

# VOSA

## A VO Spectral Energy Distribution Analyzer

Carlos Rodrigo Blanco<sup>1,2</sup>  
Amelia Bayo Arán<sup>3</sup>  
Enrique Solano<sup>1,2</sup>  
David Barrado y Navascués<sup>1</sup>

<sup>1</sup>CAB,INTA-CSIC

<sup>2</sup>Spanish Virtual Observatory

<sup>3</sup>European Southern Observatory

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# Introduction

## VOSA (VO Sed Analyzer)

- a web tool: <http://svo.cab.inta-csic.es/theory/vosa/>
- designed to automatically determine physical parameters from comparison of observed photometry with collections of theoretical models.
- for several objects at the same time. ( $\sim 1000$  *objects*)
- More than 300 users analysing data.
- More than 6000 data files analysed.
- Using VO tools and services.

# Workflow

**1**

## Build object SEDs.

- Object properties: name resolution, distance, extinction.
- User photometry tables + VO catalogs.

**2**

## Analyze object SEDs.

- Fit observed data with theoretical spectra models and/or templates from the VO and estimate physical properties for the objects. (Chi-square test + Bayes analysis)
- Generate a Hertzsprung-Russel diagram using the estimated parameters, obtaining isochrones and evolutionary tracks from the VO (only stars).

**3**

## Save results as VOTable, ASCII, png, eps...

# Two different workflows

## VOSA: VO Sed Analyzer

VO SED Analyzer

### VOSA

VOSA allows to analyze both stellar and galactic data but, given that the physics involved is not the same, there are some important differences between both cases.

Please, select first what type of objects you want to work with in this session.



Stars and brown dwarfs



Galaxies

**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 AyA2008-02156.*

**Referencing VOSA in publications:**

If your research benefits from the use of VOSA, we would appreciate if you could include the following reference in your publication:

*Bayo, A., Rodrigo, C., Barrado y Navascués, D., Solano, E., Gutiérrez, R., Morales-Calderón, M., Allard, F. 2008, A&A 492,277B.*

# News: SED building

- More filters.
  - Filter properties from the SVO Filter Profile Service.
  - ~ 1800 filters available.
  - Better correspondence with the Photometry Data Model.
- More options.
  - *nofit*: including points in the SED that won't be used for the analysis.
  - *Av range*: specifying an extinction range so that extinction becomes a fit parameter.
- More VO photometry catalogues.

# New: SED: more filters



## Filter Profile Service

An experiment about filter standardization in the VO



VO Service Browse Search

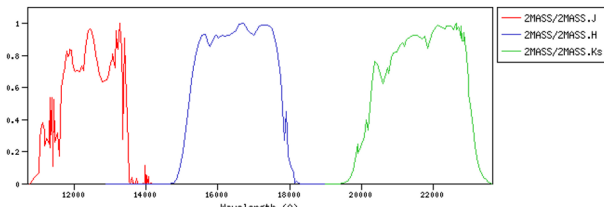
AuthId:  Passw:  Login Register

2MASS	AAO	AKARI	CAHA	CFHT	CTIO	DENIS	GALEX	Gemini	Generic	Geneva	GTC	Hipparcos	HST	IAC80
INT	IRAS	IUE	Keck	KPNO	LaSilla	MSX	NIRT	NOT	OAF	Paranal	SAO	SLOAN	Spitzer	Subaru
TCS	TNG	TYCHO	UKIRT	WHT	WISE									

### 2MASS filters:

Filter ID	$\lambda_{mean}$	$\lambda_{eff}$	$\lambda_{min}$	$\lambda_{max}$	$W_{eff}$	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



# New: SED: more filters



## Filter Profile Service

An experiment about filter standardization in the VO



VO Service Browse Search

AuthId:  Passw:  Login Register

Most of the filters from the [SVO Filter Profile Service](#) are available to be used in VOSA using the FilterID as name.

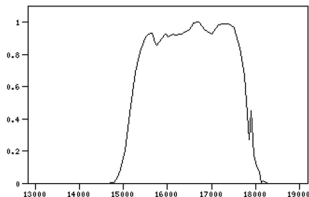
Some of them are not in the list below, in some cases to make the list more easy to browse (because they seem to be less popular filters) and in other cases because not all the synthetic photometry is ready yet. In any case, you can try to use them too.

If you want to upload your own photometry into VOSA as magnitudes, make sure that VOSA will transform those magnitudes to fluxes as you expect (click on the filter name in this list to see the details of the transformation for that case). If not, please, transform your photometry to fluxes before uploading it.

You can click on the table headers to sort the list by that field

Filter ID	$\lambda_{\text{eff}}$	$W_{\text{eff}}$	$A_t/A_v$	ZP (Jy)	Mag.Sys.	ZP Type	Description
<a href="#">2MASS/2MASS.H</a>	16620.00	2509.40	0.19	1024.00	Vega	Pogson	2MASS H

2MASS/2MASS.H



### 2MASS/2MASS.H

a.k.a. **2MASS\_H** (you can still use the old vosa name for this filter in your input files)

VOSA will assume that, if you include in your input file magnitudes corresponding to this filter, these magnitudes must be transformed to fluxes using the following relation:

$$F = F_0 * 10^{-\text{mag}/2.5}$$

where

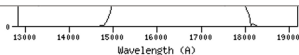
- $F_0 = 1024.00 \text{ Jy } (1.13e-10 \text{ erg/cm}^2/\text{s}/\text{A})$

If this is not right for your case, please, transform your magnitudes to fluxes before uploading them to VOSA

More info about this filter in the [Filter Profile Service](#)



# New: SED: more filters



It is not too late for your case; please, transfer your magnitudes to filter series spreading them to VOSA

