

VOSA

A VO Spectral Energy Distribution Analyzer

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VOSA (VO Sed Analyzer)

- a web tool: <http://svo2.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. (~ 2000 *objects*)
- Using VO services.
- More than 200 users analysing data (last year).
- More than 165.000 objects studied (last year).
- More than 33 papers published using VOSA.

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



VO SED Analyzer

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.

Other services used in VOSA

VOSA uses some external services and theoretical models that you might want to cite or acknowledge if your science benefits from the use of this tool

[See the complete credits page](#)



User data



VO data



Build object SED's

+ User SED options

- Delete or combine points.
- Upper limits.
- Quality, date of observation, etc
- Infrared and UV excess



+ Objects properties

+ VO photometry

+ Filter Profile Service

Build SED's: User Data

User data



Build object SED's

VO data



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+ Objects properties

+ VO photometry

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Build SED's: User Data



VO SED Analyzer

| | | | | | | | | | | |
|---------------------------------|---------|----------|-----|-----------|---|----------|--------------|-----|------|--------|
| Files | Objects | VO Phot. | SED | Chi-2 Fit | Bayes Analysis | HR Diag. | Save Results | Log | Help | Logout |
| Stars and brown dwarfs (Change) | | | | | 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: Examinar... No se ha seleccionado ningún archivo.

Description:

File type:

Fluxes (erg/cm²/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

Photometry tests

Required input file format

The uploaded file must be an ascii document with a line for each photometric point.

Each line should contain 10 columns:

| object | RA | DEC | dis | Av | filter | flux | error | pntopts | objopts |
|--------|-----|-----|-----|-----|--------|------|-------|---------|---------|
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

Other tests

Galaxies

Default folder

- 1: a one word text label, without spaces
- 2: the RA, in deg, corresponding to the photometric point
- 3: the DEC, in deg, corresponding to the photometric point
- 4: the distance to the object in parsecs
- 5: the A_v parameter defining the extinction
- 6: a label corresponding to the narrow band filter
- 7: the flux in erg/cm²/s/A, Jy or magnitude. See (7).
- 8: the observed error in the flux (in erg/cm²/s/A) or magnitude. See (8).
- 9: options specific for this photometric point. See (9).
- 10: options specific for this object (they must be repeated in each line corresponding to the same object). See (10).

| | | | | | |
|---------------|-------|---------------------|-------|---|--------|
| 2957_vosa.dat | largo | 2013-09-13 12:18:06 | star2 | 1 | Select |
| obj8.dat | obj8 | 2013-06-13 17:43:07 | star | 1 | Select |

Select
Select
Select
Select

Select
Select
Select
Select

Build SED's: Objects

User data



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VO data



+ Objects properties

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Build SED's: Objects: Coordinates



VO SED Analyzer

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

Stars and brown dwarfs (Change)

File: [dis edis](#) (Info) (Change)

Coordinates Distances Extinction

Object coordinates

This option allows you to query Sesame VO service to search for object coordinates using the object name.

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

Search for Obj. Coordinates

Mark all: User Sesame

Unmark all: User Sesame

Save Obj. Coordinates

| Object | Final | | User Data | | Sesame | | Δ (") |
|----------|-------------|--------------|-------------|--------------|-------------|--------------|--------------|
| | RA (deg) | DEC (deg) | RA (deg) | DEC (deg) | RA (deg) | DEC (deg) | |
| HD000693 | 2.8160 | -15.46797939 | 2.8160 | -15.46797939 | 2.81607340 | -15.46797939 | 0.255 |
| HD001835 | 5.72 | -12.20943907 | 5.72 | -12.20943907 | 5.71757607 | -12.20943907 | 14.830 |
| HD002665 | 7.68935948 | +57.065 | 7.68935948 | +57.065 | 7.68935948 | +57.06489698 | 0.371 |
| HD002796 | 7.82047741 | -16.79466529 | 7.82047741 | -16.79466529 | 7.82047741 | -16.79466529 | 0.000 |
| HD003567 | 9.63311447 | -8.30927645 | 9.63311447 | -8.30927645 | 9.63311447 | -8.30927645 | 0.003 |
| HD003628 | 9.80 | +3.1339 | 9.80 | +3.1339 | 9.80262932 | +3.13392630 | 16.934 |
| HD004306 | 11.36317975 | -9.54438717 | 11.36317975 | -9.54438717 | 11.36317975 | -9.54438717 | 0.000 |
| HD004307 | 11.369 | -12.88 | 11.369 | -12.88 | 11.36953271 | -12.88080956 | 3.452 |
| HD004614 | 12.27621124 | +57.81518773 | 12.27621124 | +57.81518773 | 12.27621124 | +57.81518773 | 0.000 |
| HD006582 | 17.068 | +54.7 | 17.068 | +54.7 | 17.06831622 | +54.92030307 | 790.227 |
| HD006755 | 17.42943586 | +61.54727506 | 17.42943586 | +61.54727506 | 17.42943586 | +61.54727506 | 0.000 |
| HD006833 | 17.46777005 | +54.73896613 | 17.46777005 | +54.73896613 | 17.46777005 | +54.73896613 | 0.000 |

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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, *AS&A* 592, 277B.

Other references to VOSA

C. Rodrigo Blanco

VOSA

Build SED's: VO Photometry

User data



Build object SED's

+ User SED options

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VO data



+ Objects properties

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+ Filter Profile Service

Build SED's: VO Photometry



VO SED Analyzer

Files Objects **VO Phot.** SED Chi-2 Fit Bayes
Stars Test (Change) File: OTS44 but part of th

VO ph

This option allows you to increase the wavelength cover
catalogues.

Take a look to the corresponding [Help Section](#) and [Credit](#)

First select the VO services that you want to use

Mark All Unmark All
Query selected services

- More that 20 VO catalogues.
- New: IRAS, VISTA (VVV, VIKING, VHS, VIDEO, VMC).
- Infrared, optical and ultraviolet.
- Magnitude/flux ranges.

