

# VOSA 2: the new generation



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

Stars and brown dwarfs (Change) File: C69 only confirmed spec (info) (Change)

Model Fit Template fit

Model fit+

Bestfit

Best fit+ results

Show graphs Delete this fit

Object	RA	DEC	D (pc)	Model	T <sub>eff</sub>	logg	Meta.	more	χ <sup>2</sup>	M <sub>d</sub>	F <sub>tot</sub>	ΔF <sub>tot</sub>	F <sub>obs</sub> /F <sub>tot</sub>	L <sub>bol</sub> /L <sub>sun</sub>	ΔL <sub>bol</sub> /L <sub>s</sub>
C69-IRAC-001	84.2339859	9.5229902	400.000	BT-Settl	3000	3.5	0	alpha:0	2.988e+2	5.344e-21	3.927e-11	6.435e-12	0.66	1.958e-1	8.105e-2
C69-IRAC-002	84.230545	9.7799978	400.000	BT-Settl	3300	3.5	0	alpha:0	3.507e+1	2.703e-21	1.798e-11	2.563e-13	0.44	8.968e-2	2.370e-2
C69-IRAC-003	83.962204	9.6491137	400.000	BT-Settl	3300	3.5	0	alpha:0	5.799e+0	1.719e-21	1.135e-11	1.574e-13	0.43	5.658e-2	1.493e-2
C69-IRAC-004	83.8685303	10.0409756	400.000	BT-Settl	3200	4	0	alpha:-0.2	1.040e+1	4.467e-21	2.658e-11	3.129e-13	0.44	1.325e-1	3.470e-2
C69-IRAC-005	83.8555679	9.9132547	0.000												
C69-Sub-004	83.7191086	9.9305677	400.000	BT-Settl	3000	4	0	alpha:-0.2	2.375e+1	4.670e-21	2.255e-11	1.724e-13	0.29	1.125e-1	2.898e-2
C69-Sub-005	83.516304	9.8700848	400.000	BT-Settl	2800	4	0	alpha:-0.2	5.962e+1	9.047e-21	3.227e-11	5.043e-13	0.40	1.609e-1	4.274e-2
C69-X-E-104	83.79483333333334	9.935138888888888	0.000												
C69XE-009	83.78791666666666	9.910027777777776	0.000												
C69XE-040	83.98154	9.869463	400.000	BT-Settl	3200	4	0	alpha:-0.2	8.021e+2	3.374e-21	1.989e-11	1.284e-13	0.54	9.916e-2	2.543e-2
C69XE-064	83.829475	9.9151335	400.000	Kurucz	4750	3.50	0.00	---	2.416e+1	2.689e-20	7.898e-10	6.560e-12	0.22	3.938e+0	1.017e+0
C69XE-072	84.209405	9.9066	400.000	BT-Settl	3200	3.5	0	alpha:0	2.022e+0	3.818e-21	2.280e-11	1.646e-12	0.50	1.137e-1	3.663e-2
DM003	83.842427	9.8995644	400.000	BT-Settl	3400	4	0	alpha:-0.2	1.606e+2	3.423e-21	2.716e-11	2.798e-13	0.52	1.354e-1	3.526e-2
DM005	84.114436	9.7571574	400.000	BT-Settl	3300	4	0	alpha:0	6.157e+0	2.879e-21	1.906e-11	3.055e-13	0.49	9.507e-2	2.529e-2
DM006	83.46541666666666	9.639305555555556	400.000	BT-Settl	3800	4	0	alpha:0	2.117e+1	1.066e-20	1.235e-10	1.555e-12	0.53	6.158e-1	1.617e-1
DM007	83.50833333333333	9.685055555555554	400.000	BT-Settl	4300	4.5	0	alpha:0	3.738e+0	1.138e-20	2.137e-10	5.557e-12	0.58	1.066e+0	2.941e-1
DM008	83.52058333333335	9.951055555555554	400.000	BT-Settl	3600	3.5	0	alpha:0	4.409e+1	5.183e-21	4.916e-11	5.277e-13	0.48	2.451e-1	6.391e-2
DM009	83.52304166666666	9.713	400.000	BT-Settl	4500	3.5	0	alpha:0	3.551e+1	1.309e-20	3.014e-10	6.597e-12	0.62	1.503e+0	4.086e-1
DM010	83.55704166666668	9.488833333333334	400.000	BT-Settl	4300	4.5	0	alpha:0	1.085e+1	8.370e-21	1.595e-10	4.719e-12	0.60	7.952e-1	2.223e-1
DM013	83.63670833333332	9.991916666666667	400.000	BT-Settl	4200	4.5	0	alpha:0	4.731e+0	6.241e-21	1.061e-10	1.572e-12	0.58	5.292e-1	1.401e-1