More info about this filter in the [Filter Profile Service](#)

<a href="#">2MASS/2MASS.J</a>	12350.00	1624.15	0.31	1594.00	Vega	Pogson	2MASS J
<a href="#">2MASS/2MASS.Ks</a>	21590.00	2618.86	0.13	666.80	Vega	Pogson	2MASS Ks
<a href="#">AAO/AAO.aa01</a>	4351.69	1035.57	1.31	3926.34	Vega	Pogson	AAO #1, aao glass b, B
<a href="#">AAO/AAO.aa014</a>	6418.54	1601.36	0.83	2962.97	Vega	Pogson	AAO #14, aao glass os, O*
<a href="#">AAO/AAO.aa02</a>	5349.43	909.82	1.04	3636.87	Vega	Pogson	AAO #2, aao glass v, V
<a href="#">AAO/AAO.aa021</a>	3634.27	642.64	1.57	1717.18	Vega	Pogson	AAO #21, aao cus04, U
<a href="#">AAO/AAO.aa022</a>	4391.67	1067.90	1.30	3967.53	Vega	Pogson	AAO #22, kpno b, B
<a href="#">AAO/AAO.aa023</a>	5416.22	1044.08	1.02	3592.21	Vega	Pogson	AAO #23, kpno v, V
<a href="#">AAO/AAO.aa024</a>	6499.55	1303.98	0.82	2970.27	Vega	Pogson	AAO #24, kpno r, R
<a href="#">AAO/AAO.aa025</a>	8172.24	1715.45	0.59	2370.40	Vega	Pogson	AAO #25, kpno i, I
<a href="#">AAO/AAO.aa03</a>	6677.10	1111.97	0.79	2866.13	Vega	Pogson	AAO #3, aao glass r, R
<a href="#">AAO/AAO.aa04</a>	8578.38	3028.26	0.54	2265.66	Vega	Pogson	AAO #4, aao glass i, I
<a href="#">AAO/AAO.aa044</a>	4369.69	959.06	1.31	4018.21	Vega	Pogson	AAO #44, anu 75 b, B
<a href="#">AAO/AAO.aa045</a>	5397.00	890.11	1.03	3625.75	Vega	Pogson	AAO #45, anu 75 v, V
<a href="#">AAO/AAO.aa046</a>	6358.40	1360.61	0.84	3017.04	Vega	Pogson	AAO #46, anu 75 r, R
<a href="#">AAO/AAO.aa047</a>	7784.64	1107.80	0.63	2478.48	Vega	Pogson	AAO #47, anu 75 i, I
<a href="#">AAO/AAO.aa048</a>	3692.74	546.01	1.55	1844.33	Vega	Pogson	AAO #48, u 48, U
<a href="#">AAO/AAO.aa049</a>	4267.82	963.03	1.34	3869.58	Vega	Pogson	AAO #49, b 49, B
<a href="#">AAO/AAO.aa05</a>	4430.24	1100.90	1.29	3942.03	Vega	Pogson	AAO #5, aao glass bj, BJ
<a href="#">AAO/AAO.aa050</a>	5386.72	961.22	1.03	3608.97	Vega	Pogson	AAO #50, v 50, V
<a href="#">AAO/AAO.aa053</a>	4692.92	27.22	1.22	4214.00	Vega	Pogson	AAO #53, taurus 469.2, He II
<a href="#">AAO/AAO.aa054</a>	5022.47	46.99	1.13	3942.02	Vega	Pogson	AAO #54, taurus 502.3, [O III]
<a href="#">AAO/AAO.aa055</a>	5898.78	44.01	0.93	3353.00	Vega	Pogson	AAO #55, taurus 590.4, He I/Na D
<a href="#">AAO/AAO.aa056</a>	6308.96	42.00	0.85	3137.01	Vega	Pogson	AAO #56, taurus 631.4, [O I]
<a href="#">AAO/AAO.aa057</a>	6585.67	44.75	0.80	2521.60	Vega	Pogson	AAO #57, taurus 658.4, H alpha



# New: SED: more VO Photometry catalogues

- New catalogues.
  - DENIS,
  - MSX6C,
  - AKARI, IRC and FIS,
  - IRAS,
  - C2D, Taurus and GLIMPSE Spitzer catalogues,
  - WISE.
- New releases.
  - UKIDSS DR5/7,
  - SDSS DR8
- More than 20 catalogues.

# New: SED: more VO Photometry catalogues

Theoretical model services Documents Models Services

**SVO** **VOSA: VO Sed Analyzer** VO SED Analyzer

Services: VOSA Filters TSAP S3if My data Users Models Uploads Logout

**VOSA**

Files	Objects	VO Phot.	SED	Chi-2 Fit	Bayes Analysis	HR Diag.	Save Results	Log	Help	Logout
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Stars and brown dwarfs (Change) File: aa (info) (Change)

## VO photometry

This option allows you to increase the wavelength coverage of the SEDs of your objects adding photometry from VO catalogues. Take a look to the corresponding [Help Section](#) and [Credits Page](#) for more information.

