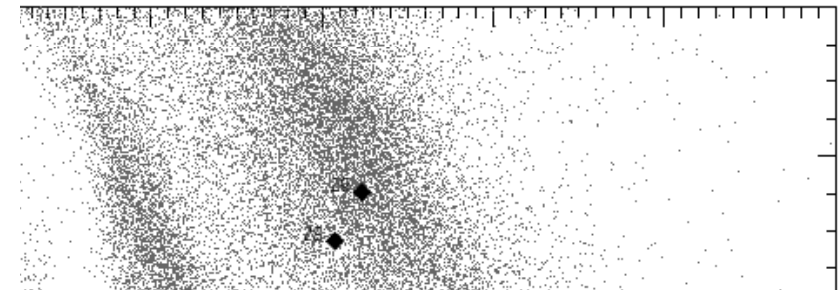
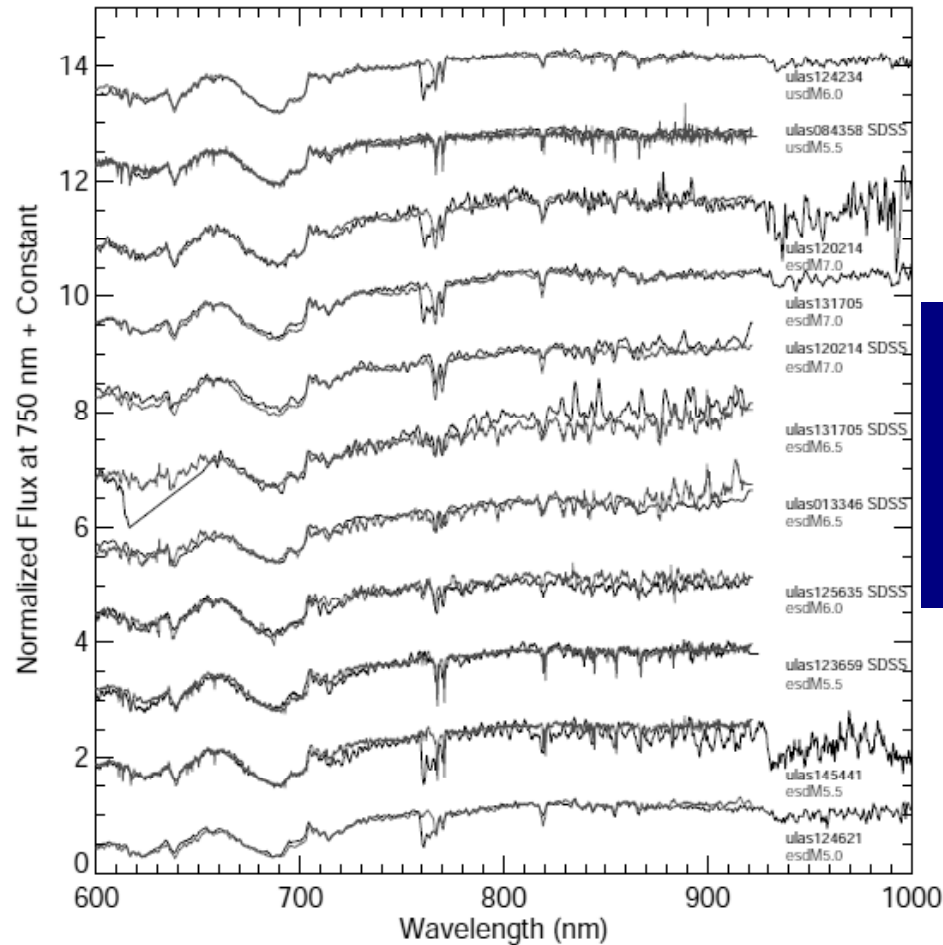
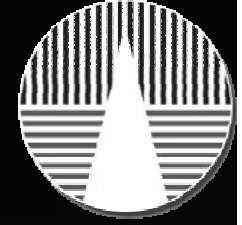