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

You can apply limits so that magnitudes out of the specified range are not shown

| Min mag | | Max mag |
|----------------------|--------------------|----------------------|
| <input type="text"/> | < 2MASS/2MASS.J < | <input type="text"/> |
| <input type="text"/> | < 2MASS/2MASS.H < | <input type="text"/> |
| <input type="text"/> | < 2MASS/2MASS.Ks < | <input type="text"/> |

[Hide 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.I DENIS/DENIS.J
 DENIS/DENIS.Ks

Search radius: 5 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.,

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

Build SED's: Filter Profile Service

User data



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VO data



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Filter Profile Service

An experiment about filter standardization in the VO



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

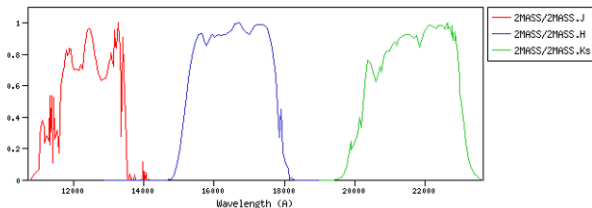
AuthId: Passw: [Login](#) [Register](#)

| | | | | | | | | | | | | | | |
|---------|-----|-------|---------|--------|------|--------|-------|---------|---------|--------|------|----------|-----------|-----|
| 2MASS | AAO | AKARI | CAHA | CFHT | CTIO | DENIS | GALEX | Gemini | Generic | Geneva | GTC | Herschel | Hipparcos | HST |
| IAC80 | INT | IRAS | ISO | IUE | Keck | Kepler | KPNO | LaSilla | Misc | MSX | NIRT | NOT | OAF | OSN |
| Paranal | SAO | SLOAN | Spitzer | Subaru | TCS | 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





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.

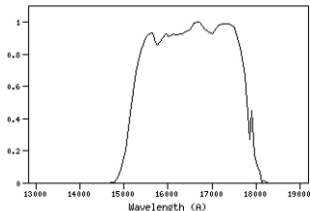
If you want to upload your own photometry into VOSA as magnitudes, make sure that VOSA will transform those magnitudes to fluxes as you expect (click on the filter name in this list to see the details of the transformation for that case). If not, please, transform your photometry to fluxes before uploading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

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

| Filter ID | λ_{eff} | W_{eff} | A_t/A_V | ZP (Jy) | Mag.Sys. | ZP Type | Description |
|-------------------------------|------------------------|------------------|-----------|---------|----------|---------|-------------|
| 2MASS/2MASS.H | 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

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

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](#)

| | | | | | | | |
|--------------------------------|----------|---------|------|---------|------|--------|---------------------------|
| 2MASS/2MASS.J | 12350.00 | 1624.15 | 0.31 | 1594.00 | Vega | Pogson | 2MASS J |
| 2MASS/2MASS.Ks | 21590.00 | 2618.86 | 0.13 | 666.80 | Vega | Pogson | 2MASS Ks |
| AAO/AAO.aao1 | 4351.69 | 1035.57 | 1.31 | 3926.34 | Vega | Pogson | AAO #1, aao glass b, B |
| AAO/AAO.aao14 | 6418.54 | 1601.36 | 0.83 | 2962.97 | Vega | Pogson | AAO #14, aao glass os, O* |
| AAO/AAO.aao2 | 5349.43 | 909.82 | 1.04 | 3636.87 | Vega | Pogson | AAO #2, aao glass v, V |
| AAO/AAO.aao21 | 3634.27 | 642.64 | 1.57 | 1717.18 | Vega | Pogson | AAO #21, aao cus04, U |

Build SED's: Options

User data



VO data



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+ Objects properties

+ VO photometry

+ Filter Profile Service

Build SED's: VO Photometry

VO SED Analyzer

File: 30A00b (info) (Change)

Object data

LO#001
LO#002
LO#003
LO#004
LO#005
LO#006
LO#007
LO#008
LO#009
LO#010
name
See all

LO#001
Position: (93.446593, 9.9273611) Distance: 409. pc A_V : 0.36209599
Data for this object:

| Filter | band | Observed | | Derreddened | | In SED | Infl | Unred | Bal | Delta | Source | RA (J20) |
|-----------------|----------|-----------|-----------|-------------|-----------|--------|------|-------|-----|-------|----------|------------|
| | | flux | F | flux | F | | | | | | | |
| SLDAN/D09A.1 | 0122.33 | 1.395e-14 | 2.50e-15 | 1.395e-14 | 2.445e-15 | ✓ | | | | | CNC-14 | 053.446723 |
| CRHT/CRHT.B | 0118.07 | 1.395e-14 | 0.000e+00 | 1.420e-14 | 0.000e+00 | ✓ | | | | | User | |
| CRHT/CRHT.F | 0101.45 | 1.395e-14 | 0.000e+00 | 1.370e-14 | 0.000e+00 | ✓ | | | | | User | |
| ZMSS/ZMSS.J | 1220.00 | 3.470e-15 | 1.920e-15 | 1.035e-14 | 2.120e-15 | ✓ | | | | | Calc (I) | |
| ZMSS/ZMSS.J | 1230.00 | 3.470e-15 | 1.920e-15 | 1.035e-14 | 2.120e-15 | | | | | | ZMSS | 053.446722 |
| ZMSS/ZMSS.J | 1230.00 | 3.470e-15 | 1.920e-15 | 1.035e-14 | 2.120e-15 | | | | | | User | |
| ZMSS/ZMSS.H | 1603.00 | 4.930e-15 | 1.320e-15 | 6.930e-15 | 1.410e-15 | ✓ | | | | | Calc (I) | |
| ZMSS/ZMSS.H | 1603.00 | 4.930e-15 | 1.320e-15 | 6.930e-15 | 1.410e-15 | | | | | | ZMSS | 053.446722 |
| ZMSS/ZMSS.H | 1603.00 | 4.930e-15 | 1.320e-15 | 6.930e-15 | 1.410e-15 | | | | | | User | |
| ZMSS/ZMSS.Ha | 2190.00 | 2.890e-15 | 5.50e-17 | 3.010e-15 | 5.850e-17 | ✓ | | | | | Calc (I) | |
| ZMSS/ZMSS.Ha | 2190.00 | 2.890e-15 | 5.50e-17 | 3.010e-15 | 5.850e-17 | | | | | | ZMSS | 053.446722 |
| ZMSS/ZMSS.Ha | 2190.00 | 2.890e-15 | 5.50e-17 | 3.010e-15 | 5.850e-17 | | | | | | User | |
| ZMSS/ZMSS.Ha | 2190.00 | 2.890e-15 | 5.50e-17 | 3.010e-15 | 5.850e-17 | | | | | | ZMSS | 053.446722 |
| ZMSS/ZMSS.Ha | 2190.00 | 2.890e-15 | 5.50e-17 | 3.010e-15 | 5.850e-17 | | | | | | User | |
| WISE/WISE.W1 | 2206.00 | 4.150e-16 | 1.24E+17 | 4.320e-16 | 1.27E+17 | ✓ | | | | | WISE | 053.446723 |
| WISE/WISE.W1 | 2206.00 | 4.150e-16 | 1.24E+17 | 4.320e-16 | 1.27E+17 | | | | | | User | |
| WISE/WISE.W1 | 2206.00 | 4.150e-16 | 1.24E+17 | 4.320e-16 | 1.27E+17 | | | | | | WISE | 053.446723 |
| WISE/WISE.W1 | 2206.00 | 4.150e-16 | 1.24E+17 | 4.320e-16 | 1.27E+17 | | | | | | User | |
| Spitzer/IRAC.11 | 3605.11 | 5.470e-16 | 1.610e-16 | 6.600e-16 | 1.540e-16 | ✓ | | | | | User | |
| Spitzer/IRAC.12 | 4403.78 | 2.150e-16 | 7.940e-16 | 2.150e-16 | 8.060e-16 | ✓ | | | | | User | |
| WISE/WISE.W2 | 4703.00 | 1.910e-16 | 4.070e-16 | 4.120e-16 | 1.010e-16 | ✓ | | | | | WISE | 053.446723 |
| WISE/WISE.W2 | 4703.00 | 1.910e-16 | 4.070e-16 | 4.120e-16 | 1.010e-16 | | | | | | User | |
| WISE/WISE.W2 | 4703.00 | 1.910e-16 | 4.070e-16 | 4.120e-16 | 1.010e-16 | | | | | | WISE | 053.446723 |
| WISE/WISE.W2 | 4703.00 | 1.910e-16 | 4.070e-16 | 4.120e-16 | 1.010e-16 | | | | | | User | |
| WISE/WISE.W3 | 11500.00 | 6.850e-18 | 3.00e-19 | 6.760e-18 | 3.120e-19 | ✓ | | | | | WISE | 053.446723 |
| WISE/WISE.W3 | 11500.00 | 6.850e-18 | 3.00e-19 | 6.760e-18 | 3.120e-19 | | | | | | User | |
| WISE/WISE.W4 | 22000.00 | 2.170e-18 | 6.240e-19 | 6.270e-19 | 1.910e-19 | ✓ | | | | | WISE | 053.446723 |
| WISE/WISE.W4 | 22000.00 | 2.170e-18 | 6.240e-19 | 6.270e-19 | 1.910e-19 | | | | | | User | |

Apply changes

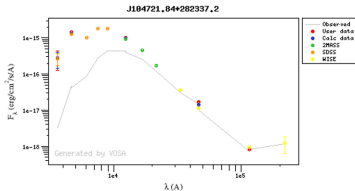
Excess

Infrared excess detected from **Spitzer/IRAC.11**. Points with larger wavelength will not be considered in model fit.

You can manually specify where excess applies (please remember to click the 'Change excess' button to apply these changes).

Apply infrared excess from to .
Apply UV/blue excess up to Angstroms.

- Handle multiple data corresponding to the same filter (from different catalogs or/and user input).
- Information available in the VO catalog about observation date, object name, quality, etc.
- See the origin of each SED point.
- Exclude points with infrared or ultraviolet excess.
- Decide what data goes to the final SED.



Build SED's: VO Photometry

VO theoretical services

Documents

Tools

Services



VO SED Analyzer

File Objects VO Phot. SED Chi-2 Fit Basic Analysis Help
Stars Test [Change] File: J04000 (Info) [Change]

Object data

LO#001
LO#002
LO#003
LO#004
LO#005
LO#006
LO#007
LO#008
LO#009
LO#010
name
See all

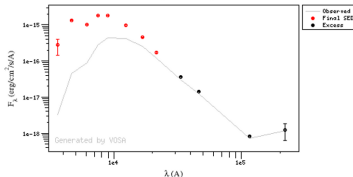
LO#001

Position: (93.446583,9.9273611) Distance: 409. pc A_V : 0.36209599

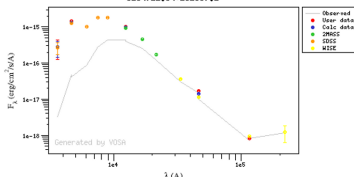
Data for this object:

| Filter | Observed | | Derreddened | | In SED | Infit | Unred | Bal | Delta | Source | RA (J20) |
|----------------|----------|-----------|-------------|-----------|-----------|-------|-------|-----|-------|--------|------------|
| | WAVE | FLUX | WAVE | FLUX | | | | | | | |
| SLOAN/SDSS-I | 6122.33 | 1.390e-14 | 2.500e-15 | 1.390e-14 | 2.445e-16 | ✓ | | | | CNO-14 | 053.446721 |
| CRHT/CRHT-B | 6117.87 | 1.390e-14 | 0.000e+00 | 1.420e-14 | 0.000e+00 | | | | | User | |
| CRHT/CRHT-R | 6101.45 | 1.390e-14 | 0.000e+00 | 1.370e-14 | 0.000e+00 | | | | | User | |
| ZWASS/ZWASS-J | 12200.00 | 3.470e-15 | 1.920e-15 | 1.030e-14 | 2.120e-16 | ✓ | | | | ZWASS | 053.446721 |
| ZWASS/ZWASS-J | 12200.00 | 3.470e-15 | 1.920e-15 | 1.030e-14 | 2.120e-16 | | | | | User | |
| ZWASS/ZWASS-J | 12200.00 | 3.470e-15 | 1.920e-15 | 1.030e-14 | 2.120e-16 | | | | | User | |
| ZWASS/ZWASS-H | 16000.00 | 6.930e-16 | 3.320e-16 | 6.930e-16 | 1.410e-16 | ✓ | | | | ZWASS | 053.446721 |
| ZWASS/ZWASS-H | 16000.00 | 6.930e-16 | 3.320e-16 | 6.930e-16 | 1.410e-16 | | | | | User | |
| ZWASS/ZWASS-H | 16000.00 | 6.930e-16 | 3.320e-16 | 6.930e-16 | 1.410e-16 | | | | | User | |
| ZWASS/ZWASS-Ks | 21900.00 | 2.890e-15 | 5.500e-17 | 3.010e-15 | 5.850e-17 | ✓ | | | | ZWASS | 053.446721 |
| ZWASS/ZWASS-Ks | 21900.00 | 2.890e-15 | 5.500e-17 | 3.010e-15 | 5.850e-17 | | | | | User | |
| ZWASS/ZWASS-Ks | 21900.00 | 2.890e-15 | 5.500e-17 | 3.010e-15 | 5.850e-17 | | | | | User | |
| WISE/WISE-W1 | 32000.00 | 6.150e-16 | 1.241e-17 | 3.010e-16 | 6.220e-17 | ✓ | | | | WISE | 053.446721 |
| WISE/WISE-W1 | 32000.00 | 6.150e-16 | 1.241e-17 | 3.010e-16 | 6.220e-17 | | | | | User | |
| WISE/WISE-W2 | 36075.11 | 3.470e-16 | 1.611e-16 | 6.600e-16 | 1.540e-16 | ✓ | | | | WISE | 053.446721 |
| WISE/WISE-W2 | 36075.11 | 3.470e-16 | 1.611e-16 | 6.600e-16 | 1.540e-16 | | | | | User | |
| WISE/WISE-W3 | 44303.78 | 2.100e-16 | 7.940e-16 | 2.100e-16 | 8.080e-16 | ✓ | | | | WISE | 053.446721 |
| WISE/WISE-W3 | 44303.78 | 2.100e-16 | 7.940e-16 | 2.100e-16 | 8.080e-16 | | | | | User | |
| WISE/WISE-W4 | 56018.02 | 1.800e-17 | 7.430e-17 | 1.800e-17 | 7.430e-17 | ✓ | | | | WISE | 053.446721 |
| WISE/WISE-W4 | 56018.02 | 1.800e-17 | 7.430e-17 | 1.800e-17 | 7.430e-17 | | | | | User | |

J104721.84+282337.2

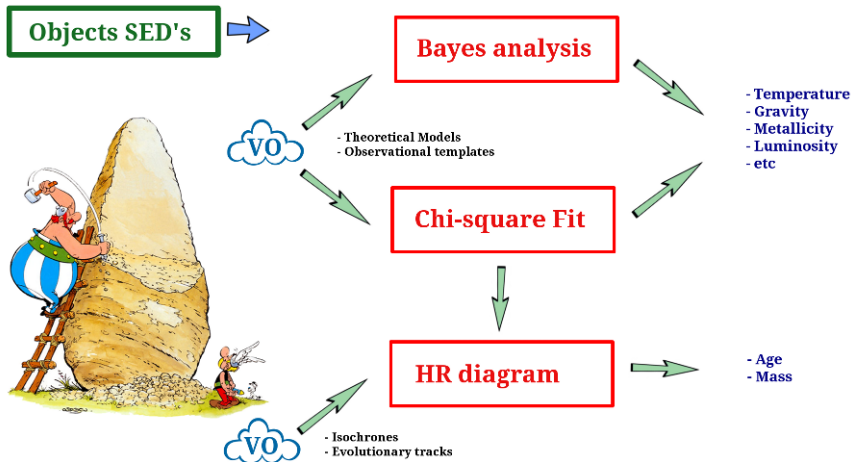


J104721.84+282337.2

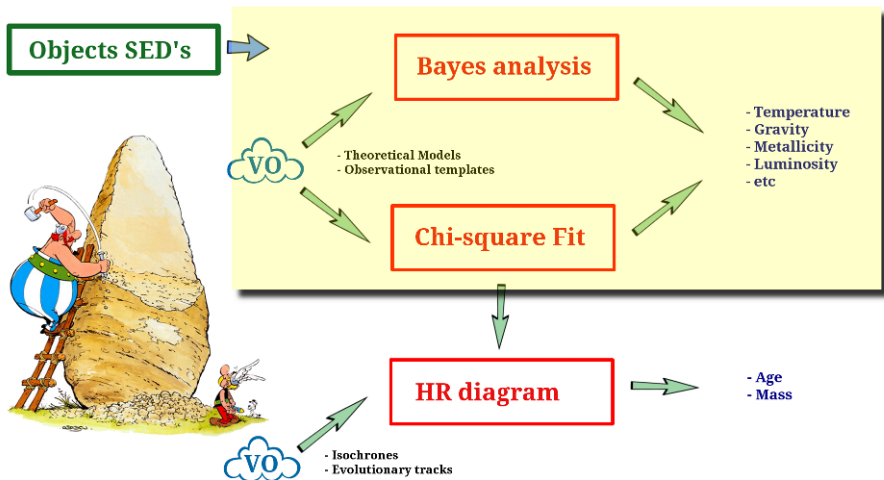


- Handle multiple data corresponding to the same filter (from different catalogs or/and user input).
- Information available in the VO catalog about observation date, object name, quality, etc.
- See the origin of each SED point.
- Exclude points with infrared or ultraviolet excess.
- Decide what data goes to the final SED.