**First select the VO services that you want to use**

### 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: 5 arcsec  
[Show magnitude limits](#)
- 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.1  
Search radius: 5 arcsec  
[Show magnitude limits](#)
- MSX6C Infrared Point Source Catalog**  
Version 2.3 of the Midcourse Space Experiment (MSX) Point Source Catalog
- AKARI/IRC mid-IR all-sky Survey (ISAS/JAXA, 2010)**  
The AKARI/IRC Point Source Catalogue Version 1.0 provides positions and fluxes

# More VO Photometry catalogues

## 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 magnitude limits](#)

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

The AKARI/FIS All-Sky Survey Bright Source Catalog Version 1.0 provides positions and fluxes for 427071 point sources in the 4 far-infrared wavelengths centered at 65, 90, 140 and 160 $\mu$ m. [More Info.](#)

Filters:  AKARI/FIS.N60  AKARI/FIS.WIDE-S  
 AKARI/FIS.WIDE-L  AKARI/FIS.N160

Search radius:  arcsec  
[Show magnitude limits](#)

## GLIMPSE Source Catalog (I + II + 3D)

The Galactic Legacy Infrared Midplane Survey Extraordinaire (GLIMPSE), is a survey of Galactic Plane central parts made with the Infrared Array Camera (IRAC) aboard the Spitzer Space Telescope (SST).. [More Info.](#)

Filters:  Spitzer/IRAC.I1  Spitzer/IRAC.I2  
 Spitzer/IRAC.I3  Spitzer/IRAC.I4

Search radius:  arcsec  
[Show magnitude limits](#)

## UKIDSS Large Area Survey DR7

UKIDSS Large Area Survey DR7. The search is restricted to class -1 (star) or -2 (probable star) objects. [More Info.](#)

Filters:  UKIRT/UKIDSS.Y  UKIRT/UKIDSS.J  
 UKIRT/UKIDSS.H  UKIRT/UKIDSS.K

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

The AKARI/IRC Point Source Catalog Version 1.0 provides positions and fluxes for 870,973 sources observed with the InfraRed Camera (IRC). [More Info.](#)

Filters:  AKARI/IRC.S9W  AKARI/IRC.L18W

Search radius:  arcsec  
[Show magnitude limits](#)

## C2D Spitzer and Ancillary Data

C2D Fall '07 Full CLOUDS Catalog (CHA, II, LUP, OPH, PER, SER).

Filters:  Spitzer/IRAC.I1  Spitzer/IRAC.I2  
 Spitzer/IRAC.I3  Spitzer/IRAC.I4  
 Spitzer/MIPS.24mu  Spitzer/MIPS.70mu

Search radius:  arcsec  
[Show magnitude limits](#)

## Taurus Catalog

Spitzer Legacy Science Program (Taurus) Public Database, October 2008 v2.1.

Filters:  Spitzer/IRAC.I1  Spitzer/IRAC.I2  
 Spitzer/IRAC.I3  Spitzer/IRAC.I4  
 Spitzer/MIPS.24mu  Spitzer/MIPS.70mu

Search radius:  arcsec  
[Show magnitude limits](#)

## UKIDSS Galactic Clusters Survey DR7

UKIDSS Galactic Clusters Survey DR7. The search is restricted to class -1 (star) or -2 (probable star) objects. [More Info.](#)

Filters:  UKIRT/UKIDSS.Z  UKIRT/UKIDSS.Y  
 UKIRT/UKIDSS.J  UKIRT/UKIDSS.H

# More VO Photometry catalogues

Filters:  UKIRT/UKIDSS.Y  UKIRT/UKIDSS.J  
 UKIRT/UKIDSS.H  UKIRT/UKIDSS.K

Search radius:  arcsec  
 Show magnitude limits

## UKIDSS Galactic Plane Survey DR6

UKIDSS Galactic Plane Survey DR6. The search is restricted to class -1 (star) or -2 (probable star) objects. [More Info.](#)

Filters:  UKIRT/UKIDSS.J  UKIRT/UKIDSS.H  
 UKIRT/UKIDSS.K

Search radius:  arcsec  
 Show magnitude limits

## UKIDSS Deep Extragalactic Survey DR7

UKIDSS Deep Extragalactic Survey DR7. The search is restricted to class -1 (star) or -2 (probable star) objects. [More Info.](#)

Filters:  UKIRT/UKIDSS.J  UKIRT/UKIDSS.H  
 UKIRT/UKIDSS.K

Search radius:  arcsec  
 Show magnitude limits

## Optical

## Tycho-2 Catalogue

The Tycho-2 Catalogue is an astrometric reference catalogue containing positions and proper motions as well as two-colour photometric data for the 2.5 million brightest stars in the sky. [More Info.](#)

Filters:  TYCHO/TYCHO.B  TYCHO/TYCHO.V

Search radius:  arcsec  
 Show magnitude limits

## Stromgren uvby-beta Catalogue (Hauck+ 1997)

This catalogue is an updated version of the one published in 1990 (Hauck and Mermilliod, 1990) and contains data for more than 63,300 stars in the Galaxy

Filters:  UKIRT/UKIDSS.Z  UKIRT/UKIDSS.Y  
 UKIRT/UKIDSS.J  UKIRT/UKIDSS.H  
 UKIRT/UKIDSS.K

Search radius:  arcsec  
 Show magnitude limits

## UKIDSS Ultra Deep Survey DR5

UKIDSS Ultra Deep Survey DR5. The search is restricted to class -1 (star) or -2 (probable star) objects. [More Info.](#)

Filters:  UKIRT/UKIDSS.J  UKIRT/UKIDSS.H  
 UKIRT/UKIDSS.K

Search radius:  arcsec  
 Show magnitude limits

## WISE catalogue

WISE.