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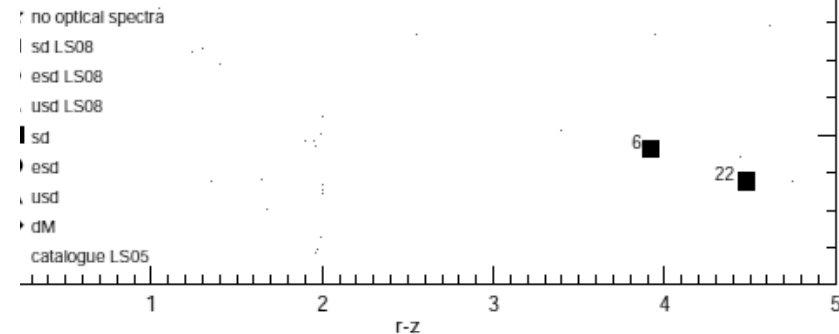




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- ✓ 20 new spectroscopically confirmed UCSDs
- ✓ > 80% success rate after proper motion refinement





VO Science. Case III



Discovery of peculiar objects

- ✓ Bright objects with peculiar colours and high proper motions are rare in the sky.
- ✓ The closer/brighter the easier to investigate their physical properties
 - Blue: Nearby WD, subO, runaway stars, or OB stars in nearby young moving groups.
 - Red: nearby M dwarfs or RG with high tangential velocity

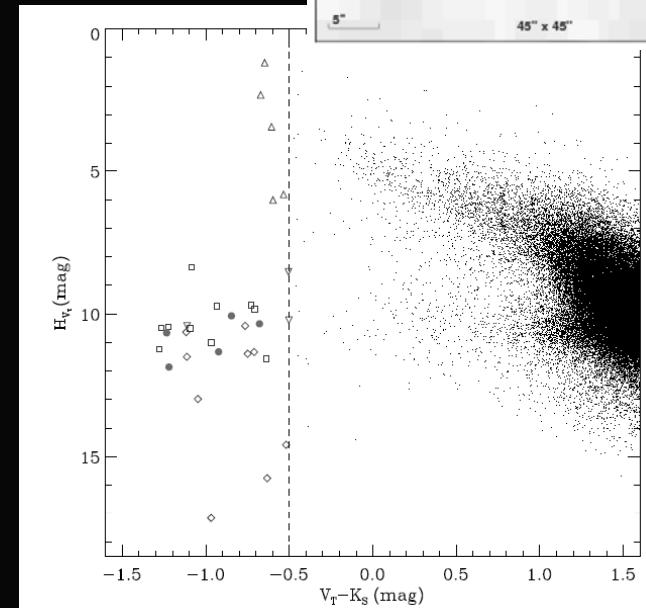
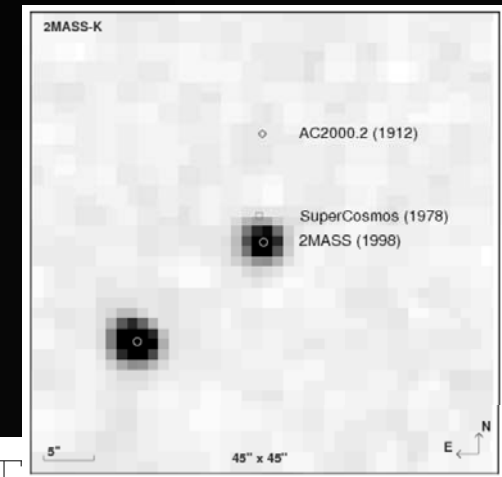


VO Science. Case III



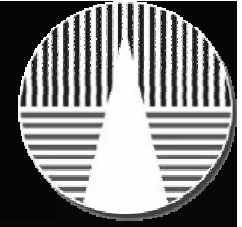
Discovery of peculiar objects

- Cross-matched Tycho-2 and 2MASS
- 155,000 high proper motion candidates ($\mu > 50$ mas/yr)
- Reduced proper motion diagram H_{VT} vs. $V_T - K_s$
- Blue sources $V_T - K_s < -0.5$
 - 32 blue (OB, sdO, WD)
 - 5 unknown WD or sdO





