

Spanish VO: Ten years and counting.

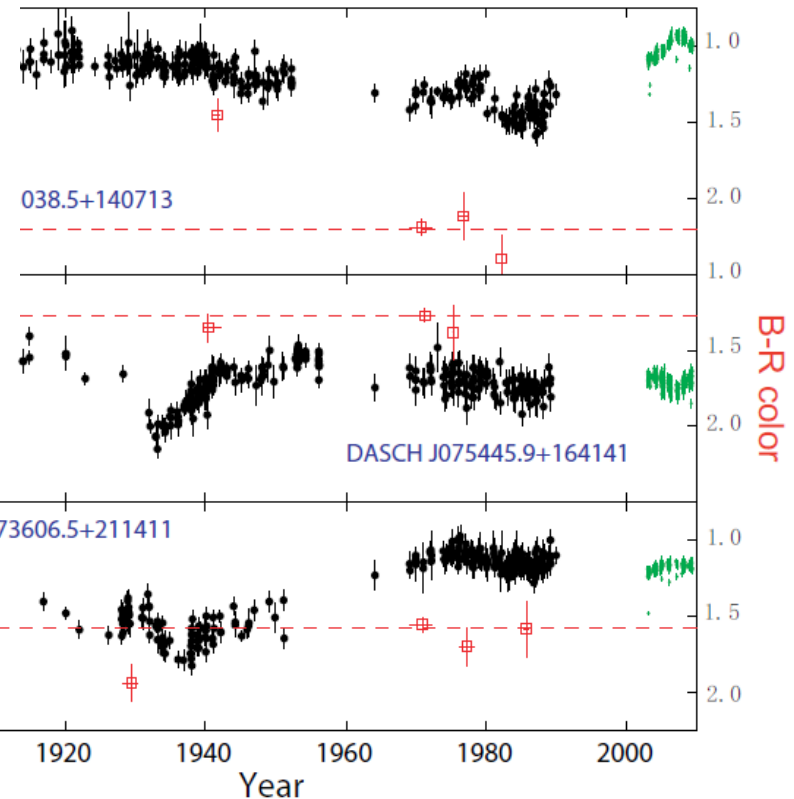
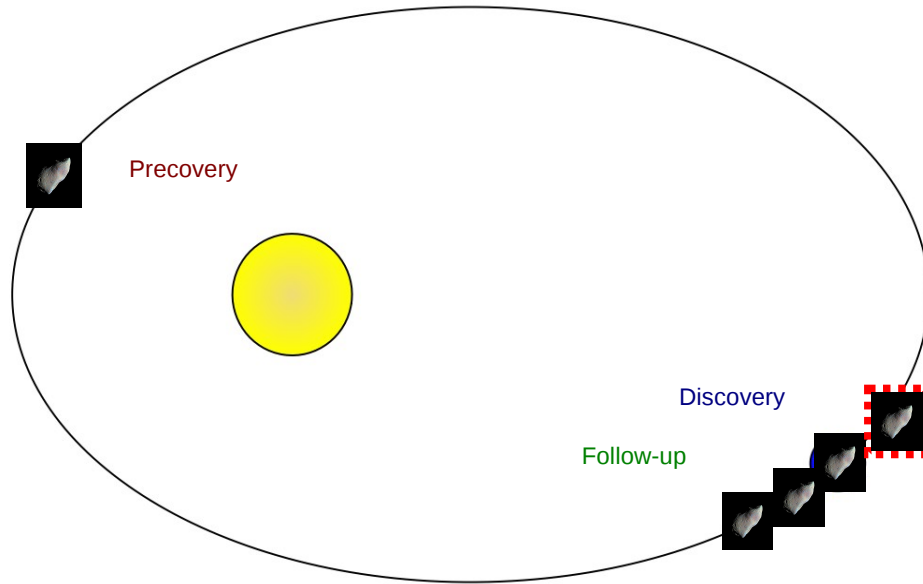
Enrique Solano
(on behalf of the SVO team)



Outline

- **Introduction**
 - Why a Virtual Observatory?
 - What is a Virtual Observatory?
 - Who is behind the Virtual Observatory?
- **The Spanish Virtual Observatory**
 - Data Providers
 - Science Community
 - Education and Outreach

Why archives?



- Big data
- Data re-purposing

Sometimes, we need something else

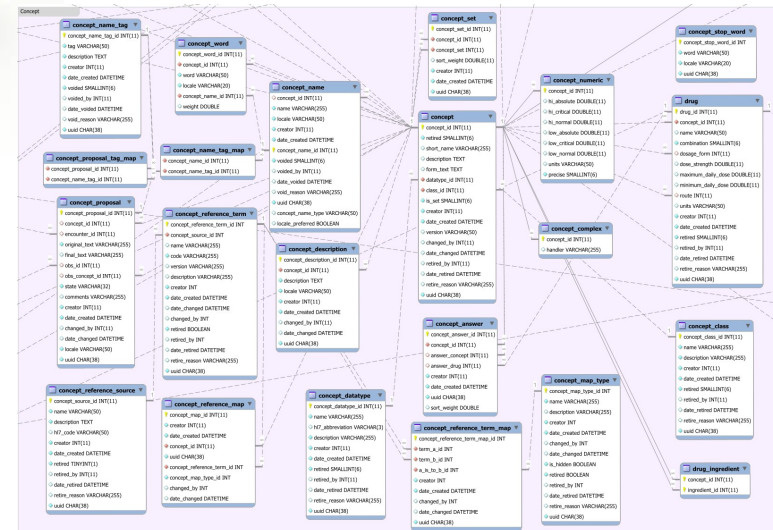
- Data discovery



- Data access



- Data representation



What is the Virtual Observatory?

- **Goal:** Easy and efficient access and analysis of the information hosted in astronomical archives.



Who is behind VO?

A Strategic Plan for European Astronomy: The ASTRONET Infrastructure Roadmap

Michael Bode

Astrophysics Research Institute, Liverpool John Moores University, Birkenhead, CH41 1LD, UK

PRIORITIES AND RECOMMENDATIONS

The Virtual Observatory will enable new kinds of multi-wavelength science and present new challenges to the way that results of theoretical models are presented and compared with real data. The Roadmap therefore proposes continued development of the Virtual Observatory, including recommending planning for the provision of a public, VO-compliant archive with any new facility.

- Included in the 2008 Roadmap.
- Confirmed in the updated Roadmap (2013).

Who is behind VO?



FP6 e-Infrastructure Communication Network Development. 2006-2008.



FP7 e-Infrastructure Scientific Research Repositories 2008-2010.



FP7. INFRA-2010-2.3.3 Research Infrastructures. 2010-2012.



FP7. INFRA-2012-3.3 Research Infrastructures. 2012-2014.

Who is behind VO?

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The premier global forum charting, demonstrating and driving convergence between emerging global data infrastructures

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Latest from RDA Europe



13.04.2014
The future of Open Access? Winning hearts and minds

RDA Europe Ecosystem: user communities & prototypes

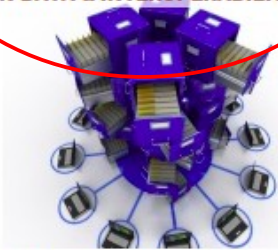
DATA-INTENSIVE ASTRONOMY



EARTH SCIENCES



OPEN DATA & INTEROPERABILITY



CHEMICAL SAFETY



RDA Europe focuses on coordinating a series of cross-infrastructure experiments on global interoperability with a selected group of projects and communities. Each prototype addresses a specific community driven use case identifying best-of-breed solutions and the remaining challenges.

Intro. / Data Providers / Science / E&O / Conclusions

Ten years of the SVO.

E. Solano

8/42

The Spanish Virtual Observatory

- Coordination of the VO-related activities at national level.
- Contact point for international VO initiatives.

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

ObsVirtEsp
@ObsVirtEsp España
El Observatorio Virtual Español (SVO) e que coordina las actividades de VO a niv
<http://svo.cab.inta-csic.es>

SVO: Funding

➤ Funded since 2005

- AyA2011-24052 (2012-2014)
- AyA2008-02156 (2009-2011)
- AyA2005- 04286 (2006-2008)
- AyA2004-00253 (2005)

➤ Other funding bodies

- INTA
- Madrid Regional Government
- Europe: FP6 - FP7

SVO: Where?

➤ Centro de Astrobiología (CAB).