Analyze SED's



Analyze SED's: Chi-square fit.



Analyze SED's: Chi-square fit.



VO SED Analyzer

Files Objects VO Phot. SED Chi-2 Fit Bayesian

Stars Test (Change) File: no

Model Fit

Model

This option allows you to estimate some physical properties (such as temperature, luminosity, etc.) of an object comparing its SED with those derived from theoretical spectra.

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

- AMES-Dusty 2000**
The AMES-Dusty Model grid of theoretical spectra
- AMES-Cond 2000**
The AMES-Cond Model grid of theoretical spectra.
- Kurucz ODFNEW /NOVER models**
ATLAS9 Kurucz ODFNEW /NOVER models. Newly computed ODFs with better opacities and better abundances have been used.
- Husfeld et al models for non-LTE Helium-rich stars**
Husfeld et al models for non-LTE Helium-rich stars
- BT-Settl**
The BT-Settl Model grid of theoretical spectra; With a cloud model, valid across the entire parameter range.
- BT-COND**
The BT-COND Model grid of theoretical spectra.
- BT-DUSTY**
The BT-DUSTY Model grid of theoretical spectra.
- BT-NextGen (AGSS2009)**
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 grid**
- GRAMS C-rich original grid**

- 15 collections of theoretical models (+5 for galaxies)
- Choose ranges of parameters.
- Get best fit values: T_{eff} , $\log g$, metallicity, luminosity, etc.
- Extinction as an additional fit parameter.

Analyze SED's: Chi-square fit.



VO SED Analyzer

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

Stars Test (change)

File: bbbbbb [obj] (change)

Model fit Template fit

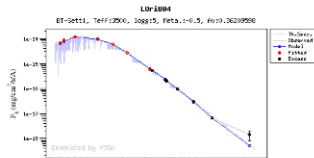
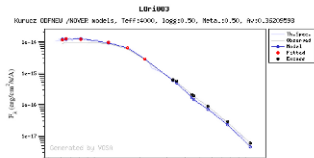
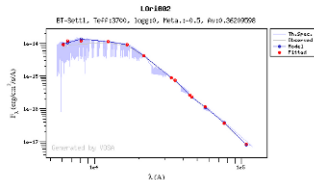
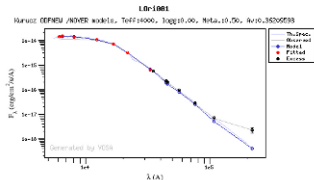
Model fit+

Best fit

LO1001
LO1002
LO1003
LO1004
LO1005
LO1006
LO1007
LO1008
LO1009
LO1010

Best fit+ results

| Object | RA | DEC | D (pc) | Model | T _{eff} | logg | M _{bol} | more | χ^2 | M ₀ | F ₀₁ | ΔF_{01} | F _{001/F₀₁} | L _{star/L_{sun}} | $\Delta L_{star/Lsun$ | R _{star/R_{sun}} | $\Delta R_{star/Rsun$ | ΔT_{eff} | $\Delta \log g$ | ΔM_{bol} | R _{star/R_{sun}} | Data Variables |
|--------|-----------|-----------|---------|---------|------------------|------|------------------|-----------|----------|----------------|-----------------|-----------------|---------------------------------|-----------------------------------|-----------------------|-----------------------------------|-----------------------|------------------|-----------------|------------------|-----------------------------------|----------------|
| LO1001 | 83.446383 | 9.927301 | 400.000 | Kurucz | 4000 | 0.00 | 0.93 | — | 4.421e+0 | 1.238e-20 | 1.780e-10 | 1.865e-12 | 0.53 | 8.922e-1 | 0.309e-3 | 33205 | 0.3020998 | 125 | 0.25 | 0.15 | 7/14 | Syn Spec. |
| LO1002 | 84.043167 | 10.148593 | 400.000 | BT-Set1 | 3700 | 0 | -0.5 | alpha 0.2 | 1.921e+1 | 2.848e-20 | 1.600e-10 | 2.488e-12 | 0.54 | 9.621e-1 | 1.241e-2 | 119008 | 0.3020998 | 50 | 0.25 | 0.25 | 13/13 | Syn Spec. |
| LO1003 | 83.961000 | 9.942833 | 400.000 | Kurucz | 4000 | 0.20 | 0.93 | — | 4.485e+0 | 1.056e-20 | 1.987e-10 | 1.485e-12 | 0.50 | 7.915e-1 | 7.423e-3 | 21950 | 0.3020998 | 125 | 0.25 | 0.15 | 6/13 | Syn Spec. |
| LO1004 | 83.948125 | 9.7663278 | 400.000 | BT-Set1 | 3500 | 0 | -0.5 | alpha 0.2 | 3.047e+1 | 1.785e-20 | 1.520e-10 | 1.445e-12 | 0.50 | 7.591e-1 | 7.209e-3 | 33205 | 0.3020998 | 50 | 0.25 | 0.25 | 7/14 | Syn Spec. |
| LO1005 | 83.473542 | 9.7388899 | 400.000 | BT-Set1 | 3500 | 1 | 0 | alpha 0 | 6.641e+0 | 1.976e-20 | 1.721e-10 | 2.773e-12 | 0.54 | 8.544e-1 | 1.385e-2 | 119008 | 0.3020998 | 50 | 0.25 | 0.2 | 13/14 | Syn Spec. |
| LO1006 | 83.817750 | 9.9278111 | 400.000 | Kurucz | 4000 | 0.20 | 0.93 | — | 2.049e+0 | 9.705e-21 | 1.417e-10 | 1.453e-12 | 0.48 | 7.995e-1 | 7.346e-3 | 33205 | 0.3020998 | 125 | 0.25 | 0.15 | 6/13 | Syn Spec. |
| LO1007 | 83.921125 | 9.8162099 | 400.000 | Kurucz | 3600 | 0.00 | -1.38 | — | 2.776e+0 | 1.336e-20 | 1.204e-10 | 1.180e-12 | 0.50 | 8.021e-1 | 9.280e-3 | 21950 | 0.3020998 | 125 | 0.25 | 0.25 | 6/14 | Syn Spec. |
| LO1008 | 83.901542 | 9.909911 | 400.000 | BT-Set1 | 3500 | 0.5 | -2 | alpha 0.4 | 4.238e+1 | 1.017e-20 | 1.414e-10 | 1.567e-12 | 0.48 | 7.055e-1 | 2.788e-2 | 21950 | 0.3020998 | 50 | 0.25 | 0.25 | 6/13 | Syn Spec. |
| LO1009 | 83.990993 | 10.106691 | 400.000 | BT-Set1 | 4100 | -0.1 | -2.5 | alpha 0.4 | 5.970e+0 | 1.950e-20 | 1.910e-10 | 2.945e-12 | 0.55 | 8.745e-1 | 1.029e-2 | 119008 | 0.3020998 | 50 | 0.25 | 0.25 | 13/13 | Syn Spec. |
| LO1010 | 83.637333 | 10.144750 | 400.000 | BT-Set1 | 4100 | -0.1 | -2.5 | alpha 0.4 | 2.152e+1 | 1.467e-20 | 1.900e-10 | 1.178e-12 | 0.50 | 8.436e-1 | 5.873e-3 | 77891 | 0.3020998 | 50 | 0.25 | 0.25 | 12/14 | Syn Spec. |