VO Science. Case III



Discovery of peculiar objects

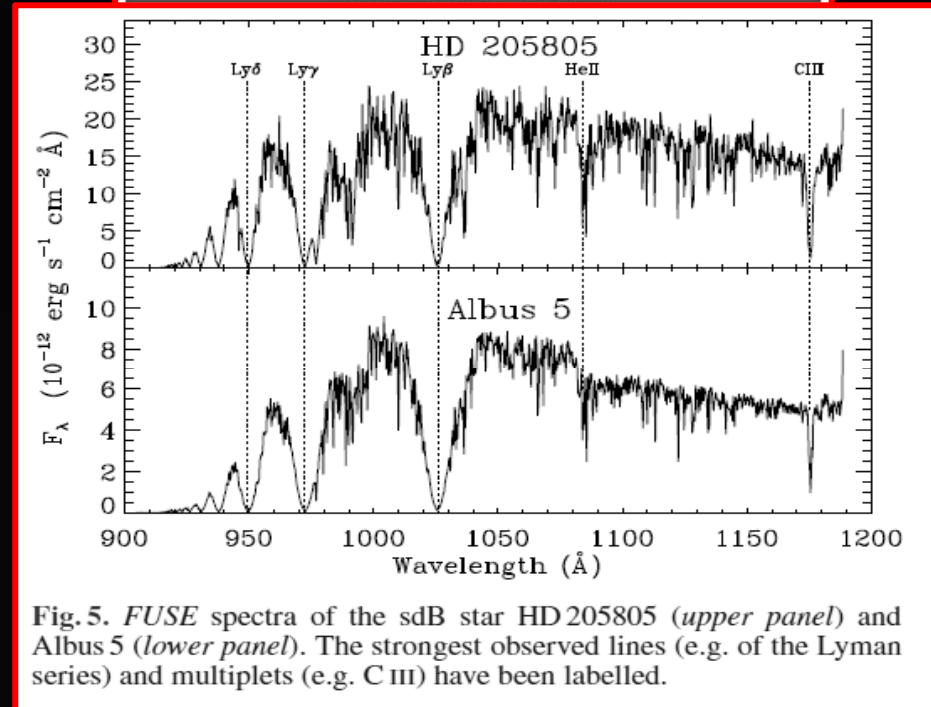
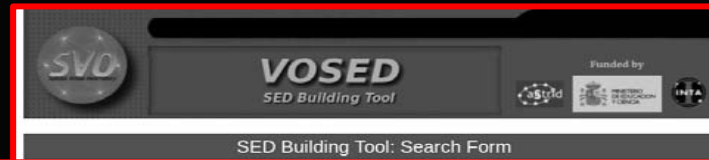
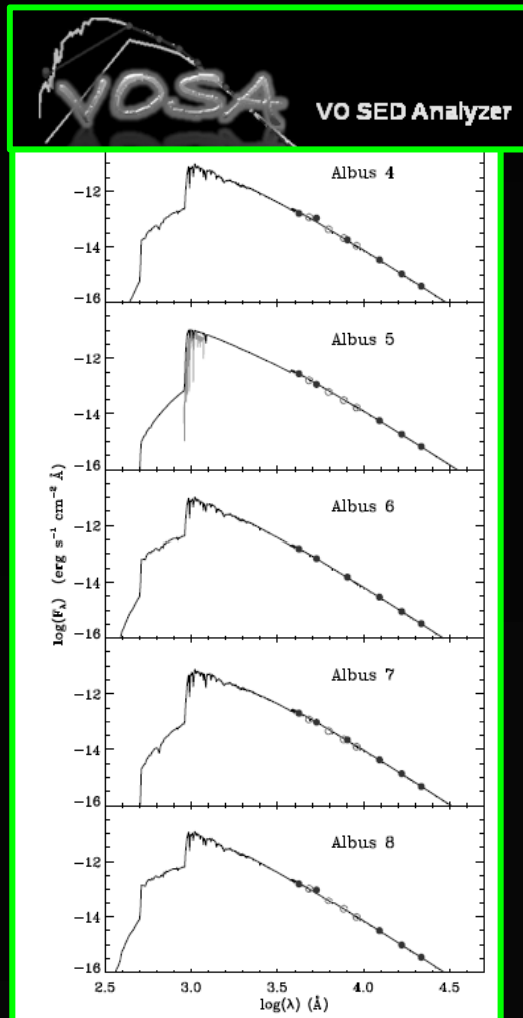
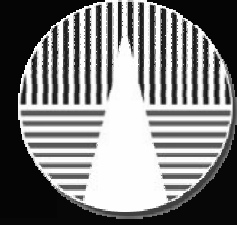