- The largest astronomical data centre managed by a Spanish institution (INTA-CSIC).
- Long experience in the management of astronomical archives:

2011



THE COROT PUBLIC ARCHIVE AT CAB

2009

The SVO target audience

- **Three types of stakeholders:**
 - **Data providers**
 - Willingness to provide a service.
 - Some kind of sustainability.
 - Concern for quality.
 - **Astronomical community**
 - **Education and Outreach**

The Spanish Data Providers

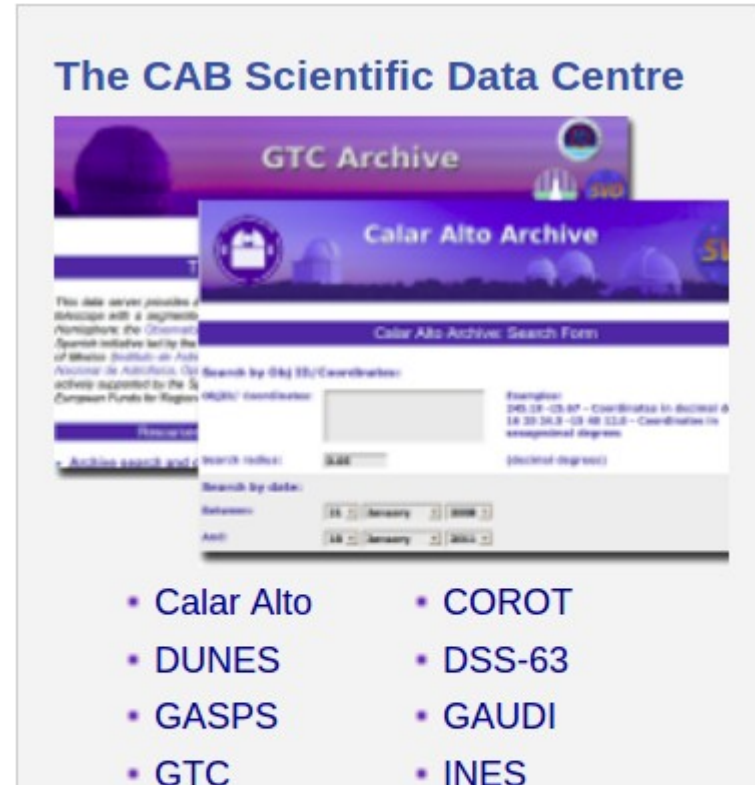


SVO: Support to Data Providers

Making the data available on the web, other than as a tar-file on an anonymous ftp, and especially if it has to be VO compliant may also become a burden. Plez (2007)

➤ First approach

- Your VO manages the service.



The screenshot displays the 'The CAB Scientific Data Centre' website. It features two main archive sections: 'GTC Archive' and 'Calar Alto Archive'. Below these, there is a 'Calar Alto Archive Search Form' with various search options. The form includes a 'Search by RA/Dec/Coordinate' section with a text input field and a 'Search by date' section with dropdown menus for 'Between' and 'And' dates. A list of supported archives is shown at the bottom, including Calar Alto, COROT, DUNES, DSS-63, GASPS, GAUDI, GTC, and INES.

The CAB Scientific Data Centre

GTC Archive

Calar Alto Archive

Calar Alto Archive Search Form

This data server provides a database with a regular update of the Calar Alto Archive. The Calar Alto Archive is a project of the Spanish Institute for Astrophysics (IAU) and is actively supported by the European Union for the 5th European Framework for Research.

Search by RA/Dec/Coordinate: Example: 245.15 -05.57 - Coordinate in decimal 6 14 30 36.3 -05 40 12.8 - Coordinate in sexagesimal degrees

Search by date: Search index: Search by date: Between: And:

- Calar Alto
- COROT
- DUNES
- DSS-63
- GASPS
- GAUDI
- GTC
- INES

SVO: Support to Data Centres

- **Second scenario**
 - **You** manage the service.

SVO: Support to Data Centres

➤ Organization of workshops

- Networking / community building
- How?
 - Putting together in the same room
 - SVO staff
 - Data providers
- What for?
 - To know each other.
 - DP: “Tell the story” of what they do and what are their VO needs.
 - VO: Show the publishing tools to publish in the VO in a much more friendly way.

Publishing tools

SVOCat Documentation

Version 0.4, Apr 2014, author: Carlos Rodrigo



[Home](#) | [Download](#) | [Documentation](#) | [Examples](#) | [Credits](#) | [Help-Desk](#)

1. Introduction
2. Download
 - 2.1. Extract
 - 2.2. Permissions
3. The files
4. Example

(You can see this documentation)

Introduction

SVOCat is an application web page and as a Virtual

CENTRO DE ASTROBIOLOGÍA		
Title: MySpec-MyImg		
Subtitle: Tools for publication of spectra and images in the Virtual Observatory		
Unidad de Archivo de Datos	2014-04-02	Page 1 of 20



UNIDAD DE ARCHIVO DE DATOS

Centro de Astrobiología

INTA-CSIC



MySpec-MyImg
Tools for publication of spectra and images in the Virtual Observatory

Workshop on data publishing



THROES Catalogue

First THROES Catalogue V1.0

[Home](#) [Data retrieval](#) [News](#) [Documentation](#) [Help-Desk](#)

RA (?) DEC (?) Radius (?) Search Reset
10 results default verb. (Maximum Search Radius allowed: 360 degrees)

[+] Hide additional search fields

Name (?)
RA (hh:mm:ss) (?)
dec (dd:mm:ss) (?)
AOT (?)
#Obs (?)
Secondary Classification (?) O rich AGB
Main Classification (?) Evolved low-intermediate mass star

First 10 results shown (25 found)

Δ (?) (arcsec)	RA (ICRS) (deg)	DEC (ICRS) (deg)	RA (ICRS) (hh:mm:ss)	DEC (ICRS) (hh:mm:ss)	Name (?)	AOT (?)	#Obs (?)	Main Classification (?)	Secondary Classification
74656.44	16.60825	12.59805555555556	01:06:25.98	12:35:53.00	WX_PSC	PacsRangeSpec	2	Evolved low-intermediate mass star	O rich AGB
125811.43	34.836625	-2.97763888888889	02:19:20.79	-2:58:39.50	OMI_CET	PacsRangeSpec	2	Evolved low-intermediate mass star	O rich AGB
185003.64	359.603625	51.38880555555556	23:58:24.87	51:23:19.70	R_CAS	PacsRangeSpec	2	Evolved low-intermediate mass star	O rich AGB
207370.65	302.616125	-6.27044444444444	20:10:27.87	-6:16:13.60	V1300_Aql-1	PacsRangeSpec	2	Evolved low-intermediate mass star	O rich AGB
207377.64	302.614208333333	-6.27102777777778	20:10:27.41	-6:16:15.70	IRC_-10 529	PacsRangeSpec	2	Evolved low-intermediate mass star	O rich AGB
208821.17	306.979958333333	-28.2610555555556	20:27:55.19	-28:15:39.80	T_Mic	PacsRangeSpec	3	Evolved low-intermediate mass star	O rich AGB
212632.49	58.3701666666667	11.4062777777778	03:53:28.84	11:24:22.60	NML_TAU	PacsRangeSpec	3	Evolved low-intermediate mass star	O rich AGB
212632.82	58.3702916666667	11.4060277777778	03:53:28.87	11:24:21.70	IK_Tau	PacsLineSpec	1	Evolved low-intermediate mass star	O rich AGB
214140.12	311.606083333333	40.1165555555556	20:46:25.46	40:06:59.60	NML_CYG	PacsRangeSpec	2	Evolved low-intermediate mass star	O rich AGB
218222.09	299.40025	-1.88647222222222	19:57:36.06	-1:53:11.30	RR_Aql	PacsRangeSpec	1	Evolved low-intermediate mass star	O rich AGB

Download all results as [VOTable](#) or [CSV file](#)
Open results table in [Aladin](#) (via JNLP/webstart)

VO and the astronomical community

Rediscover Astronomy

The Virtual Observatory - A New Era for Astronomy

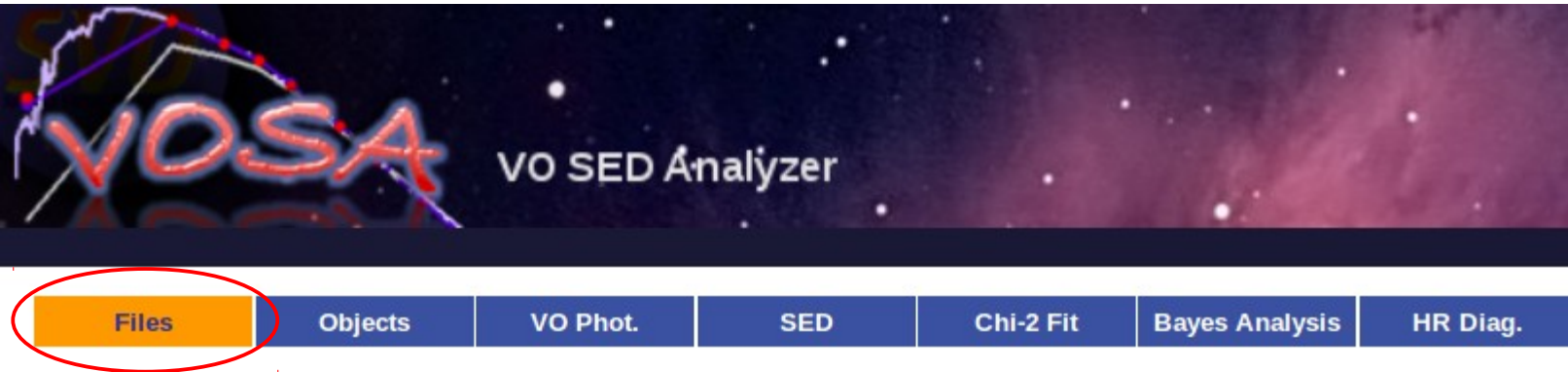


There is a new paradigm in astronomy, the Virtual Observatory (VO).