~200 regular users, cited in ~ 50 papers

Bayo et al. (2008, 2014a subm.)

# VOSA 2: the new generation

The screenshot displays the VOSA 2 web interface. At the top left is the VOSA logo and 'VO SED Analyzer'. A navigation bar includes 'Files', 'Objects', 'VO Phot.', 'SED', 'Chi-2 Fit' (highlighted), 'Bayes Analysis', 'HR Diag.', 'Save Results', and 'Log'. Below the navigation bar, it says 'Stars and brown dwarfs (Change)' and 'File: C69 only confirmed spec (info) (Change)'. On the left, a 'Bestfit' list contains various object names like C69-IRAC-001 to DM014. The main area shows four SED plots for different objects: BT-Sett1 (Teff:4100, logg:4, Meta.:0, Av:0), BT-Sett1 (Teff:3500, logg:4, Meta.:0, Av:0), DM005 (BT-Sett1, Teff:3600, logg:4.5, Meta.:0, Av:0), and DM066 (BT-Sett1, Teff:4200, logg:4.5, Meta.:0, Av:0). Each plot shows flux density  $F_\lambda$  (erg/cm<sup>2</sup>/Å) vs wavelength  $\lambda$  (Å) on a log-log scale. The plots include 'Observed' data (black dots), 'Model' fits (blue line), 'Fitted' points (red dots), 'No fit' points (yellow dots), and 'Excess' points (black squares). To the right of the plots is a table with columns  $F_{tot}$ ,  $L_{bol}/L_{sun}$ , and  $\Delta L_{bol}/L_s$ .

$F_{tot}$	$L_{bol}/L_{sun}$	$\Delta L_{bol}/L_s$
1.958e-1	8.105e-2	
8.968e-2	2.370e-2	
5.658e-2	1.493e-2	
1.325e-1	3.470e-2	
1.125e-1	2.898e-2	
1.609e-1	4.274e-2	
9.916e-2	2.543e-2	
3.938e+0	1.017e+0	
1.137e-1	3.663e-2	
1.354e-1	3.526e-2	
9.507e-2	2.529e-2	
6.158e-1	1.617e-1	
1.066e+0	2.941e-1	
2.451e-1	6.391e-2	
1.503e+0	4.086e-1	
7.952e-1	2.223e-1	
5.292e-1	1.401e-1	