Fig. 5. *FUSE* spectra of the sdB star HD 205805 (upper panel) and Albus 5 (lower panel). The strongest observed lines (e.g. of the Lyman series) and multiplets (e.g. C III) have been labelled.

We confirmed the nature of one sdO
(*FUSE* spectra)



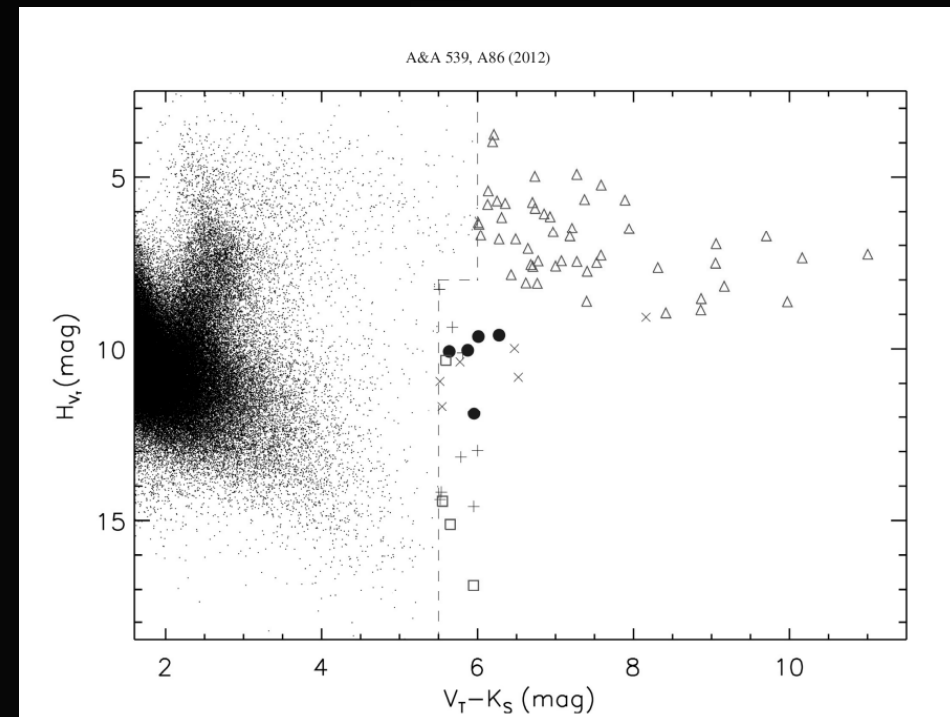
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Discovery of peculiar objects