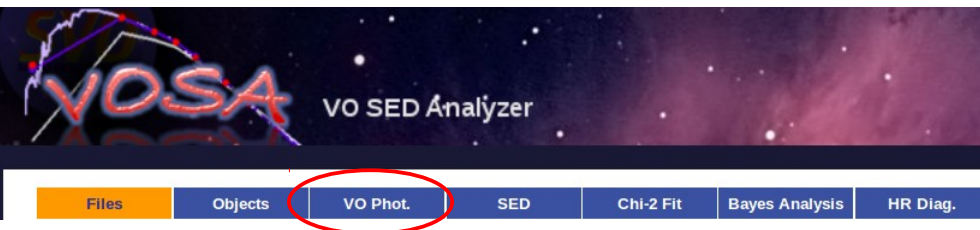
SVO: Support to the astronomical community

- **Activities focused on three major topics:**
 - **Development of VO tools**
 - **Organization of VO-schools**
 - **Support to VO-science**

VO-tools: VOSA



VOSA



Infrared

☒ 2MASS All-Sky Point Source Catalog

2MASS has uniformly scanned the entire sky in three near-infrared bands to detect and characterize point sources brighter than about 1 mJy in each band, with signal-to-noise ratio (SNR) greater than 1. [More Info.](#)

Filters: ☒ 2MASS/2MASS.J ☒ 2MASS/2MASS.H
☒ 2MASS/2MASS.Ks

Search radius: arcsec

[Show magnitude limits](#)

☒ IRAS Catalog of Point Sources, Version 2.0

This is a catalog of some 250,000 well-confirmed infrared point sources observed by the Infrared Astronomical Satellite, i.e., sources with angular extents less than approximately 0.5, 0.5, 1.0, and 2.0 arcmin in the in-scan direction at 12, 25, 60, and 1. [More Info.](#)

Filters: ☒ IRAS/IRAS.12mu ☒ IRAS/IRAS.25mu
☒ IRAS/IRAS.60mu ☒ IRAS/IRAS.100mu

Search radius: arcsec

[Show flux limits](#)

☒ AKARI/IRC mid-IR all-sky Survey (ISAS/JAXA, 2010)

This is a catalog of some 250,000 well-confirmed infrared point sources observed by the Infrared Astronomical Satellite, i.e., sources with angular extents less than approximately 0.5, 0.5, 1.0, and 2.0 arcmin in the in-scan direction at 12, 25, 60, and 1. [More Info.](#)

☒ DENIS Catalogue

This catalogue is the latest incremental release of the DENIS project. It consists of a set of 355,220,325 point sources detected by the DENIS survey in 3662 strips (covering each 30 degrees in declination and 12 arcmin in right ascension). [More Info.](#)

Filters: ☒ DENIS/DENIS.I ☒ DENIS/DENIS.J
☒ DENIS/DENIS.Ks

Search radius: arcsec

[Show magnitude limits](#)

☒ MSX6C Infrared Point Source Catalog

Version 2.3 of the Midcourse Space Experiment (MSX) Point Source Catalog (PSC), which supersedes the version (1.2) that was released in 1999 (Cat. V/107), contains over 100,000 more sources than the previous version.. [More Info.](#)

Filters: ☒ MSX/MSX.A ☒ MSX/MSX.C
☒ MSX/MSX.D ☒ MSX/MSX.E

Search radius: arcsec

[Show flux limits](#)

☒ AKARI/FIS All-Sky Survey Point Source Catalogues (ISAS/JAXA, 2010)

VOSA



Filter Profile Service

An experiment about filter standardization in the VO

Funded by



[VO Service](#) [Browse](#) [Search](#)

AuthId: Passw: [Login](#)

2MASS	AAO	AKARI	CAHA	CFHT	CTIO	DENIS	GALEX	Gemini	Generic	Geneva	GTC	Herschel	Hipparcos	HST
IAC80	INT	IRAS	ISO	IUE	Keck	Kepler	KPNO	LaSilla	LCO	LICK	Misc	MSX	NIRT	NOAO
NOT	OAF	OSN	Paranal	SAO	SLOAN	Spitzer	Subaru	Swift	TCS	TD1	TNG	TYCHO	UKIRT	WHT
WISE														

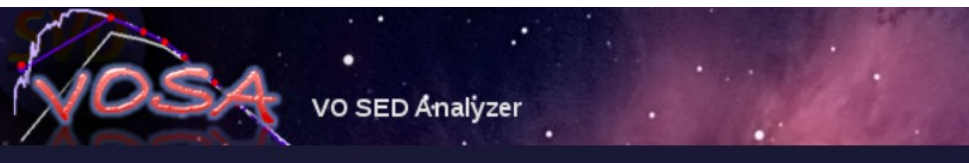
2MASS filters:

Filter ID	λ_{mean}	λ_{eff}	λ_{min}	λ_{max}	W_{eff}	ZP (Jy)	Obs. Facility	Instrument	Description
2MASS/2MASS.J	12350.0	12350.0	10806	14068	1624.1	1594.0	2MASS		2MASS J
2MASS/2MASS.H	16620.0	16620.0	14787	18231	2509.4	1024.0	2MASS		2MASS H
2MASS/2MASS.Ks	21590.0	21590.0	19544	23552	2618.9	666.8	2MASS		2MASS Ks

Filter Plots



VOSA



Files Objects VO Phot. SED **Chi-2 Fit** Bayes Analysis HR Diag.

☒ **AMES-Dusty 2000**
The AMES-Dusty Model

☒ **Kurucz ODFNEW**
ATLAS9 Kurucz ODFNEW opacities and better

☒ **BT-Settl**
The BT-Settl Model for the entire parameter space

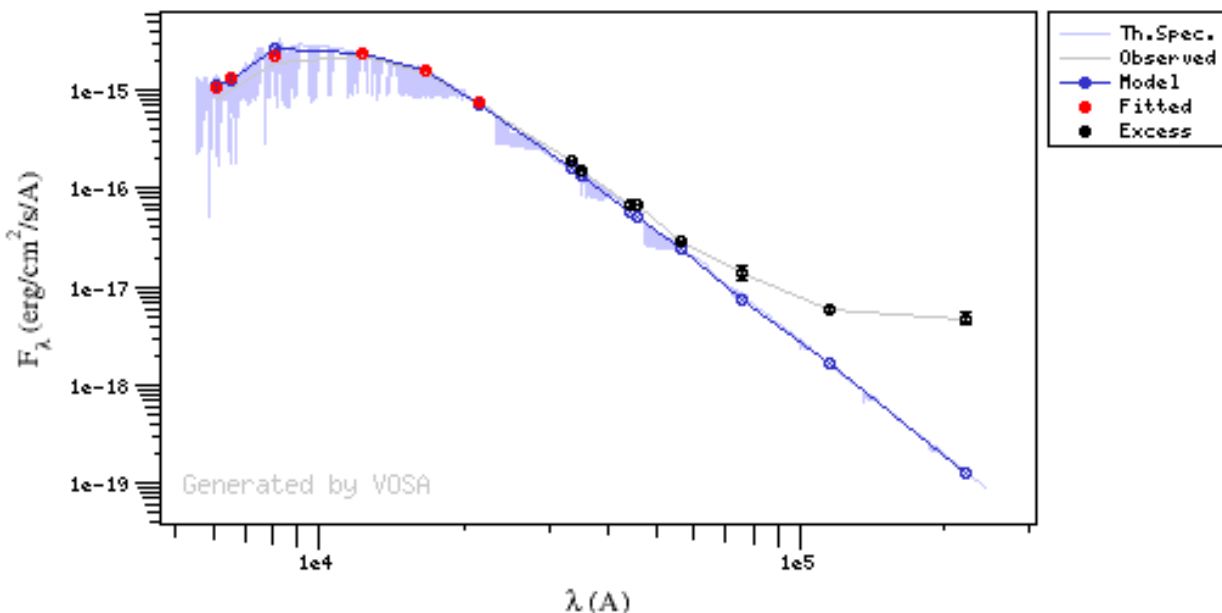
☒ **BT-DUSTY**
The BT-DUSTY Model

☒ **BT-NextGen (GN)**
The NextGen Model for 2700 K. Updated opacities

☒ **GRAMS, C-rich**
GRAMS (Grid of Radiative transfer Models) for C-rich stars

L0r1048

BT-Settl1, Teff:3500, logg:4.5, Meta.:0.3, Av:0.36209598



$$\chi_r^2 = \frac{1}{N - n_p} \sum_{i=1}^N \left\{ \frac{(Y_{o,i} - M_d Y_{m,i})^2}{\sigma_{o,i}^2} \right\}$$