Analyze SED's: Bayes analysis



VO SED Analyzer

| | | | | | | | | | | |
|---------------------|---------|----------|-----|-----------|------------------------------|----------|--------------|-----|------|--------|
| Files | Objects | VO Phot. | SED | Chi-2 Fit | Bayes Analysis | HR Diag. | Save Results | Log | Help | Logout |
| Stars Test (Change) | | | | | File: bbbbbb (info) (Change) | | | | | |

Model Bayes Analysis Template Bayes Analysis

Model Bayes analysis+

Bestfit

L Ori001

L Ori002

L Ori003

L Ori004

L Ori005

L Ori006

L Ori007

L Ori008

L Ori009

L Ori010

L Ori001

Here you can see, for each model, the relative probability found for each parameter.

Only those with a probability higher than 1e-4 are shown.

Kurucz ODFNEW /NOVER models

| A_V | Probability | logg | Probability | Meta. | Probability | T_{eff} | Probability |
|------------|-------------|------|-------------|-------|-------------|------------------|-------------|
| 0.36209598 | 1.000000 | 0.00 | 0.548390 | -2.50 | 0.121223 | 3500 | 0.000229 |
| | | 0.50 | 0.161894 | -2.00 | 0.097722 | 3750 | 0.156114 |
| | | 1.00 | 0.027613 | -1.50 | 0.030925 | 4000 | 0.843655 |
| | | 1.50 | 0.008018 | -1.00 | 0.005155 | | |
| | | 2.00 | 0.031249 | -0.50 | 0.008567 | | |
| | | 2.50 | 0.051509 | 0.00 | 0.058373 | | |
| | | 3.00 | 0.083071 | 0.20 | 0.312587 | | |
| | | 3.50 | 0.073487 | 0.50 | 0.365448 | | |
| | | 4.00 | 0.012700 | | | | |
| | | 4.50 | 0.001856 | | | | |
| | | 5.00 | 0.000212 | | | | |

logg



| Next >

Analyze SED's: Template fit.



VO SED Analyzer

| Files | Objects | VO Phot. | SED | Chi-2 Fit | Bayes |
|---------------------|---------|----------|-----|-------------|-------|
| Stars Test (Change) | | | | File: bbbbb | |

Model Fit

Temp

This option allows you to estimate the spectral type for each object corresponding to the SED. Take a look to the corresponding [Help Section](#) and [Credits Page](#) for more information.

First select the template collection:

Mark All | Unmark all

Next: Make the fit

L and T dwarf data archive
L and T dwarf data from [Chiu et al. 2006](#), [Golmowski et al. 2004](#) and [Knapp et al. 2004](#)

The NIRSPEC Brown Dwarf Spectroscopic Survey
The Brown Dwarf Spectroscopic Survey (BDSS), 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.

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)

Next: Make the fit

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

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 ApJS, 77, 417 (1991 - for M dwarfs) and Kirkpatrick et al ApJ 519, 882 (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

Acknowledging VOSEA in publications:

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

This publication makes use of VOSEA, developed under the Spanish Virtual Observatory project supported from the Spanish MICINN through grant AYA2008-02156.

Referencing VOSEA in publications:

If your research benefits from the use of VOSEA, 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.

Analyze SED's: Template fit.