Red sources $V_T - K_S > 5.5$

- 59 red (M dwarfs and giants)
- 5 unknown, probably thick-disc and halo giants

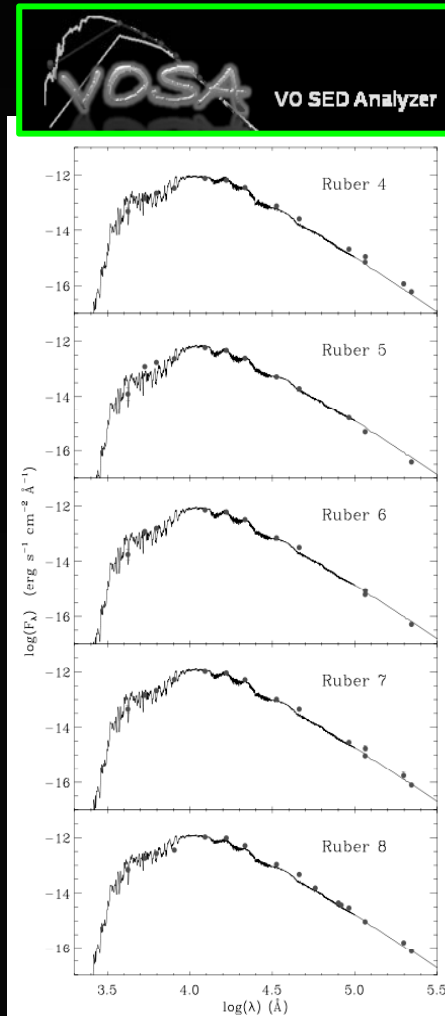




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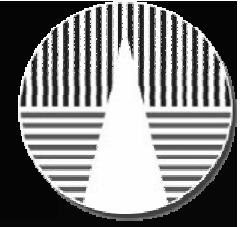


Discovery of peculiar objects





VO Science. Case III



Discovery of peculiar objects

The All Sky Automated Survey

- **Goals**

The All Sky Automated Survey (**ASAS**) is a low cost project dedicated to constant photometric monitoring of the whole available sky, which is approximately 10^7 stars brighter than 14 magnitude. The project's ultimate goal is detection and investigation of any kind of the photometric variability. One of the main objectives of **ASAS** is to find and catalog variable stars.

- **Equipment**

Presently, **ASAS** consists of two observing stations, one in LCO, Chile (since 1997) and the other on Haleakala, Maui (since 2006). Both are equipped with two wide-field 200/2.8 instruments, observing simultaneously in **V** and **I** band. For technical and historical details please refer to the *Statistical and Historical*

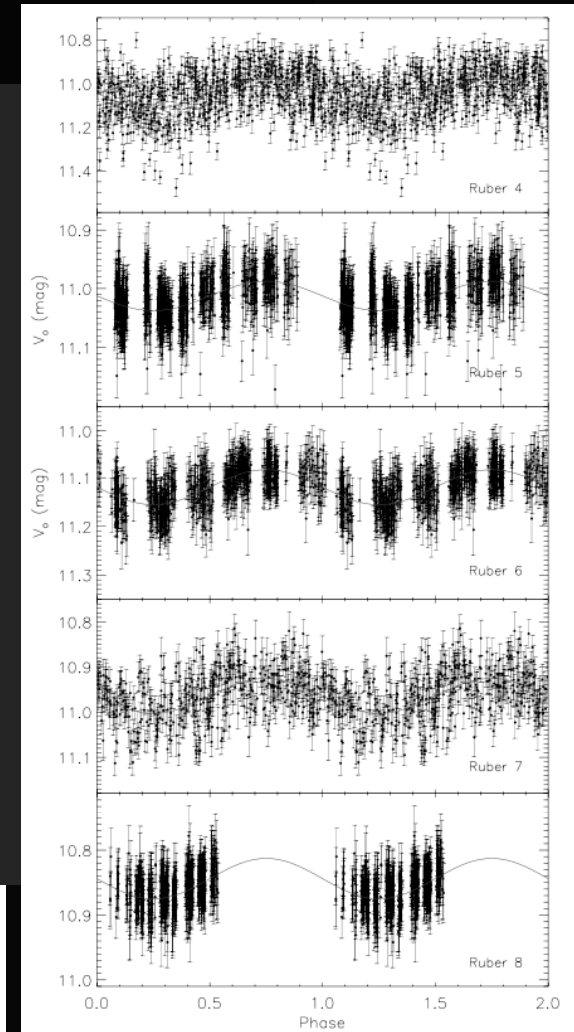
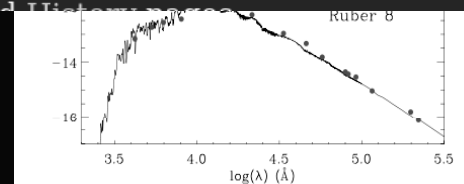
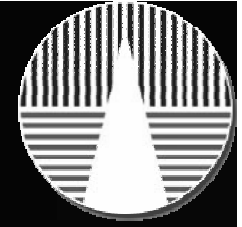


Fig. 6. ASAS V-band light curves as a function of phase of Ruber 4



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Discovery of peculiar objects