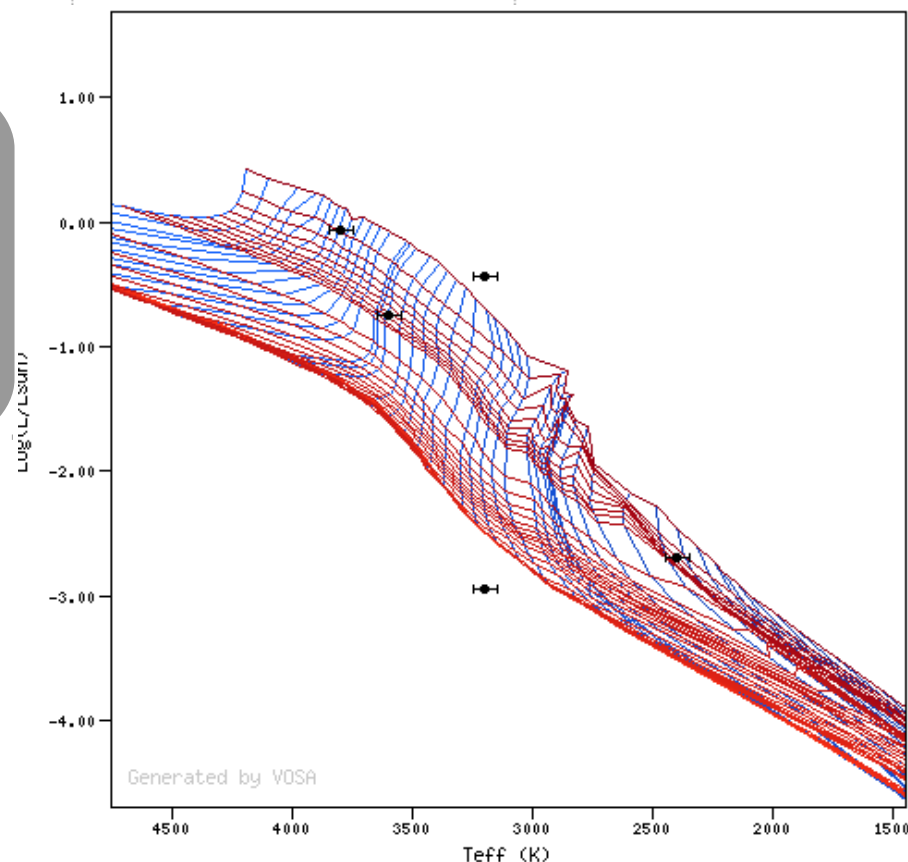
$$P'(\lambda_j) = \sum_i \exp(-X^2/2) / \sum_j P(\lambda_j)$$

VOSA

	Object	Model	T _{eff}		LogL		Age			Mass	
☑	L Ori005	BT-Settl	3800	(3750,3850)	-0.0652	(-0.0692,-0.0613)	0.0020	..(0.0018,0.0023)	[1]	0.9456	(0.8718,1.0001)
☑	L Ori029	BT-Settl	3200	(3150,3250)	-0.4357	(-0.4463,-0.4253)	---	---	[4]	---	---
☑	L Ori048	BT-Settl	3600	(3550,3650)	-0.7493	(-0.7540,-0.7447)	0.0076	..(0.0060,0.0094)		0.5671	(0.5006,0.6112)
☑	L Ori158	BT-Settl	3200	(3150,3250)	-2.9517	(-2.9580,-2.9455)	---	---	[4]	---	---
☑	L Ori162	BT-Settl	2400	(2350,2450)	-2.6969	(-2.7049,-2.6891)	0.0030	..(0.0020,0.0100)		0.0170	(0.0147,0.0200)

- First release: 2008
- > 300 active users
- > 50 refereed papers

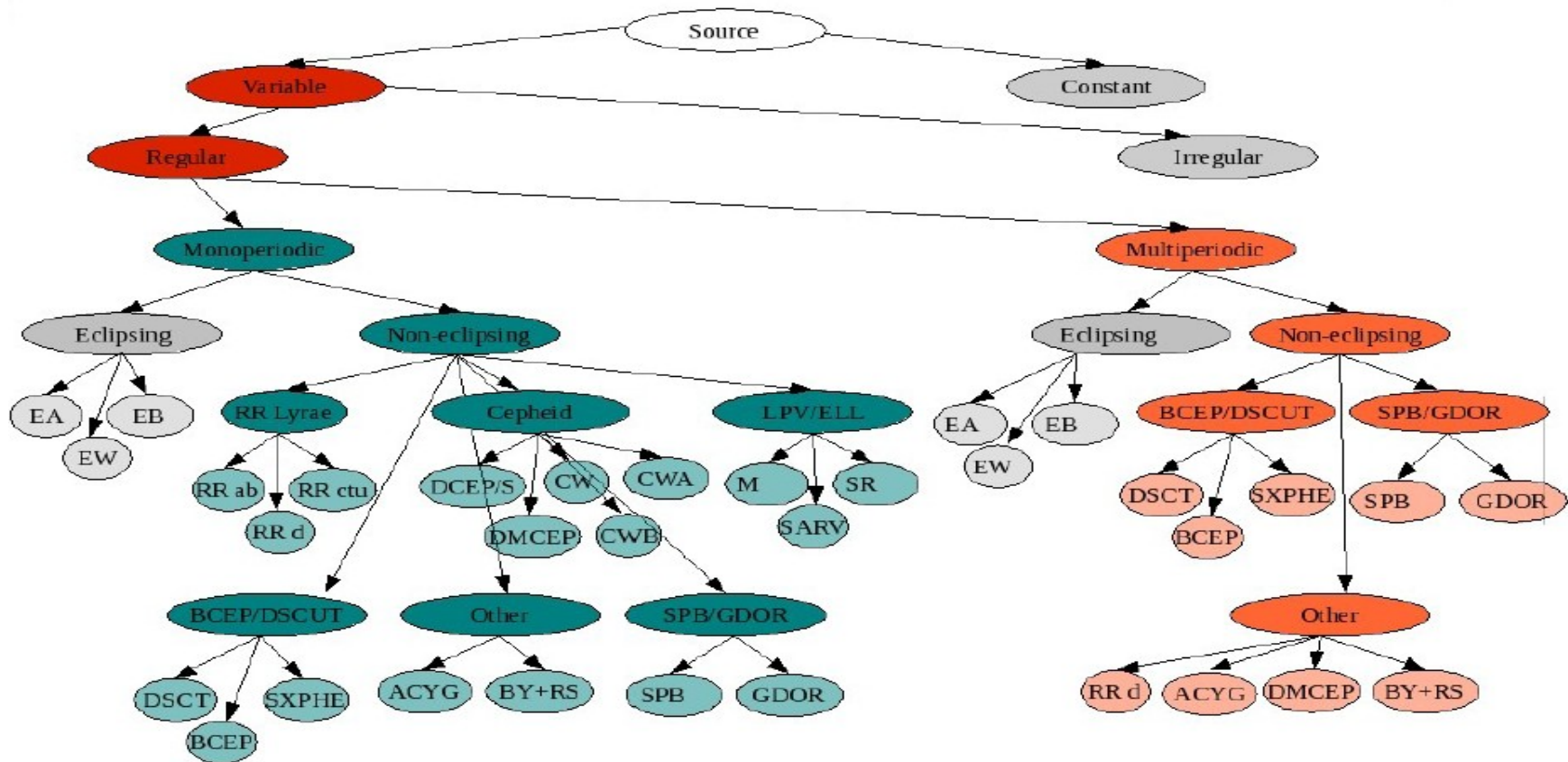
<http://svo2.cab.inta-csic.es/theory/vosa/>



VOSA: The power of standardization

- Discovery and access of observational data → [Registry + Cone Search](#).
- Magnitude to flux transformation → [Filter Profile Service](#).
- Unit handling (wave and flux) → [Data Model](#).
- Discovery and access of theoretical data → [Registry + SSAP + S3](#).
- Comparison among theoretical models. [Data Model](#).