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

Stars Test (Change) File: bbbbbb (info) (Change)

Model Fit **Template fit**

Template fit

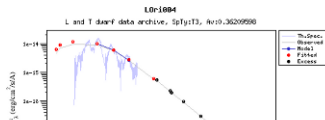
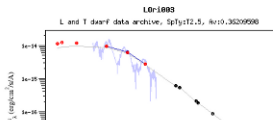
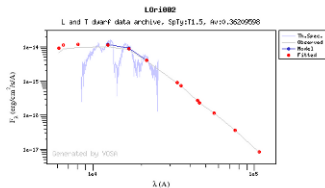
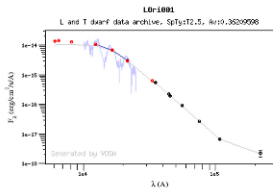
Best fit

LOr001
LOr002
LOr003
LOr004
LOr005
LOr006
LOr007
LOr008
LOr009
LOr010

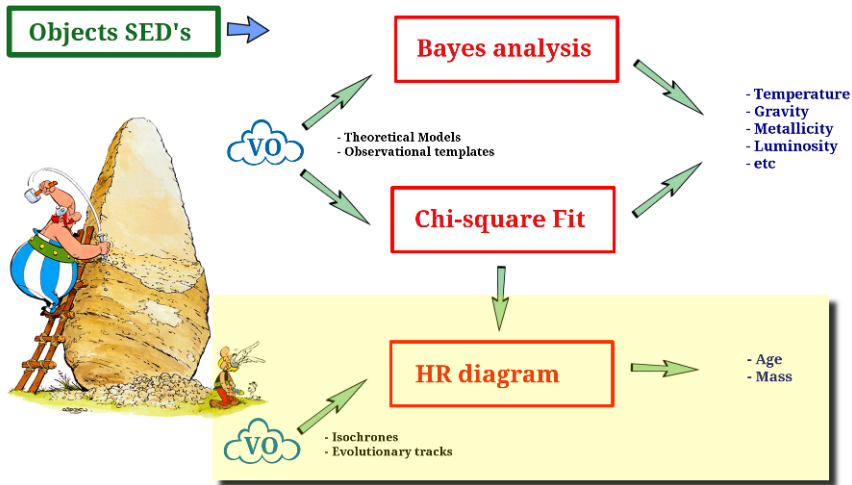
Best fit+ results

| Object | RA | DEC | Model | SpTy | more | A_V | χ^2 | M_B | A_{max} | N_{fit}/N_{tot} | Data VOTables |
|--------|-----------|-----------|------------------|------|------|------------|----------|----------|-----------|-------------------|---------------|
| LOr001 | 83.446583 | 9.9273611 | Chiu et al. 2006 | T2.5 | --- | 0.36209598 | 5.028e-1 | 1.409e+2 | 33526 | 3/14 | Spec. |
| LOr002 | 84.043167 | 10.148593 | Chiu et al. 2006 | T1.5 | --- | 0.36209598 | 9.330e+0 | 2.386e+2 | 115608 | 3/13 | Spec. |
| LOr003 | 83.981000 | 9.9420833 | Chiu et al. 2006 | T2.5 | --- | 0.36209598 | 1.331e-1 | 1.267e+2 | 21590 | 3/13 | Spec. |
| LOr004 | 83.948125 | 9.7640278 | Chiu et al. 2006 | T3 | --- | 0.36209598 | 3.385e+0 | 6.330e+1 | 33526 | 3/14 | Spec. |
| LOr005 | 83.473542 | 9.7188889 | Chiu et al. 2006 | T1.5 | --- | 0.36209598 | 9.135e-1 | 1.854e+2 | 115608 | 3/14 | Spec. |
| LOr006 | 83.817750 | 9.9216111 | Chiu et al. 2006 | T2.5 | --- | 0.36209598 | 4.205e-1 | 1.128e+2 | 33526 | 3/13 | Spec. |
| LOr007 | 83.623125 | 9.8163056 | Chiu et al. 2006 | T3 | --- | 0.36209598 | 1.206e+0 | 4.637e+1 | 21590 | 3/14 | Spec. |
| LOr008 | 83.991542 | 9.9091111 | Chiu et al. 2006 | T2.5 | --- | 0.36209598 | 3.123e-1 | 1.123e+2 | 21590 | 3/13 | Spec. |
| LOr009 | 83.693063 | 10.109889 | Chiu et al. 2006 | T2 | --- | 0.36209598 | 1.351e+0 | 6.296e+1 | 115608 | 3/13 | Spec. |
| LOr010 | 83.637333 | 10.144750 | Chiu et al. 2006 | T2.5 | --- | 0.36209598 | 1.957e+0 | 8.043e+1 | 75891 | 3/14 | Spec. |

Hide graphs Delete this fit



Analyze SED's: HR diagram.



Analyze SED's: HR diagram.



VO SED Analyzer

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

Stars Test (Change)

File: bbbbbb (info) (Change)

HR Diagram

This option allows you to estimate values for the age and the mass of the objects. In order to do that, the $(T_{\text{eff}}, \log(L))$ values obtained from the best model fit are used as starting points for interpolating collections of theoretical isochrones and evolutionary tracks obtained from the VO. Then, a HR diagram is displayed showing the data points, isochrones and evolutionary tracks.

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

Take into account that:

- The properties obtained in the model fit for each object will be compared to the isochrones and evolutionary tracks more adequate for that model.

(See list of objects)

Choose the parameter ranges that you want to use for the diagram

BT-Setti Isochrones and Evolutionary Tracks

Theoretical Isochrones and Evolutionary Tracks for the BT-Setti model.

t: 0.00100 - 12.00000 (Min/Max value for the age of the star. Ages are given in Gyr)

m: 0.001 - 1.400 (Min/Max value for the mass of the star. Masses are given in Msun)

Siess Isochrones and Evolutionary Tracks

Grid of isochrones and evolutionary tracks for pre-main sequence (PMS) in the mass range 0.1 to 7 Msun.

- "An internet server for pre-main sequence tracks of low- and intermediate-mass stars"
Siess et al 2000, *A&A*, 358, 5935

t: 0.00007 - 30 (Min. Age of the star in Gyr)

m: 0.1 - 7.0 (Min. Mass of the star in solar masses)

Make the HR Diagram



Analyze SED's: HR diagram.