Filters:  WISE/WISE.W1  WISE/WISE.W2  
 WISE/WISE.W3  WISE/WISE.W4

Search radius:  arcsec  
 Show magnitude limits

## CMC-14

The full CMC-14 catalog (around 95.85million source in the region -30 to +50°). [More Info.](#)

Filters:  SLOAN/SDSS.r  
 Search radius:  arcsec  
 Show magnitude limits

## Homogeneous Means In the UBV System (Mermilliod 1991)

The present catalog supersedes an earlier edition of Nicolet (1978). It is a collection of weighted mean photoelectric values (V, B-V, U-B) for stars

# More VO Photometry catalogues

## Stromgren Survey New Catalogue (Green 2007)

This catalogue is an updated version of the one published in 1990 (Hauck and Merriam, 1990) and contains data for more than 63,300 stars in the Galaxy and Magellanic Clouds. [More Info.](#)

Filters:  Generic/Stromgren.u  Generic/Stromgren.v  
 Generic/Stromgren.b  Generic/Stromgren.y

Search radius:  arcsec

[Show magnitude limits](#)

## SDSS Catalogue, Release 8

The SDSS Photometric Catalog, Release 8. Only Class=6 (Star) objects will be selected. [More Info.](#)

Filters:  SLOAN/SDSS.u  SLOAN/SDSS.g  
 SLOAN/SDSS.r  SLOAN/SDSS.i  
 SLOAN/SDSS.z

Search radius:  arcsec

[Show magnitude limits](#)

## Homogeneous Filter in the UV System (Cristiani 1997)

The present catalog supersedes an earlier edition of Nicolet (1978). It is a collection of weighted mean photoelectric values (V, B-V, U-B) for stars measured in the UB<sub>V</sub> system. [More Info.](#)

Filters:  Generic/Johnson.U  Generic/Johnson.B  
 Generic/Johnson.V

Search radius:  arcsec

[Show magnitude limits](#)

## IPHAS Catalogue

IPHAS Initial data release. [More Info.](#)

Filters:  INT/IPHAS.gR  INT/IPHAS.Ha  
 INT/IPHAS.gI

Search radius:  arcsec

[Show magnitude limits](#)

## Ultraviolet

### Galaxy Evolution Explorer [GALEX]

The Galaxy Evolution Explorer (GALEX), a NASA Small Explorer mission, is performing the first all-sky, deep imaging and spectroscopic ultraviolet surveys in space. The prime goal of GALEX is to study star formation in galaxies and its evolution with time. [More Info.](#)

Filters:  GALEX/GALEX.FUV  GALEX/GALEX.NUV

Search radius:  arcsec

[Show magnitude limits](#)

### IUE HPDP photometry

A catalogue of around 400 objects with ultraviolet photometry extracted from IUE spectra.

Filters:  IUE/IUE.1250-1300  IUE/IUE.1450-1500  
 IUE/IUE.1675-1725  IUE/IUE.2150-2200  
 IUE/IUE.2395-2445  IUE/IUE.2900-3000

Search radius:  arcsec

[Show magnitude limits](#)

[Query selected services](#)

# Final SED

## Object data

- ChaHa1
- ChaHa10
- ChaHa11
- ChaHa12
- ChaHa13
- ChaHa2**
- ChaHa3
- ChaHa4
- ChaHa5
- ChaHa6
- ChaHa7
- ChaHa8
- ChaHa9
- excess
- excess
- See all

### ChaHa2

Position: (166.929167,-77.566389) Distance: 160 pc  $A_v$ : 2.0

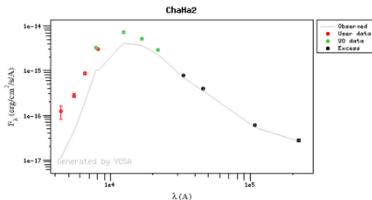
Data for this object:

Filter	Final			User			VO		
	Amid	Flux	$\Delta F$	Flux	$\Delta F$	Flux	$\Delta F$		
Generic/Johnson.B	4378.11999165	1.211241e-16	3.904581e-17	1.211241e-16	3.904581e-17	---	---	Delete	
Generic/Johnson.V	5466.11399596	2.764148e-16	2.545874e-17	2.764148e-16	2.545874e-17	---	---	Delete	
CFHT/CFHT.R	6515.8719123	8.586614e-16	3.954282e-17	8.586614e-16	3.954282e-17	---	---	Delete	
DENIS/DENIS.I	7862.1015966	3.217687e-15	1.185440e-16	---	---	3.217687e-15	1.185440e-16	Delete	
CFHT/CFHT.I	8090.44887259	3.051053e-15	1.405062e-16	3.051053e-15	1.405062e-16	---	---	Delete	
2MASS/2MASS.J	12350	7.213639e-15	1.594562e-16	---	---	7.213639e-15	1.594562e-16	Delete	
2MASS/2MASS.H	16620	5.157575e-15	1.235079e-16	---	---	5.157575e-15	1.235079e-16	Delete	
2MASS/2MASS.Ks	21590	2.898952e-15	5.607070e-17	---	---	2.898952e-15	5.607070e-17	Delete	
WISE/WISE.W1	33156.5603084	7.832506e-16	4.328403e-18	---	---	7.832506e-16	4.328403e-18	Delete	
WISE/WISE.W2	45644.9905454	3.935687e-16	2.537431e-18	---	---	3.935687e-16	2.537431e-18	Delete	
WISE/WISE.W3	107868.444576	6.032565e-17	5.556197e-19	---	---	6.032565e-17	5.556197e-19	Delete	
WISE/WISE.W4	219149.640363	2.726999e-17	1.632579e-18	---	---	2.726999e-17	1.632579e-18	Delete	

Excess detected from **WISE/WISE.W1**. Points with larger wavelength will not be considered in model fit.

You can manually specify where excess starts.

Apply excess from



# News: SED analysis

## Chi-2 fitting and Bayes analysis.

- New theoretical models.
- New observational templates.
- Extinction as a fit parameter.
  - Having the right value for the extinction is very important because it changes the SED, specially for hot objects.
  - Now, the user can give an  $A_v$  range so that VOSA estimates the best value of the extinction together with model parameters.