VO tools: Data Mining



VO tools: Data Mining



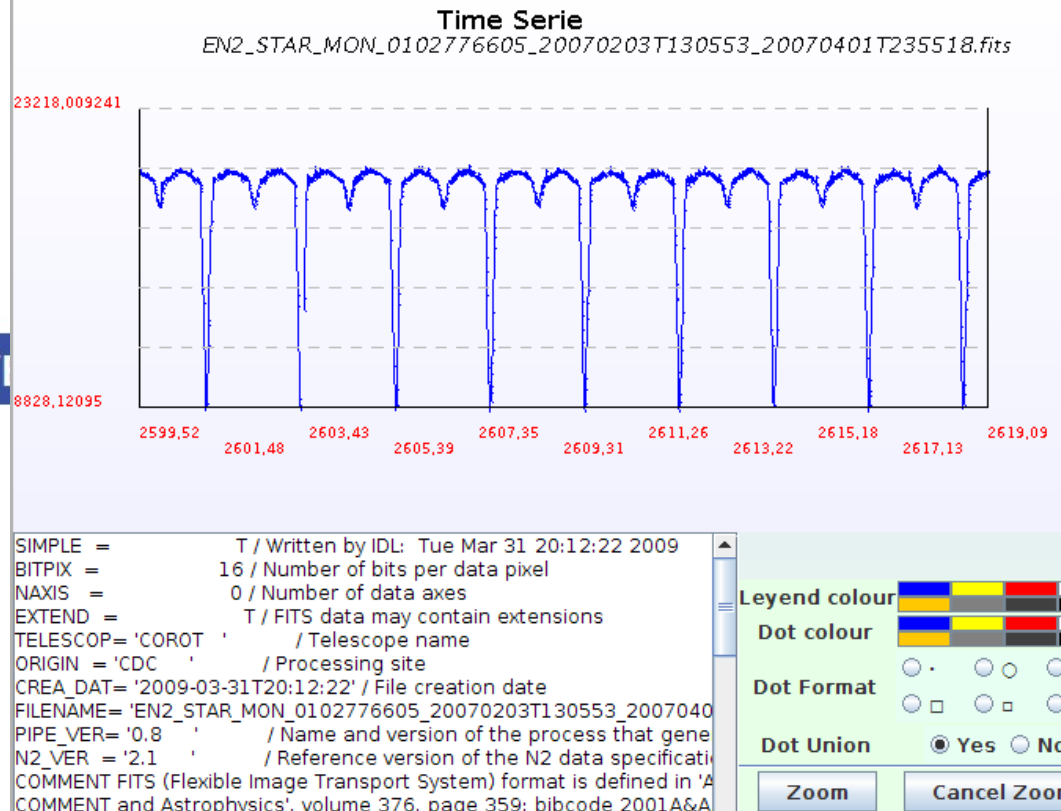
THE COROT PUBLIC ARCHIVE

Found 255 records, displaying page 1 of 6

Retrieval Format: Mark Fits: ☐

EXOPLANET

RUN	COROT ID	TYPE	RA(J2000)	DE(J2000)	START DATE	END DATE	SpType	LUM	VMAG	B-V	BROWSE	FETCH/MARK	VAR1	PROB1	VAR2	PROB2
IRa01	102776605	monochromatic	101.34364	-0.65412	2007-02-03 13:05:53.0	2007-04-01 23:55:18.0	K3	V	16.226	0.839	FITS	FITS ☐	ECL	0.999967	MISC	3.3E-5
IRa01	102897917	monochromatic	102.12041	-0.72015	2007-02-03 13:05:53.0	2007-04-01 23:55:18.0	K3	V	16.126	0.914	FITS	FITS ☐	ECL	0.999967	ELL	2.5E-5
IRa01	102897917	monochromatic	102.12041	-0.72015	2007-02-03 13:05:53.0	2007-04-01 23:55:18.0	K3	V	16.126	0.914	FITS	FITS ☐	ECL	0.999967	ELL	2.5E-5
IRa01	102897917	monochromatic	102.12041	-0.72015	2007-02-03 13:05:53.0	2007-04-01 23:55:18.0	K3	V	16.126	0.914	FITS	FITS ☐	ECL	0.999967	ELL	2.5E-5
IRa01	102776605	monochromatic	101.34364	-0.65412	2007-02-03 13:05:53.0	2007-04-01 23:55:18.0	K3	V	16.226	0.839	FITS	FITS ☐	ECL	0.999967	MISC	3.3E-5
IRa01	102776605	monochromatic	101.34364	-0.65412	2007-02-03 13:05:53.0	2007-04-01 23:55:18.0	K3	V	16.226	0.839	FITS	FITS ☐	ECL	0.999967	MISC	3.3E-5



SVO schools



Spanish Virtual Observatory



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[User Menu](#)

Octava Escuela del Observatorio Virtual Español

Centro de Astrobiología (INTA-CSIC). Villafranca del Castillo. Madrid,
25-26 noviembre 2014

[Home](#) - [Programme](#) - [Participants](#)

Eighth SVO School

[Edit](#)

The Spanish Virtual Observatory (SVO) is organising a VO school at the Centro de Astrobiología.

Important dates

- Deadline for submission of use cases: November 10, 2014
- Deadline for registration: November 21, 2014
- School: November 25-26, 2014

Goal of the School

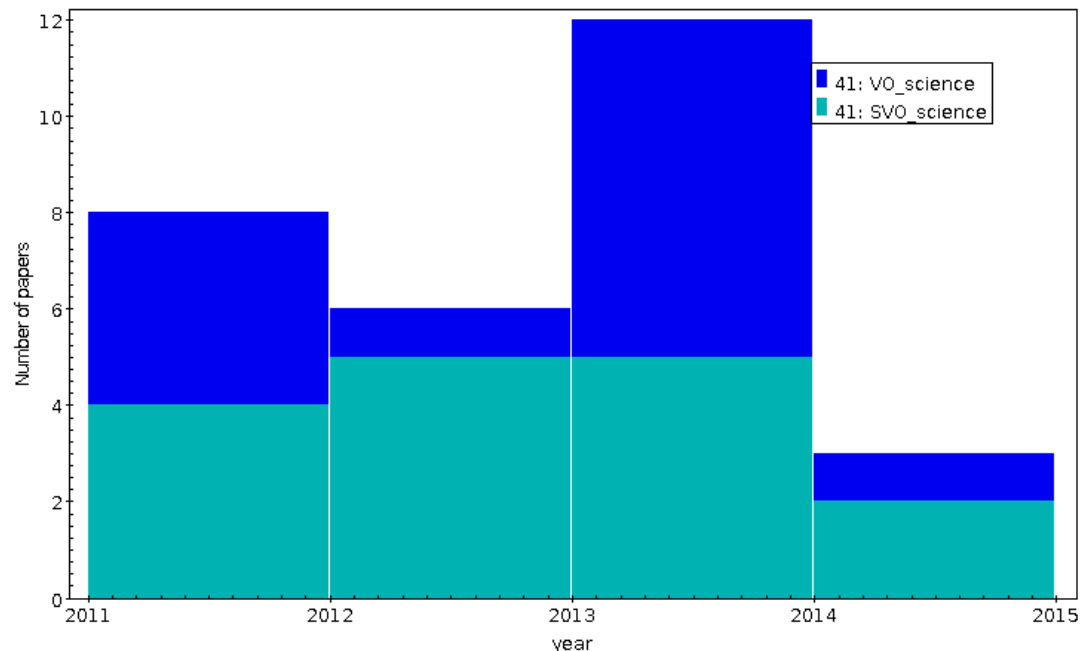
The Virtual Observatory (VO) is opening new ways of optimally exploiting the ever increasing volume of data, both observational and theoretical, available in the astronomical archives. The main objective of this school is to expose participants to the most popular VO tools and services available today so that they can use them efficiently for their own research. During the school, VO experts will guide participants on the usage of such tools through a series of real life science cases. The use cases will focus on:

Support to science community

11 projects. 9 refereed papers.



55% of the refereed VO-papers published in the last three years include a member of the Spanish astronomical community.



VO Science

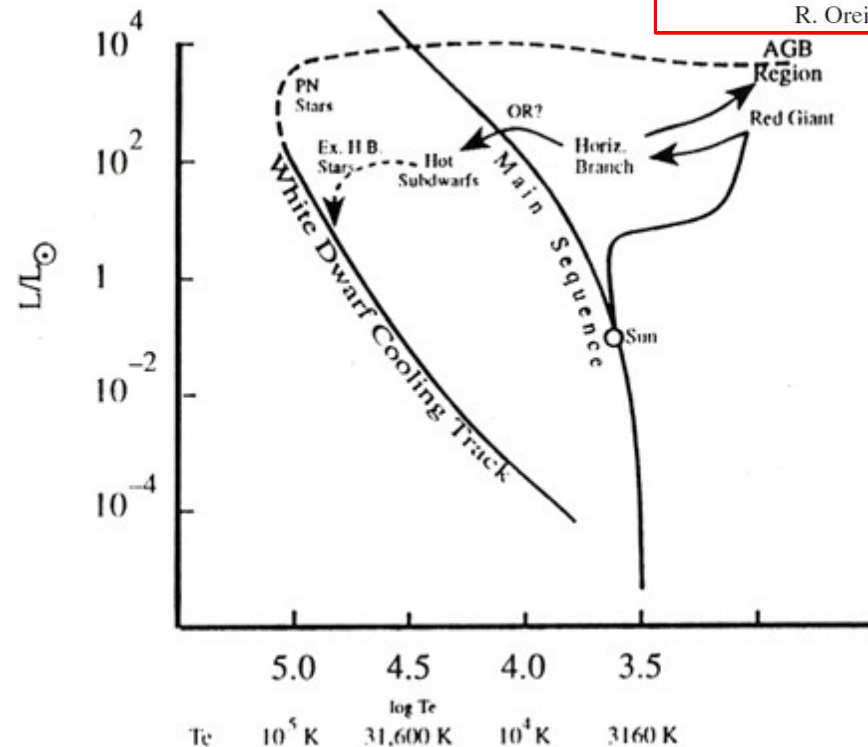
- Science that clearly benefits from using VO tools and services.