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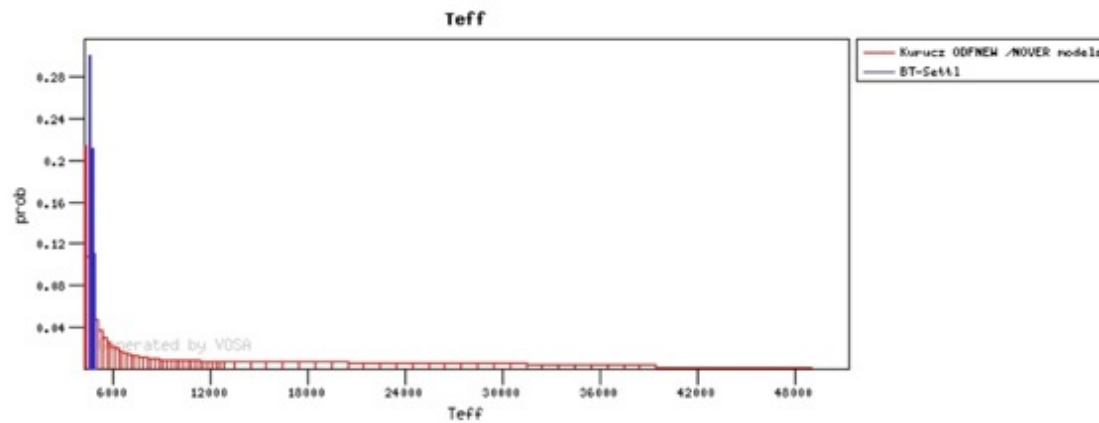
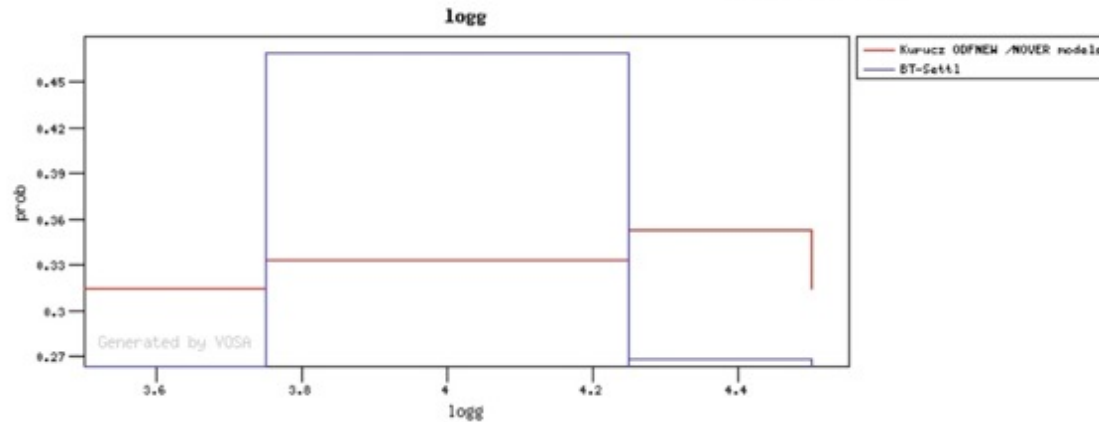
# VOSA 2: the new generation



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- L Ori 079
- L Ori 080
- L Ori 081

-0.2	0.099350	0.	1.000000	3.5	0.263404	0	1.000000	4500	0.227847
0	0.795954			4	0.468714			4700	0.149859
0.2	0.104697			4.5	0.267882			4800	0.211416
								4900	0.110616