# News: Analysis: New theoretical models

- New Lyon models.
  - BT-NextGen (AGS2009 and GNS93),
  - BT-Cond,
  - BT-Dusty,
- Red supergiants and AGB stars.
  - GRAMS C-rich,
  - GRAMS O-rich
- Simple Black Body.
- 10 models for stars and 5 for galaxies.



# News: Analysis: New theoretical models

**VOSA**

Files Objects VO Phot. SED **Chi-2 Fit** Bayes Analysis HR Diag. Save Results Log Help Logout

Stars and brown dwarfs (Change) File: ori (info) (Change)

Model Fit Template fit

## Model fit+

This option allows you to estimate some physical properties (such as effective temperature, surface gravity and luminosity) for each object comparing its SED with those derived from theoretical spectra obtained from VO services.

Take a look to the corresponding [Help Section](#) and [Credits Page](#) for more information.

**First select the models that you want to use for the fit**

Mark All Unmark All

Next: Select model params

- Kurucz**  
*Kurucz ATLAS9 ODFNEW /NOVER models. Newly computed ODFs with better opacities and better abundances have been used.*
- Husfeld**  
*Husfeld et al models for non-LTE Helium-rich stars*
- BT-COND**  
*The BT-COND Model grid of theoretical spectra.*
- BT-DUSTY**  
*The BT-DUSTY Model grid of theoretical spectra.*
- BT-NextGen (AGS52009)**  
*The NextGen Model grid of theoretical spectra; Gas phase only, valid for  $T_{\text{eff}} > 2700$  K. Updated opacities.*
- BT-NextGen (GNS93)**  
*The NextGen Model grid of theoretical spectra; Gas phase only, valid for  $T_{\text{eff}} > 2700$  K. Updated opacities.*
- Black Body flux**  
*Black Body flux as calculated in the BT-NextGen model.*
- GRAMS, C-rich**  
*GRAMS (Grid of Red supergiant and Asymptotic giant ModelS) is a grid of radiative transfer (RT) models for dust shells around red supergiant (RSg) and asymptotic giant branch (AGB) stars. This is the model grid for Carbon-rich stars*
- GRAMS, O-rich**  
*GRAMS (Grid of Red supergiant and Asymptotic giant ModelS) is a grid of radiative transfer (RT) models for dust shells around red supergiant (RSg) and asymptotic giant branch (AGB) stars. This is the model grid for Oxygen-rich stars*
- 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.*

# News: Analysis: New theoretical models

## VOSA

Files	Objects	VO Phot.	SED	CNI-2 FIT	Bayes Analysis	HR Diag.	Save Results	Log	Help	Logout
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Stars and brown dwarfs (Change)

File: prueba (info) (Change)

Model fit Template fit

### Model fit+

Show graphs Delete this fit

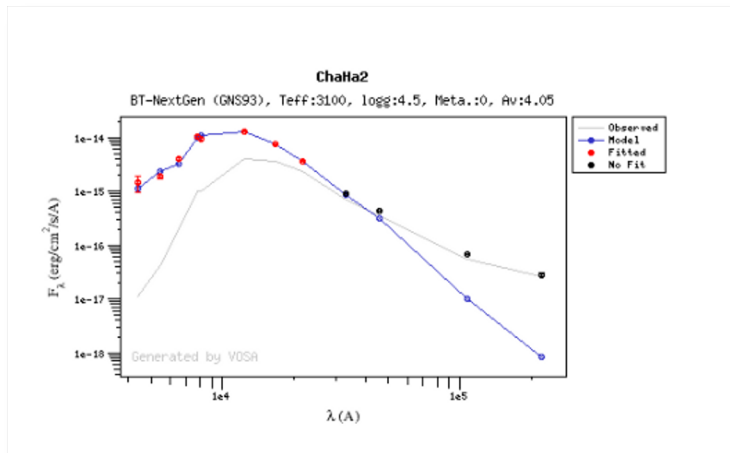
#### Best fit+ results

#### Bestfit

- ChaHa1
- ChaHa10
- ChaHa11
- ChaHa12
- ChaHa13
- ChaHa2
- ChaHa3
- ChaHa4
- ChaHa5
- ChaHa6
- ChaHa7
- ChaHa8
- ChaHa9