A&A 530, A2 (2011)
DOI: [10.1051/0004-6361/201016324](https://doi.org/10.1051/0004-6361/201016324)
© ESO 2011

Astronomy
&
Astrophysics

A search for new hot subdwarf stars by means of Virtual Observatory tools

R. Oreiro¹, C. Rodríguez-López^{2,3}, E. Solano⁴, A. Ulla³, R. Østensen⁵, and M. García-Torres⁶



- Uncertain origin.
- Need of significant number of “bona-fide” hot sds.

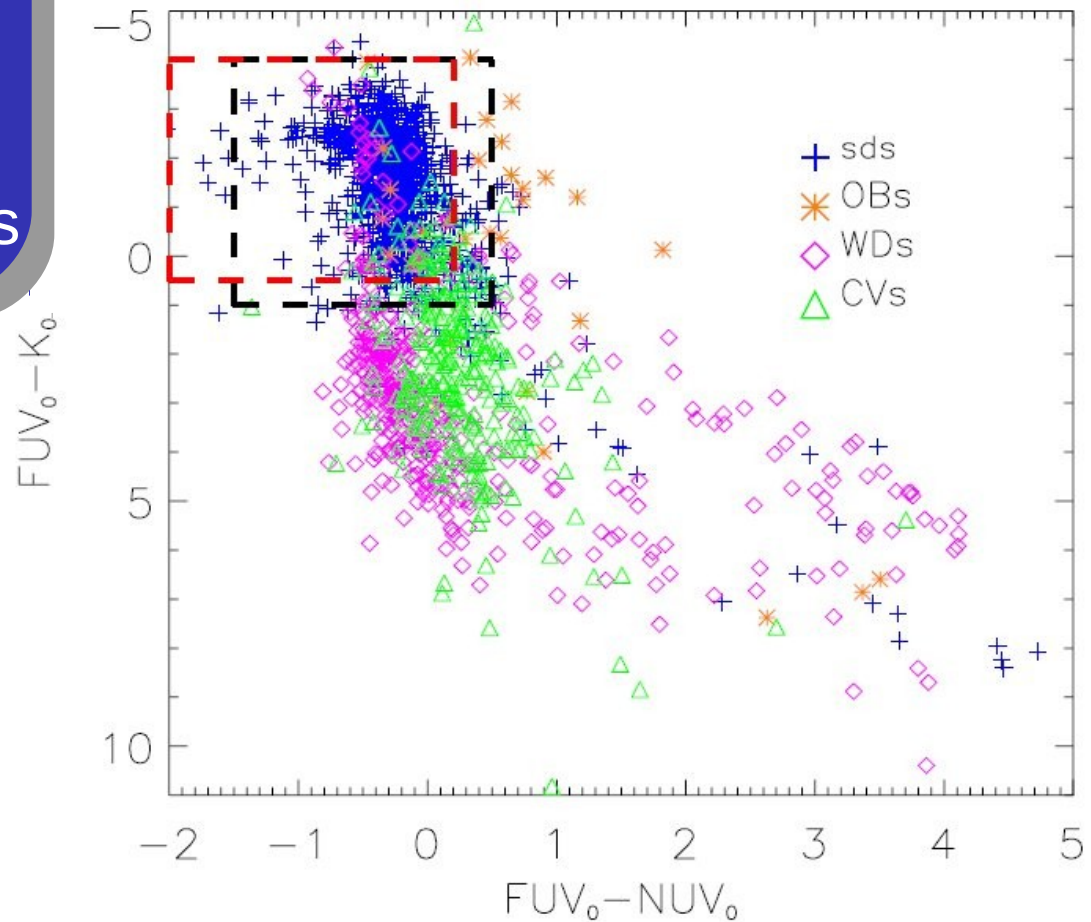
VO Science

X-match: GALEX – 2MASS.