We found from ASAS analysis:

- 1 long secondary period
- 1 extremely long period

We confirmed with follow-up observations:

- 1 RG
- 1 metal-poor RG

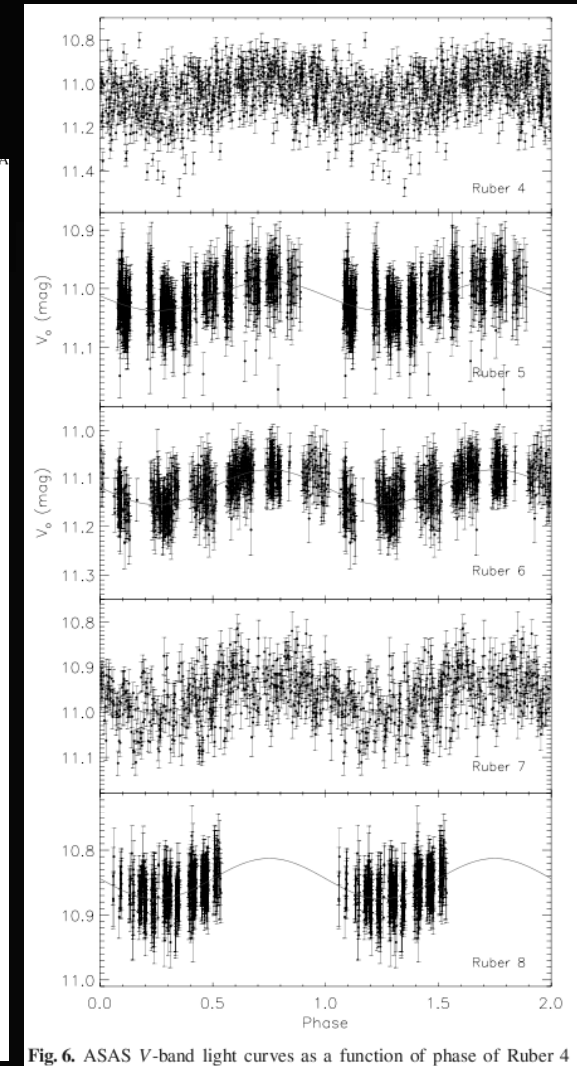
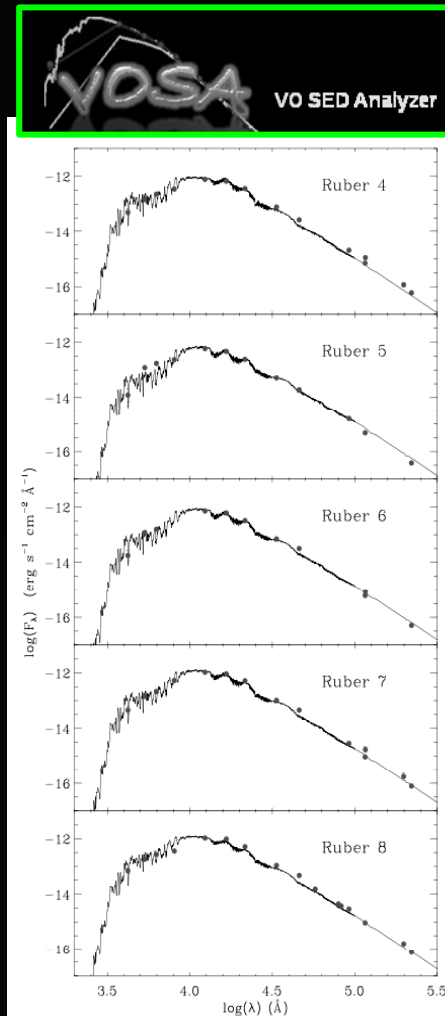
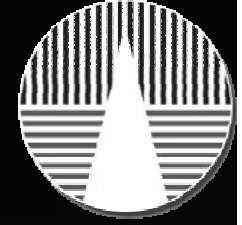


Fig. 6. ASAS V-band light curves as a function of phase of Ruber 4



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Discovery of peculiar objects

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Astronomy
&
Astrophysics

Identification of blue high proper motion objects in the Tycho-2 and 2MASS catalogues using Virtual Observatory tools

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ABSTRACT

Aims. With available Virtual Observatory tools, we looked for new bright blue high proper motion objects in the entire sky: white dwarfs, hot subdwarfs, runaway OB stars, and early-type stars in nearby young moving groups.