Object	RA	DEC	D (pc)	Model	T <sub>eff</sub>	logg	Meta.	more	χ <sup>2</sup>	M <sub>*</sub>	F <sub>fit</sub>	ΔF <sub>fit</sub>	F <sub>obs</sub> /F <sub>fit</sub>	L <sub>bol</sub> /L <sub>sun</sub>	ΔL <sub>bol</sub> /L <sub>sun</sub>	A <sub>max</sub>	A <sub>v</sub>	N <sub>in</sub> /N <sub>tot</sub>	Data VOtables	
ChaHa1	166.820833	-77.598333	160.000	BT-NextGen-GNS93	2600	3	0	---	6.464e+0	1.090e-20	2.718e-11	4.941e-13	0.44	2.168e-2	3.942e-4	21590	1.68	8/12	Syn. Spec.	
ChaHa10	167.106667	-77.658333	160.000	BT-NextGen-GNS93	3900	4	0	---	1.346e+1	1.024e-20	1.657e-10	4.157e-14	0.49	1.322e-1	3.317e-5	8090	7.21	5/5	Syn. Spec.	
ChaHa11	167.126333	-77.655278	160.000	BT-NextGen-GNS93	2700	3	0	---	4.155e+0	2.917e-21	8.499e-12	1.041e-13	0.45	6.781e-3	8.307e-5	21590	1.68	8/8	Syn. Spec.	
ChaHa12	166.856200	-77.718611	160.000	BT-NextGen-GNS93	2800	2.5	0	---	1.615e+1	1.114e-20	3.789e-11	3.045e-13	0.51	3.023e-2	2.429e-4	33156	1.68	9/12	Syn. Spec.	
ChaHa13	167.076667	-77.736667	160.000	BT-NextGen-GNS93	2900	5	0	---	2.003e+1	2.883e-20	1.174e-10	9.711e-13	0.54	9.370e-2	7.749e-4	33156	1.68	9/12	Syn. Spec.	
ChaHa2	166.929167	-77.566389	160.000	BT-NextGen-GNS93	3100	4.5	0	---	9.593e+0	3.319e-20	2.021e-10	6.253e-13	0.59	1.613e-1	4.989e-4	21590	4.05	8/12	Syn. Spec.	
ChaHa3	166.970417	-77.615556	160.000	BT-NextGen-GNS93	2800	5	0	---	3.189e+1	2.109e-20	6.541e-11	5.390e-13	0.46	5.219e-2	4.301e-4	33156	1.68	9/12	Syn. Spec.	
ChaHa4	167.081667	-77.654722	160.000	BT-NextGen-GNS93	2900	4.5	0	---	2.261e+1	2.352e-20	1.077e-10	6.634e-13	0.56	8.596e-2	5.293e-4	21590	1.68	8/12	Syn. Spec.	
ChaHa5	167.106667	-77.696111	160.000	BT-NextGen-GNS93	3100	4	0	---	1.677e+1	2.921e-20	1.328e-10	6.918e-13	0.44	1.060e-1	5.520e-4	21590	3.26	8/8	Syn. Spec.	
ChaHa6	167.167500	-77.571389	160.000	BT-NextGen-GNS93	2500	4.5	0	---	1.965e+1	3.496e-20	8.827e-11	5.653e-13	0.50	7.123e-2	4.510e-4	21590	1.68	9/13	Syn. Spec.	
ChaHa7	166.910000	-77.591667	160.000	BT-NextGen-GNS93	2700	2.5	0	---	9.684e+0	8.431e-21	2.459e-11	1.743e-13	0.45	1.962e-2	1.391e-4	21590	2.47	8/12	Syn. Spec.	
ChaHa8	166.949167	-77.666889	0.000																	
ChaHa9	166.830000	-77.547778	160.000	BT-NextGen-GNS93	3100	4.5	0	---	1.106e+1	1.564e-20	8.589e-11	1.805e-13	0.54	6.853e-2	1.440e-4	21590	6.42	8/12	Syn. Spec.	

# News: Analysis: New theoretical models



# News: Analysis: Observational templates

Comparison of the observed SED with observational templates is useful to estimate the object spectral type.

- Four collections of observational templates.
- Chi-2 fitting, similar to the one for theoretical models.
- Bayesian analysis, similar to the one for theoretical models.

# News: Analysis: Observational templates

**VOSA**

Files	Objects	VO Phot.	SED	Chi-1 Fit	Bayes Analysis	HR Diag.	Save Results	Log	Help	Logout
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Stars and brown dwarfs (Change) File: aa (info) (Change)

Model Fit Template fit

## Template fit

This option allows you to estimate the spectral type for each object comparing its SED with those in template collections obtained from VO services. Take a look to the corresponding [Help Section](#) and [Credits Page](#) for more information.

**First select the template collections that you want to use for the fit**

Mark All Unmark All  
Next: Make the fit

**L and T dwarf data archive**  
*L and T dwarf data from Chiu et al. 2006, Golimowski et al. 2004 and Knapp et al. 2004*

**The NIRSPEC Brown Dwarf Spectroscopic Survey**  
*The Brown Dwarf Spectroscopic Survey (BOSS), established in 1998 by Dr. Ian McLean in collaboration with Dr. J. Davy Kirkpatrick at IPAC, is designed to study near-infrared moderate-to-high resolution spectra for a large sample of low-mass stars and sub-stellar mass objects in the M and newly defined L and T dwarf classes.*

**Keck LRIS spectra of late-M, L and T dwarfs**  
*These spectra were obtained between 1997 and 1999; they are all flux calibrated and generally span the wavelength range 6000-10,000 Å. Spectral types are on the Kirkpatrick et al system as defined in Kirkpatrick et al ApJ, 77, 417 (1991 - for M dwarfs) and Kirkpatrick et al ApJ 519, 802 (1999 - L dwarfs). While not all of these stars are primary spectral standards, they are all bright and should provide an adequate reference sequence. Photometric properties can be derived from the appended postscript files.*

**The SpeX Prism Spectral Libraries**  
*The SpeX Prism Spectral Libraries*

**Options for this fit**

Include model spectrum in fit plots? (The fit process will be slower, because getting the spectra from the VO can take some time)

# News: Analysis: Observational templates

**VOSA**

Files	Objects	VO Phot.	SED	Chi-2 Fit	Bayes Analysis	HR Diag.	Save Results	Log	Help	Logout
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Stars and brown dwarfs (Change) File: prueba (info) (Change)