VO SED Analyzer

| | | | | | | | | | | |
|---------------------|---------|------------------------------|-----|-----------|----------------|----------|--------------|-----|------|--------|
| Files | Objects | VO Phot. | SED | Chi-2 Fit | Bayes Analysis | HR Diag. | Save Results | Log | Help | Logout |
| Stars Test (Change) | | File: bbbbbb (Info) (Change) | | | | | | | | |

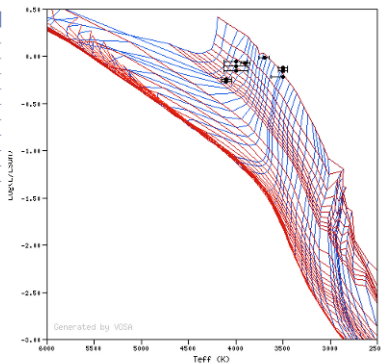
HR Diagram

Delete this HR Diagram

Objects

| Object | Model | T _{eff} | LogL | Age | Mass |
|----------|----------|------------------|---------|--------|-----------|
| L Ori001 | siess | 4000 | -0.0496 | 0.0018 | 0.6992 |
| L Ori002 | BT-Settl | 3700 | -0.0168 | 0.0011 | 0.8333 |
| L Ori003 | siess | 4000 | -0.1015 | 0.0019 | 0.7000 |
| L Ori004 | BT-Settl | 3500 | -0.1203 | — | [4] — [4] |
| L Ori005 | BT-Settl | 3900 | -0.0863 | 0.0029 | 1.0515 |
| L Ori006 | siess | 4000 | -0.1509 | 0.0020 | 0.7000 |
| L Ori007 | siess | 3500 | -0.2199 | 0.0009 | 0.3700 |
| L Ori008 | BT-Settl | 3500 | -0.1527 | — | [4] — [4] |
| L Ori009 | BT-Settl | 4100 | -0.2411 | 0.0079 | 1.1052 |
| L Ori010 | BT-Settl | 4100 | -0.2847 | 0.0081 | 1.1000 |

[4] The point lies outside the area covered by the isochrones





| | | | | | | | | | | |
|---------------------|---------|----------|-----|------------------------------|----------------|----------|--------------|-----|------|--------|
| Files | Objects | VO Phot. | SED | Chi-2 Fit | Bayes Analysis | HR Diag. | Save Results | Log | Help | Logout |
| Stars Test (Change) | | | | File: bbbbbb (info) (Change) | | | | | | |

Save Results

Please, select what you want to retrieve.

Object SED

Photometry (Observed) .dat .kml .png .eps

Model Fit+

Best Fit+ Results .dat .kml

Fit+ parameters info .dat

Photometry (Obs+Model fit+) .dat .kml .png .eps

Bayes Analysis+

Best Model Bayes Results .dat .kml

Bayes parameters info .dat

Object Model Bayes analysis results .dat .kml .png .eps

Template Fit

Template fit .dat .kml

Template Fit parameters info .dat

Template Bayes Analysis+

Best Template Bayes Results -- --

Template Bayes parameters info -- --

Object Template Bayes analysis results -- --

HR diagram

HR diagram .dat .kml .png .eps

Log File

Activity log .dat

If your research benefits from the use of VOSA, please remember to include the appropriate references in your publication.

The main reference for VOSA is:

Bayo, A., Rodrigo, C., Barrado y Navascues, D., Solano, E., Gubiern, R., Morales-Calderon, N., Allard, F. 2008, A&A 492, 277B.

We would also appreciate if you include the following acknowledgement 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 MICTINN through grant AyA2008-02156.

VOSA uses also external services, theoretical models and science inputs from other sources that you might want to cite or acknowledge as well.

When you download your results two additional files are included:

- info/refs.dat : with a description of all references for the services that have been used in this file.
- info/refs.bibtex.bib : with the bibtex entries corresponding to all those references.

Please, read the info/refs.dat file and take it into account.

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

Results: activity log.



VO SED Analyzer

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

Stars Test (Change)

File: bbbbbb (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

- 2013/09/18 02:51:17 **HR diagram generated**
Model parameter values used for the diagram:
BT-Settl Isochrones and Evolutionary Tracks
Isochrones
t_min = 0.00100
t_max = 12.00000
Ev. tracks
m_min = 0.001
m_max = 1.400
Siess Isochrones and Evolutionary Tracks
Isochrones
t_min = 0.00007
t_max = 30
Ev. tracks
m_min = 0.1
m_max = 7.0
- 2013/09/18 02:49:46 Previous HR diagram results are not valid anymore. They have been deleted
- 2013/09/18 02:10:00 **Bayes+ analysis executed**
Model parameter values used for the fit:
Kurucz ODFNEW /NOVER models
teff_min = 3500
teff_max = 50000
logg_min = 0.00
logg_max = 5.00
meta_min = -2.50
meta_max = 0.50
- 2013/09/18 02:09:49 Previous Bayes+ analysis results are not valid anymore. They have been deleted
- 2013/09/18 02:02:06 **Model fit+ executed**
Parameter values used for the fit:
Land T dwarf data archive
Keck LRIS spectra of late-M, L and T dwarfs
The NIRSPEC Brown Dwarf Spectroscopic Survey
The SpeX Prism Spectral Libraries

Summary of news/future news

- Blue/UV excess.
- New VO catalogues.
 - IRAS, VISTA (VVV, VIKING, VHS, VIDEO, VMC).
- New theoretical models.
 - TMAP, sdOs.
- Better control of final SED / VO photometry.
 - Several points for the same filter.
 - More info about observation date, quality, etc.
 - Manual editing of SED.
- Better handling of extinction properties.
 - Accesing extinction maps from VO services.

THANK YOU!