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



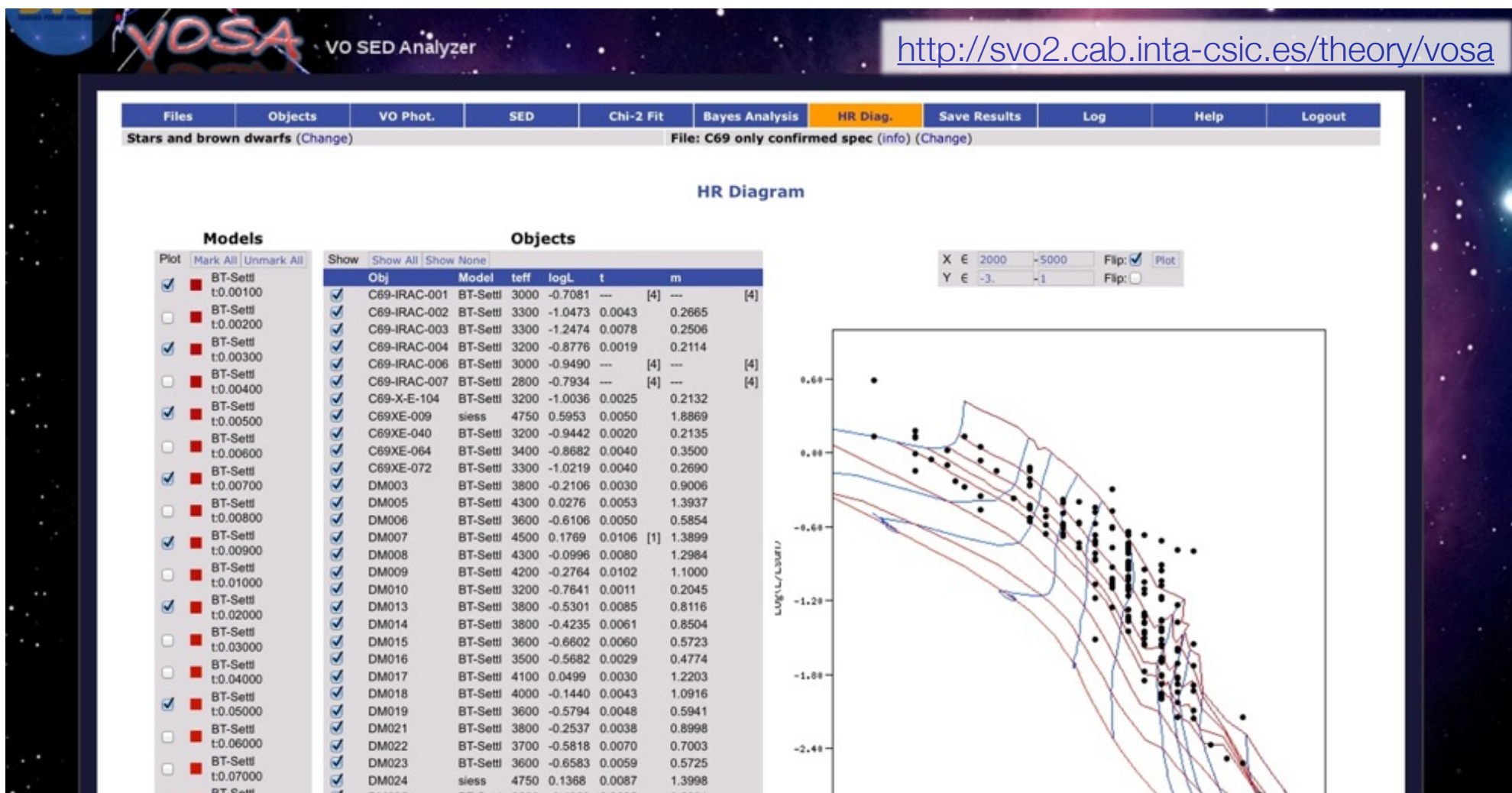
~200 regular users, cited in ~ 50 papers

Bayo et al. (2008, 2014a subm.)