All-sky surveys

GALEX: > 75 Msources

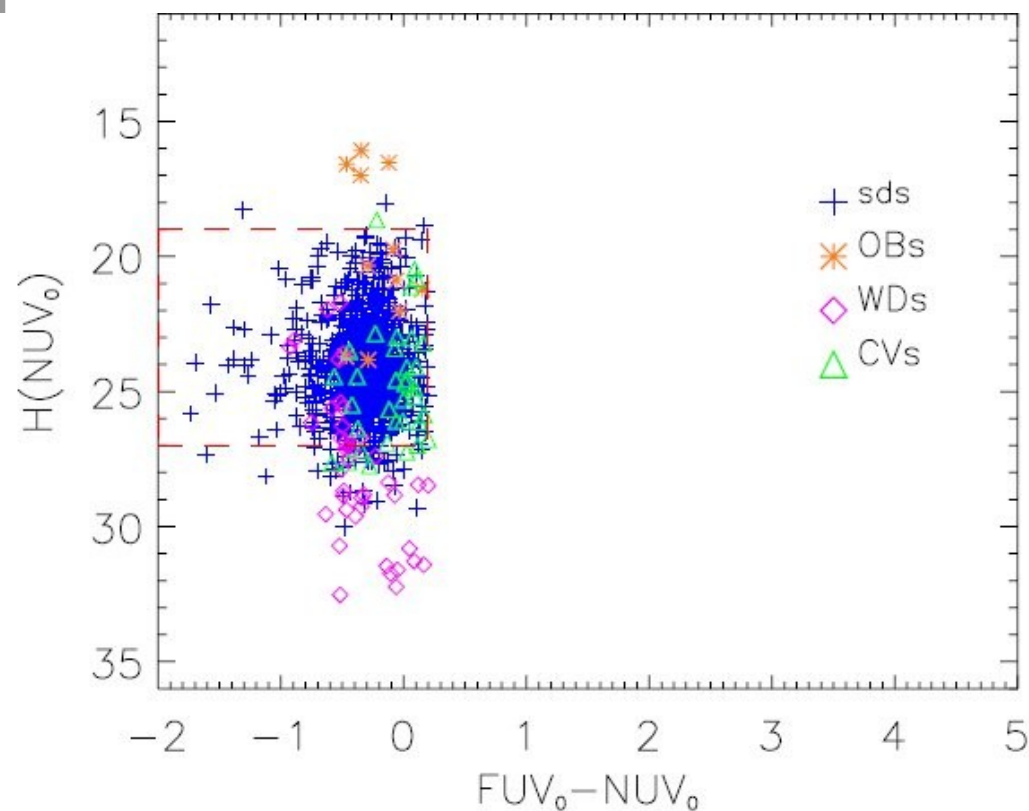
2MASS: >400 Msources



VO Science

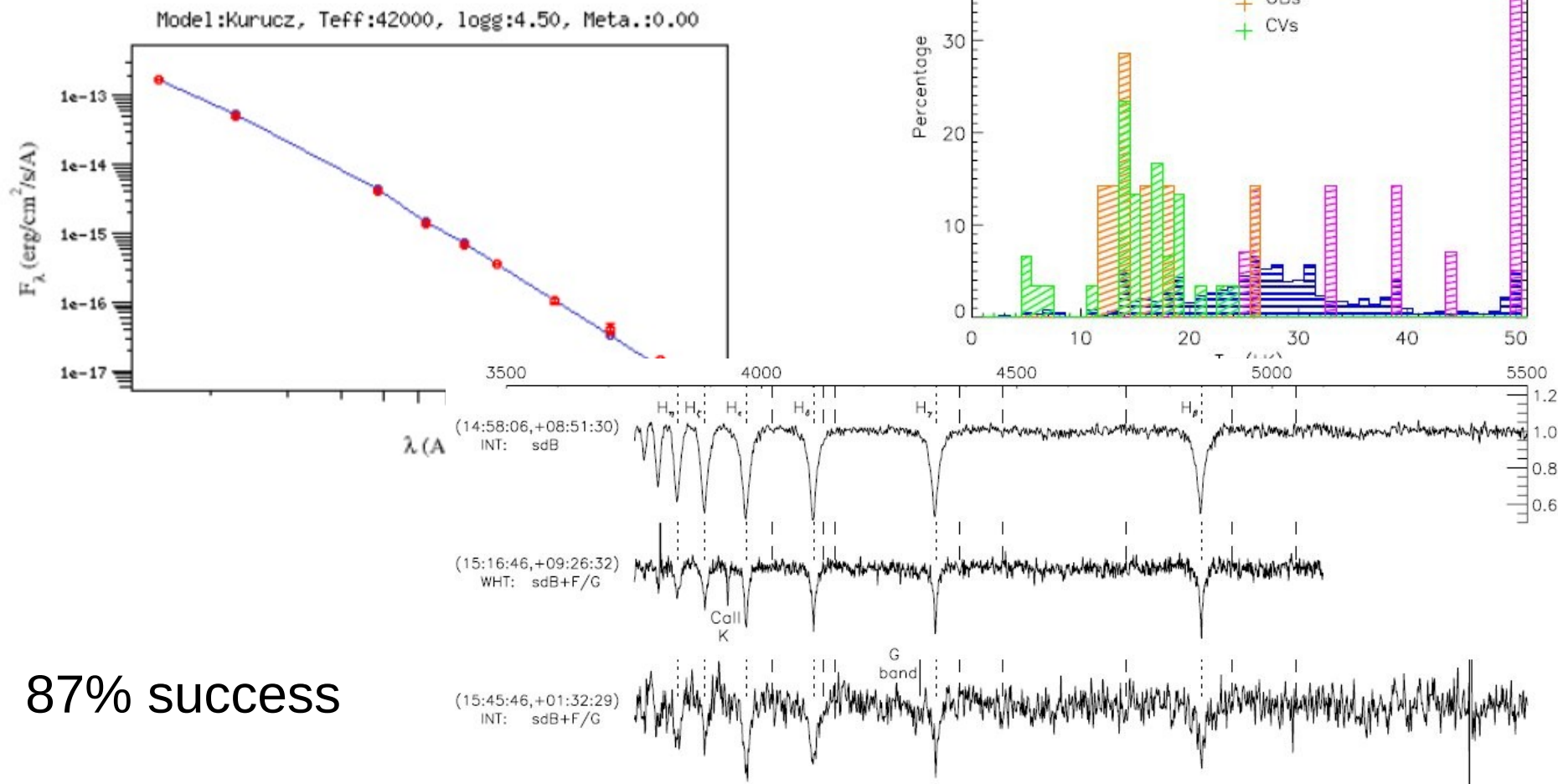
X-match: GALEX /2MASS -
SuperCosmos

$$H(\text{Filter}) = m + 5 \log_{10}(\mu) + 5$$



VO Science

Filtering by Teff



A&A 534, L7 (2011)
DOI: 10.1051/0004-6361/201117822
© ESO 2011

Astronomy
&
Astrophysics

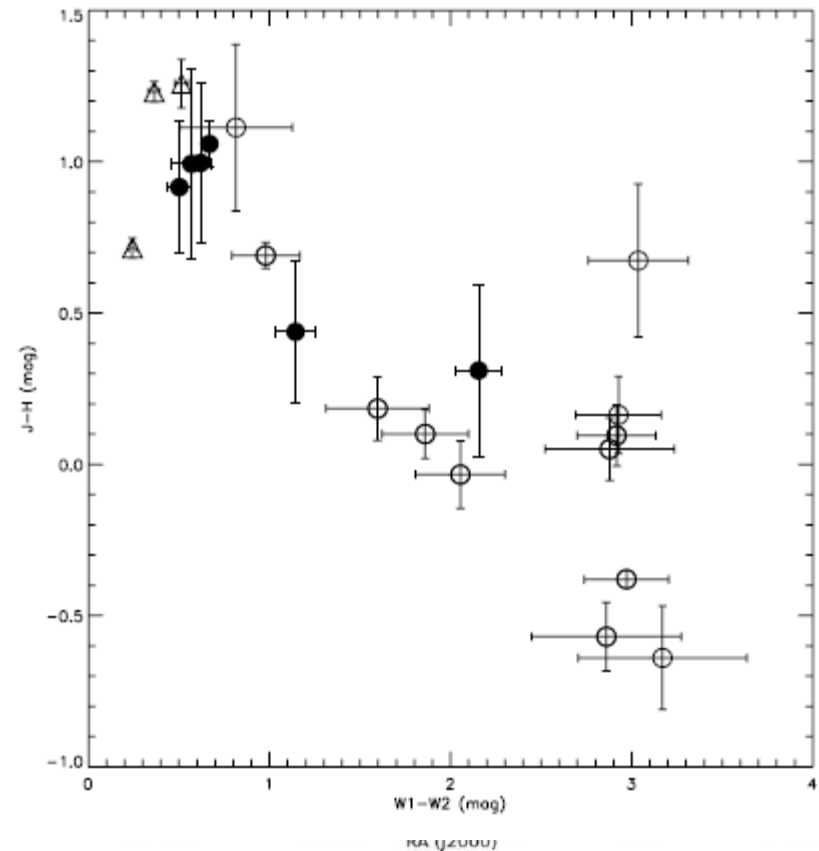
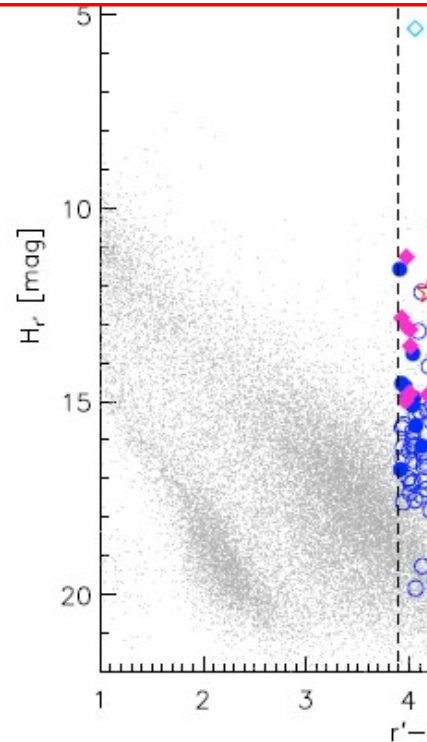
LETTER TO THE EDITOR

WISE/2MASS-SDSS brown dwarfs candidates using Virtual Observatory tools^{*}

M. Aberasturi^{1,2}, E. Solano^{1,2}, and E. L. Martín¹

VIRTUAL OBSERVATORY TOOLS

FEZ-ORTIZ, E. SOLANO AND E. L. MARTÍN
8, E-28691 Villanueva de la Cañada, Madrid, Spain

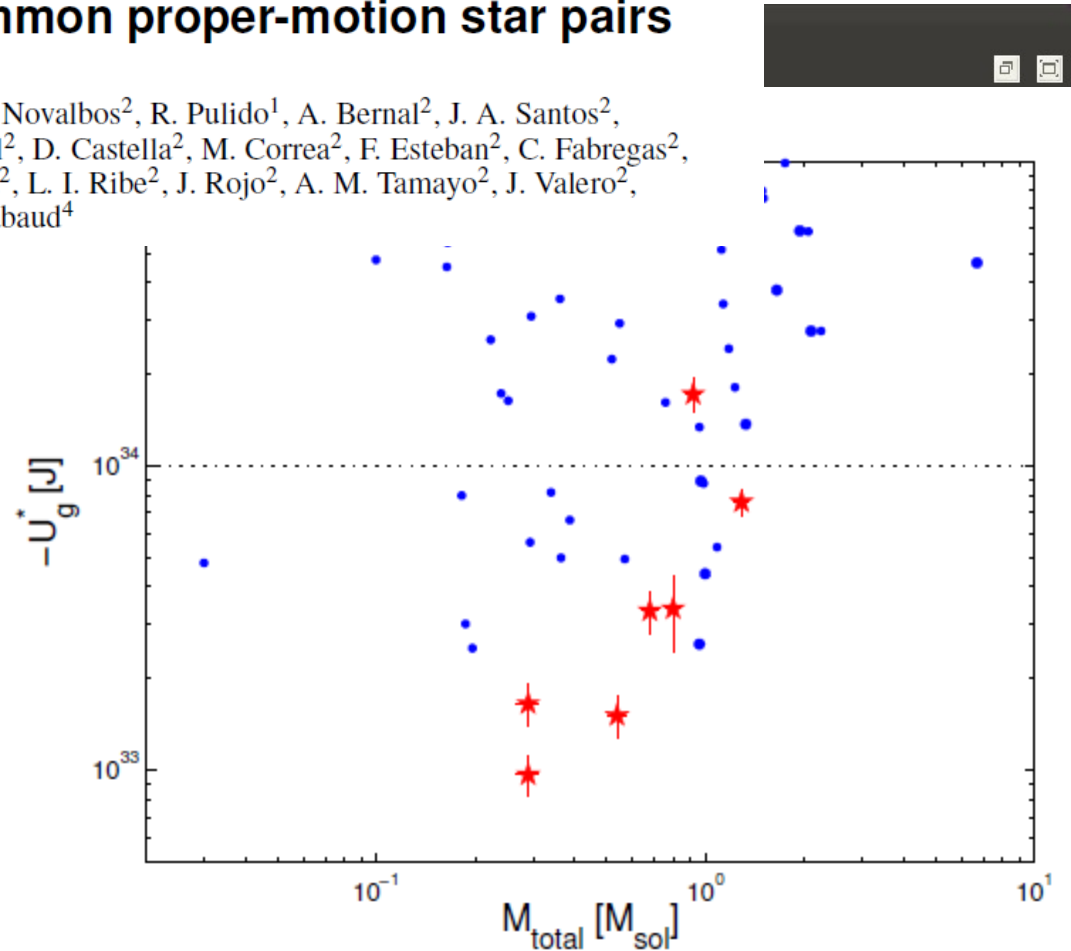
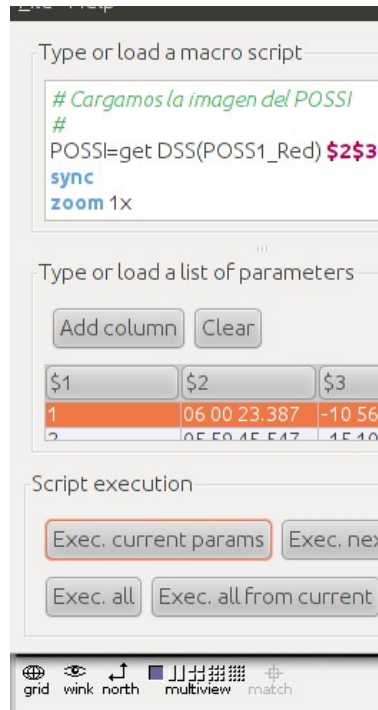


Amateurs. Scientific support

1669 new pairs included in WDS.