Methods. We performed an all-sky cross-match between the optical Tycho-2 and near-infrared 2MASS catalogues with Aladin, and selected objects with proper motions $\mu > 50 \text{ mas yr}^{-1}$ and colours $V_T - K_s < -0.5 \text{ mag}$ with TOPCAT. We also collected multi-wavelength photometry, constructed the spectral energy distributions and estimated effective temperatures from fits to atmospheric models with VOSA for the most interesting targets.

Results. We assembled a sample of 32 bright blue high proper motion objects, including ten sdO/B subdwarfs, nine DA white dwarfs, five young early-type stars (two of which are runaway stars), two blue horizontal branch stars, one star with poor information, and five objects reported for the first time in this work. These last five objects have magnitudes $B_T \approx 11.0\text{--}11.6 \text{ mag}$, effective temperatures $T_{\text{eff}} \approx 24\,000\text{--}30\,000 \text{ K}$, and are located in the region of known white dwarfs and hot subdwarfs in a reduced proper motion-colour diagram. We confirmed the hot subdwarf nature of one of the new objects, Albus 5, with public far-ultraviolet spectroscopic data obtained with FUSE.

Key words. astronomical databases: miscellaneous – virtual observatory tools – stars: early-type – stars: peculiar – subdwarfs – white dwarfs

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Astronomy
&
Astrophysics

Identification of red high proper-motion objects in Tycho-2 and 2MASS catalogues using Virtual Observatory tools

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ABSTRACT

Aims. With available Virtual Observatory tools, we looked for new M dwarfs in the solar neighbourhood and M giants with high tangential velocities.

Methods. From an all-sky cross-match between the optical Tycho-2 and the near-infrared 2MASS catalogues, we selected objects with proper motions $\mu > 50 \text{ mas yr}^{-1}$ and very red $V_T - K_s$ colours. For the most interesting targets, we collected multi-wavelength photometry, constructed spectral energy distributions, estimated effective temperatures and surface gravities from fits to atmospheric models, performed time-series analysis of ASAS V-band light curves, and assigned spectral types from low-resolution spectroscopy obtained with CAFOS at the 2.2 m Calar Alto telescope.

Results. We got a sample of 59 bright red high proper-motion objects, including fifty red giants, four red dwarfs, and five objects reported in this work for the first time. The five new stars have magnitudes $V_T \approx 10.8\text{--}11.3 \text{ mag}$, reduced proper motions midway between known dwarfs and giants, near-infrared colours typical of giants, and effective temperatures $T_{\text{eff}} \approx 2900\text{--}3400 \text{ K}$. From our time series analysis, we discovered a long secondary period in Ruber 4 and an extremely long primary period in Ruber 6. With the CAFOS spectra, we confirmed the red giant nature of Ruber 7 and 8, the last of which seems to be one of the brightest metal-poor M giants ever identified.

Key words. stars: oscillations – stars: late-type – stars: chemically peculiar – virtual observatory tools – stars: peculiar – astronomical databases: miscellaneous



Summary



- ✓ Archives: Fundamental tool for modern astrophysics.
- ✓ Strengths:
 - Efficiency
 - Legacy
- ✓ Weaknesses:
 - Inefficient scientific exploitation
 - Distributed resources / lack of interoperability
 - Huge volumes of data



Summary



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Virtual Observatory



Summary



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- ✓ Strengths:
 - Efficiency
 - Legacy
- ✓ Weaknesses:
 - Inefficient scientific exploitation
 - Distributed resources / lack of interoperability
 - Huge volumes of data
- ✓ VO is already an astronomical infrastructure that is producing science.
- ✓ The number of VO-papers is growing. Currently, there are more than 200 papers with “Virtual Observatory” in the abstract
 - ✓ > 3000 citations.

Virtual Observatory



Thanks!