# VOSA 2: the new generation

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



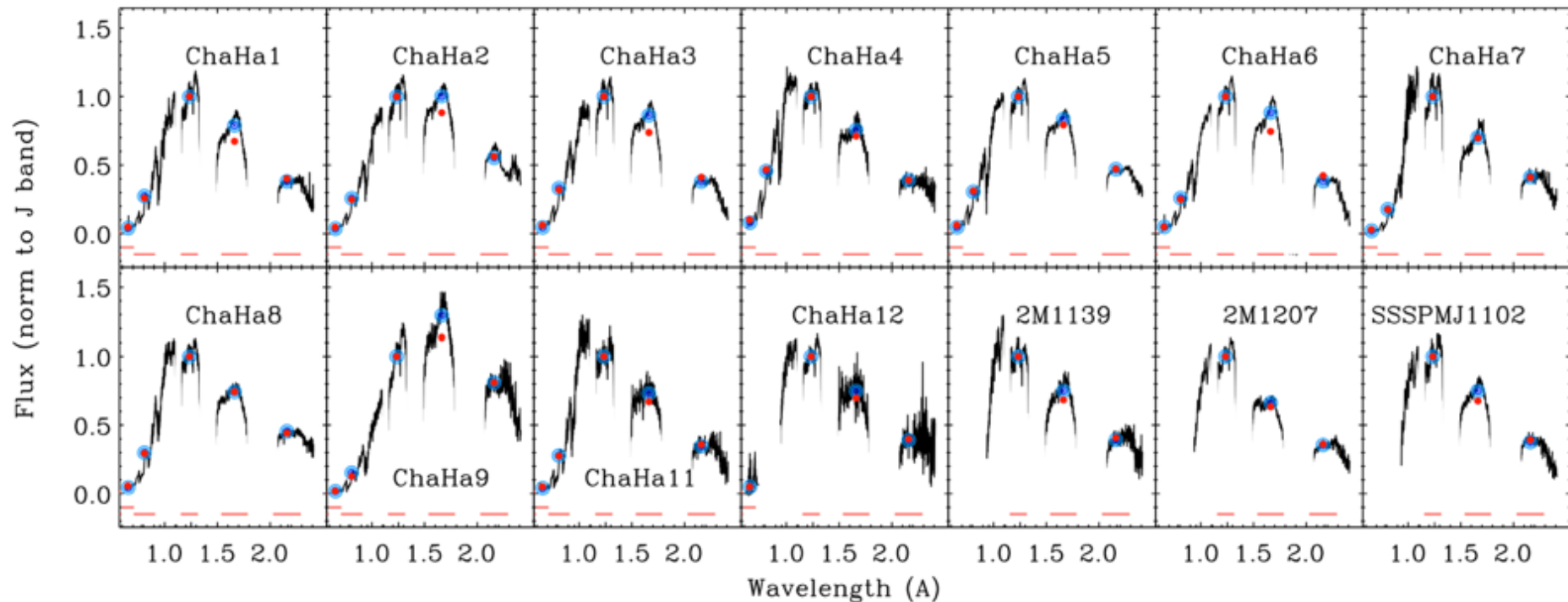
~200 regular users, cited in ~ 50 papers

Bayo et al. (2008, 2014a subm.)

# Cases that benefit from the new VOSA: Late M-type members of Cha I and TWA

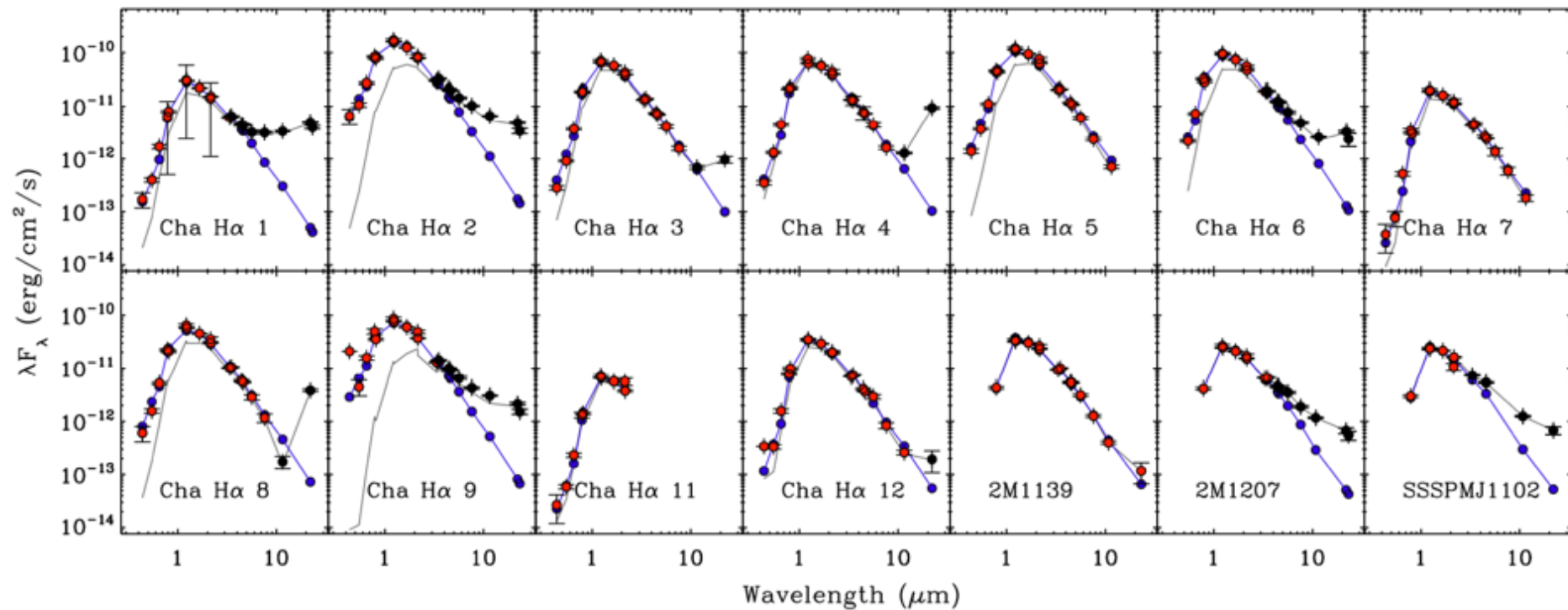
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- ✓ Spectral types (optical) M6 - M9 (dust settling)
- ✓ Well populated SEDs
- ✓ Optical + NIR spec available