Seven ultrafragile, low-mass, common proper-motion star pairs

J. A. Caballero¹, E. Solano¹, F. X. Miret², T. Tobal², I. Novalbos², R. Pulido¹, A. Bernal², J. A. Santos², J. Alonso Santiago^{2,3}, L. Alonso², E. Arredondo², M. Bernal², D. Castella², M. Correa², F. Esteban², C. Fabregas², N. Franc², T. Galera², C. Schnabel², N. Miret², A. Oliva², L. I. Ribe², J. Rojo², A. M. Tamayo², J. Valero², D. Valls-Gabaud⁴



SVO: Education

- **PhD Thesis (1+2)**
- **Master Thesis**
- **Undergraduate / graduate research work**
- **Master courses**
 - Madrid
 - Valencia
 - Granada



SVO: Education

Enseñando Astronomía con el Observatorio Virtual

Si haces uso de los recursos disponibles en esta página, te agradeceríamos que nos lo hicieras saber escribiendo a: esm@cab.inta-csic.es

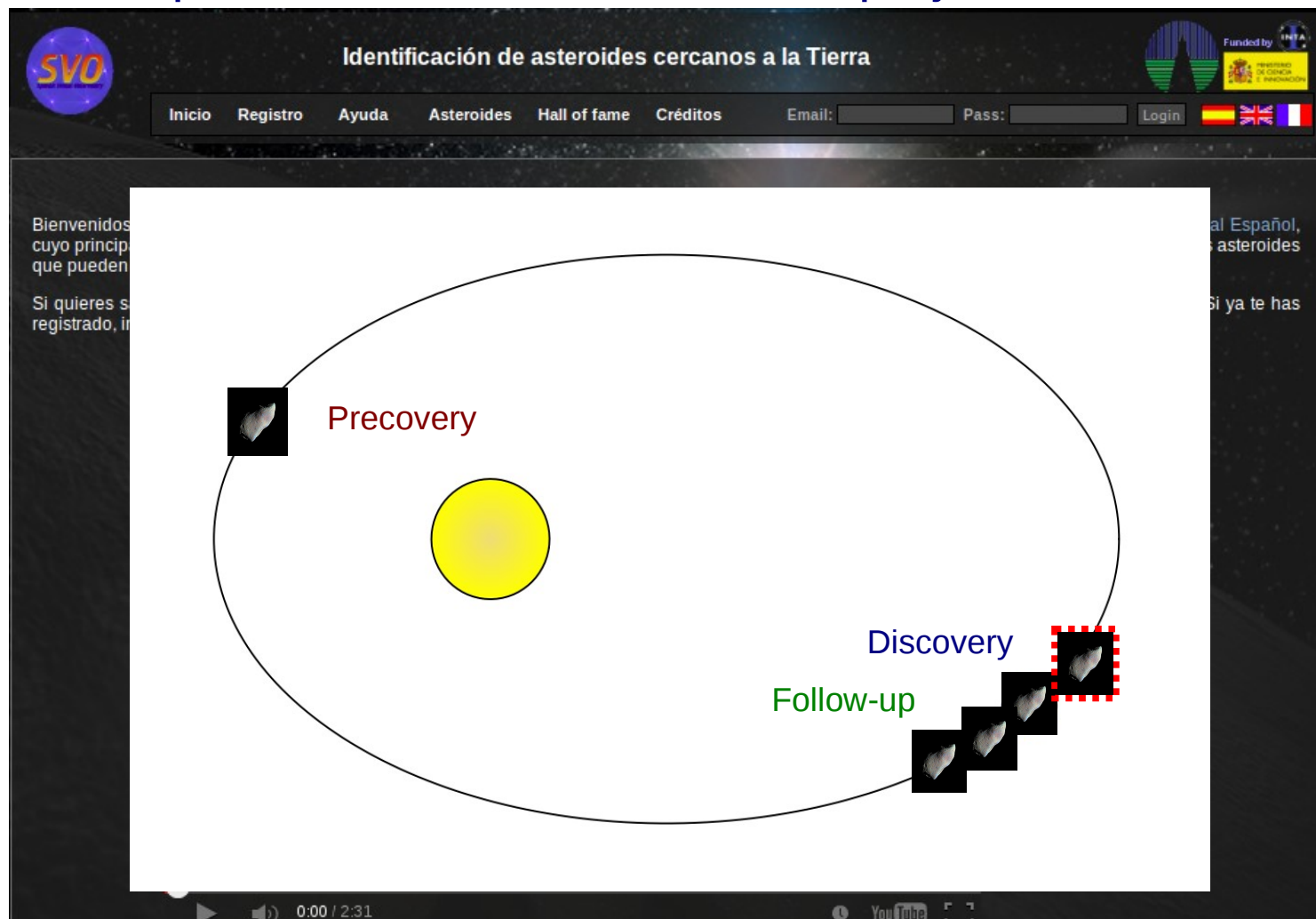
!!! Muchas gracias!!!

Casos prácticos del Máster de Astronomía y Astrofísica de la Universidad Internacional de Valencia

- Título: "Composición mineralógica de asteroides". (PDF)
- Título: "Las lunas de Júpiter". (PDF)
- Título: "Búsqueda de exoplanetas y zona de habitabilidad". (PDF)
- Título: "Estudio multirango de la galaxia NGC 2997 con VO". (PDF)
- Título: "Búsqueda de enanas marrones con VO". (PDF)
- Título: "Astrometría: Movimientos propios". (PDF)
- Título: "Cálculo de distancias entre galaxias: Las Cefeidas". (PDF)
- Título: "La constante de Hubble". (PDF)
- Título: "Análisis de datos espectroscópicos". (PDF)

SVO: Outreach. Citizen science

<http://www.laeff.cab.inta-csic.es/projects/near/>



SVO: Outreach. Citizen science

sdss_r

sdss_i






SAO/NASA ADS Astronomy Abstract Service

Ver resumen hasta el 2014 - 11 - 14 Ver

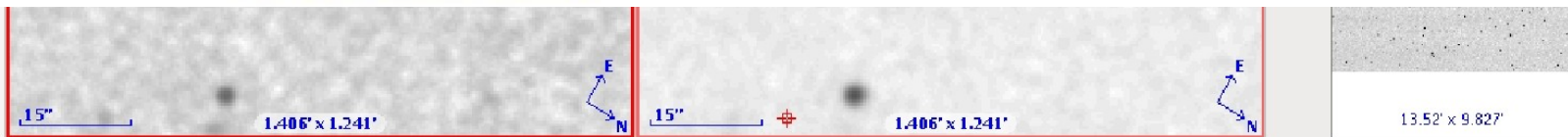
Número de usuarios registrados: 3678

	all	mars	nea	sdss	vhs	vst	ukidss
Número de usuarios que han hecho medidas	530	229	505	502	67	39	89
Número de medidas realizadas	378277	172411	205857	363057	3684	748	10779
Número de objetos comprobados	3759	2400	1358	3469	61	44	346
Número de parejas objeto/imagen distintas comprobadas	37029	25151	11877	35309	497	92	1130
Objetos para los que se han publicado medidas en el MPC	936	339	597	860	44	3	39
Número de medidas publicadas en el MPC	4323	1787	2536	3901	317	6	99

Publication Date: 08/2011

Origin: MPC

Bibliographic Code: [2011MPC..75600...1I](#)



Was it worth it?

*** How do you see the role of the Virtual Observatory as a research infrastructure for astronomy?**

- 41 Very important
- 14 Important
- 13 Sometimes useful
- 1 Irrelevant

*** What is your opinion about the Spanish Virtual Observatory in terms of professionalism?**

- 56 Very professional
- 9 Moderately professional
- 1 Not professional at all

*** What is your overall degree of satisfaction with the Spanish Virtual Observatory?**

- 39 High
- 24 Normal
- 4 Low. In this case, please, tell us how we could improve

Summary

- Is VO for IT people? **YES**
 - For data centres? **YES**
 - For astronomers? **YES**
 - For everybody? **YES**
 - Who is behind VO?
 - **IVOA, 21 VO projects, EC, ASTRONET, RDA,...**
 - Is VO sustainable? **I hope it is**
 - Does it really help astronomers? **YES**
-
- **esm@cab.inta-csic.es**
 - **<http://svo.cab.inta-csic.es>**
 - **[@ObsVirtEsp](#)**