Model Fit
Template fit

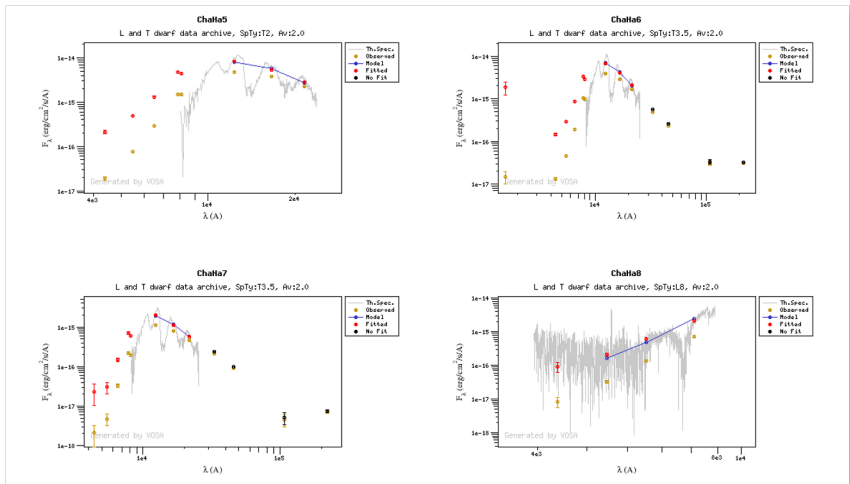
## Template fit

[Show graphs](#)
[Delete this fit](#)

**Best fit+ results**

Object	RA	DEC	Model	SpTy	more	$A_v$	$\chi^2$	$M_d$	$A_{max}$	$N_H/N_{tot}$	Data VOTables
ChaHa1	166.820833	-77.598333	Chiu et al. 2006	T3.5	---	2.0	1.178e+1	4.446e+1	21590	3/12	Spec.
ChaHa10	167.106667	-77.658333	Chiu et al. 2006	L8	---	2.0	1.919e+1	2.530e+1	8090	4/5	Spec.
ChaHa2	167.128333	-77.655278	Chiu et al. 2006	T3	---	2.0	3.339e+0	4.806e+0	21590	3/8	Spec.
ChaHa3	166.856250	-77.718611	Chiu et al. 2006	T3.5	---	2.0	4.795e+0	6.298e+1	33156	3/12	Spec.
ChaHa4	167.076667	-77.736667	Chiu et al. 2006	T3.5	---	2.0	5.142e+0	1.850e+2	33156	3/12	Spec.
ChaHa5	166.929167	-77.566389	Chiu et al. 2006	T3	---	2.0	6.717e+0	1.084e+2	21590	3/12	Spec.
ChaHa6	167.081667	-77.654722	Chiu et al. 2006	T3.5	---	2.0	4.437e+0	1.334e+2	21590	3/12	Spec.
ChaHa7	167.106667	-77.696111	Chiu et al. 2006	T2	---	2.0	1.007e+1	1.844e+2	21590	3/8	Spec.
ChaHa9	167.167500	-77.571389	Chiu et al. 2006	T3.5	---	2.0	7.718e-1	1.263e+2	21590	3/13	Spec.
ChaHa7	166.910000	-77.591667	Chiu et al. 2006	T3.5	---	2.0	4.932e+0	3.509e+1	21590	3/12	Spec.
ChaHa8	166.949167	-77.668889	Chiu et al. 2006	L8	---	2.0	4.015e+1	9.777e+1	8090	3/4	Spec.
ChaHa9	166.830000	-77.547778	Chiu et al. 2006	L8	---	2.0	4.030e-2	3.051e+1	21590	3/12	Spec.

# News: Analysis: Observational templates



## News: more information.

- **Log** of all the work done.
  - VO services consulted, fit made, fit undone, models used, etc since the file was uploaded.
  - Web visualization and downloadable file.
- **References**
  - Description of all the references for external services, models, etc used to obtain the results for a user file.
  - Bibtex file with the bibtex entries for those references.
  - Always included in downloads.



# News: Log info

**VOSA**

Files	Objects	VO Phot.	SED	Chi-2 Fit	Bayes Analysis	HR Diag.	Save Results	Log	Help	Logout
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Stars and brown dwarfs (Change)      File: only\_Ha\_sources\_for\_testing.InputVOSA (Info) (Change)

## Activity Log

Here you can see a log with a summary of all the activity already performed with this file.  
Last operations are shown first

2012/05/18 22:22:10 Previous model fit+ results are not valid anymore. They have been deleted

2012/05/18 22:21:43 Model fit+ executed

Parameter values used for the fit:

Kurucz

teff\_min = 3500  
teff\_max = 50000  
logg\_min = 0.00  
logg\_max = 5.00  
meta\_min = -2.50  
meta\_max = 0.50

BT-NextGen (GNS93)

teff\_min = 800  
teff\_max = 9800  
logg\_min = -5.5  
logg\_max = 0.5  
meta\_min = -1.5  
meta\_max = 0.3

2012/05/18 22:14:00 New photometry found in VO services.

SED changed

ChaHa1: 2MASS,DENIS,WISE  
ChaHa10: DENIS  
ChaHa11: 2MASS,DENIS  
ChaHa12: 2MASS,DENIS,WISE  
ChaHa13: 2MASS,DENIS,WISE  
ChaHa2: 2MASS,DENIS,WISE  
ChaHa3: 2MASS,DENIS,WISE  
ChaHa4: 2MASS,DENIS,WISE  
ChaHa5: 2MASS,DENIS  
ChaHa6: 2MASS,DENIS,GAI FX WISF

# News: References

refs.dat (~/.cache/.fr-FxeA84/vosa\_results\_74/info) - gedit

File Edit View Search Tools Documents Help

Open Save Print Undo Redo Cut Copy Paste Find Replace

refs.dat ✖

If your research benefits from the use of VOSA, we would appreciate if you could include the corresponding reference in your publication. Note also that VOSA makes use of models, VO services, etc that should be referenced too if they are relevant to your final results. Here you have a list of all the services that have been used for obtaining the results for this particular file. Please, take that into account. The refs.bibtex.bib file includes all the bibtex entries corresponding to the information below

VOSA

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- \* VOSA
  - Acknowledgement : This publication makes use of VOSA, developed under the Spanish Virtual Observatory project supported from the Spanish MICINN through grant AyA2008-02156.
  - 2008A&A...492..277B : Bayo et al 2008, A&A, 492, 277B

Dereddening

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- \* For dereddening the SEDs we make use of the extinction law by Fitzpatrick (1999) improved by Indebetouw et al (2005) in the infrared.
  - 1999PASP...111..63F : Fitzpatrick, E.; 1999, PASP, 111, 63
  - 2005ApJ...619..931I : Indebetouw et al, 2005, ApJ 619, 931

VO photometry

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- \* 2MASS All-Sky Point Source Catalog
  - Acknowledgement : This publication makes use of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.
  - 2000A&AS...143...230 : Ochsenbein et al 2000, A&AS 143, 221
- \* DENIS Catalogue
  - 2000A&AS...143...230 : Ochsenbein et al 2000, A&AS 143, 221

# News: References

```

refs.bibtex.bib (~/cache/fr-XUW4rS/vosa_results_74/info) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
refs.dat refs.bibtex.bib
@ARTICLE{2008A&A...492..277B,
  author = {{Bayo}, A. and {Rodrigo}, C. and {Barrado Y Navascu{\`e}s}, D. and
           {Solano}, E. and {Guti{\`e}rrez}, R. and {Morales-Calder{\`o}n}, M. and
           {Allard}, F.},
  title = "{VOSA: virtual observatory SED analyzer. An application to the Collinder 69 open cluster}",
  journal = {\aap},
  archivePrefix = "arXiv",
  eprint = {0808.0270},
  keywords = {astronomical data bases: miscellaneous, stars: formation, stars: circumstellar matter, stars: low-mass,
             brown dwarfs , stars: Hertzsprung-Russell (HR) and C-M diagrams, Galaxy: open clusters and associations: individual:
             Collinder 69},
  year = 2008,
  month = dec,
  volume = 492,
  pages = {277-287},
  doi = {10.1051/0004-6361:200810395},
  adsurl = {http://adsabs.harvard.edu/abs/2008A%26A...492..277B},
  adsnote = {Provided by the SAO/NASA Astrophysics Data System}
}

@ARTICLE{1999PASP..111..63F,
  author = {{Fitzpatrick}, E.-L.},
  title = "{Correcting for the Effects of Interstellar Extinction}",
  journal = {\pasp},
  eprint = {arXiv:astro-ph/9809387},
  keywords = {ISM: DUST, EXTINCTION},
  year = 1999,
  month = jan,
  volume = 111,
  pages = {63-75},
  doi = {10.1086/316293},

```

## News: Input user files.

- Single object search.
  - No need to create a file.
  - Just one object coordinates.
- Input files management.
  - No sessions anymore.
  - Easy access to old files.
  - Organization of files in user folders.

# News: Input user files

## VOSA

Files	Objects	VO Phot.	SED	Model Fit	Bayes Analysis	Save Results	Log	Help	Logout
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No file selected (Select/upload a file)

**Upload your own data file** (max size=500kb)

It must comply with the [required data format](#)  
 (A small utility is available to help you to convert an original file in [ascii](#) (csv) or [votable](#) to VOSA input format)

**File to upload:**

**Description:**

**File type:**

Fluxes (erg/cm<sup>2</sup>/s/A)  
 Fluxes (Jy)  
 Magnitudes

**Create a single object data file**

Just write the coordinates (in decimal degrees) of one object that you want to study and we will create a single object data file with the adequate format.  
 RA and DEC are compulsory.

**RA:**  (deg)  
**DEC:**  (deg)  
**Obj.Name:**   
**Description:**

### Your files

Folder	Filename	Descrip	Last Used	Obj.type	N.Obj.
Default folder	only_Ha_sources_for_testing.inputVOSA	only_Ha_sources_for_testing.inputVOSA	2012-05-18 23:15:37	star	13 <a href="#">Select</a>
	LOr1-10.bt	test	2012-05-18 22:04:44	galaxy	10 <a href="#">Select</a>
	LOr1-10.bt	ori	2012-05-18 17:05:33	star	10 <a href="#">Select</a>
VO Phot tests	LOr1001.dat	aa	2012-05-18 23:15:34	star	1 <a href="#">Select</a>
	ej.resolve.dat	resolve	2012-05-18 23:15:23	star	12 <a href="#">Select</a>

### Your Folders

New folder:

Rename VO Phot tests as

# News: Input user files

**Description:**

**File type:**

- Fluxes (erg/cm2/s/A)
- Fluxes (Jy)
- Magnitudes

**RA:**  (deg)

**DEC:**  (deg)

**Obj.Name:**

**Description:**

---

Your files

Folder	Filename	Descrip	Last Used	Obj.type	N.Obj.	
Default folder	only_Ha_sources_for_testing.inputVOSA	only_Ha_sources_for_testing.inputVOSA	2012-05-18 23:17:56	star	13	Select

If you change something remember to click the save button

**File properties**

Filename: only\_Ha\_sources\_for\_testing.inputVOSA

Uploaded: 2012-05-18 22:09:07

Last used: 2012-05-18 23:17:56

Obj. Type: star

N. objects: 13

Descrip.:

Folder:

**Actions**

**Your comments**

This file is a test for IVOA talk

LOr11-10.bt	test	2012-05-18 22:04:44	galaxy	10	Select
LOr11-10.bt	ori	2012-05-18 17:05:33	star	10	Select
<b>VO Phot tests</b>	LOr001.dat	aa	2012-05-18 23:15:34	star	1 Select
	ej.resolve.dat	resolve	2012-05-18 23:15:23	star	12 Select

## Try it

All this is implemented in new **beta** version:

- <http://svo2.cab.inta-csic.es/theory/vosa/>
- Still testing it
- Feel free to try it

# THANK YOU!