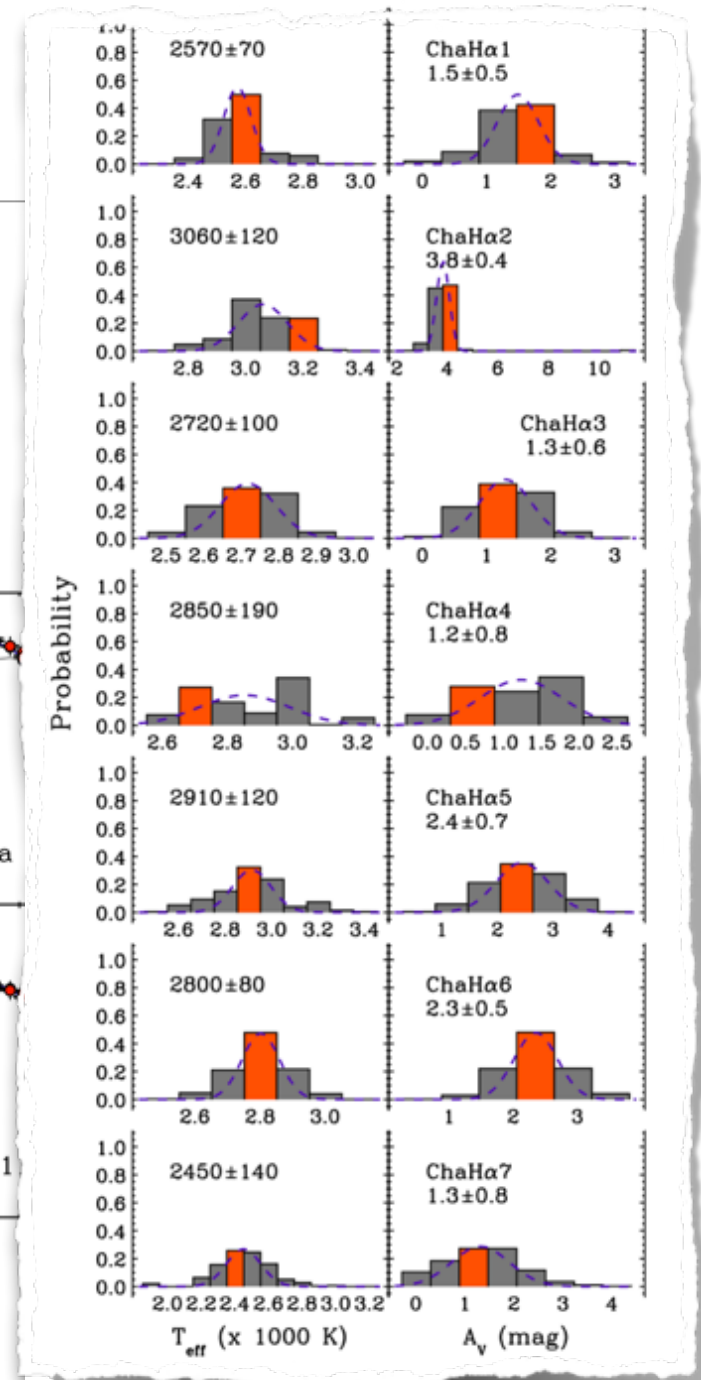
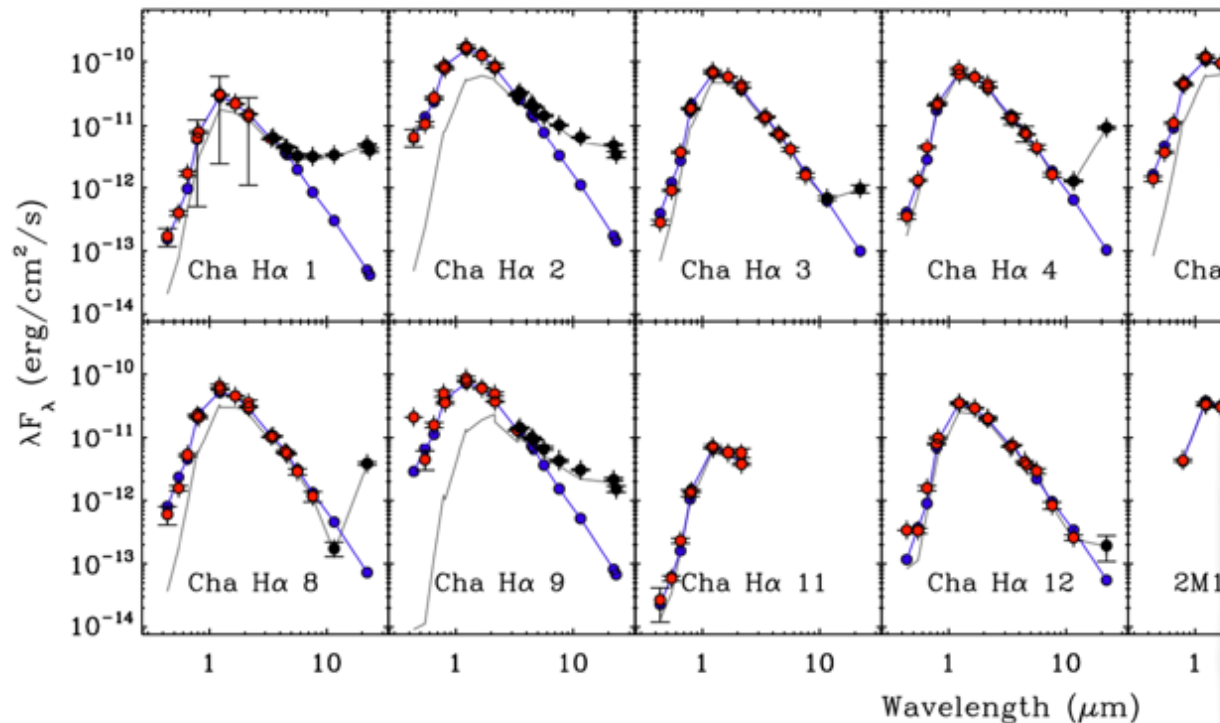
# VOSA results of the sample

- ✓ Good fits for most of the objects
- ✓ Significant parameters



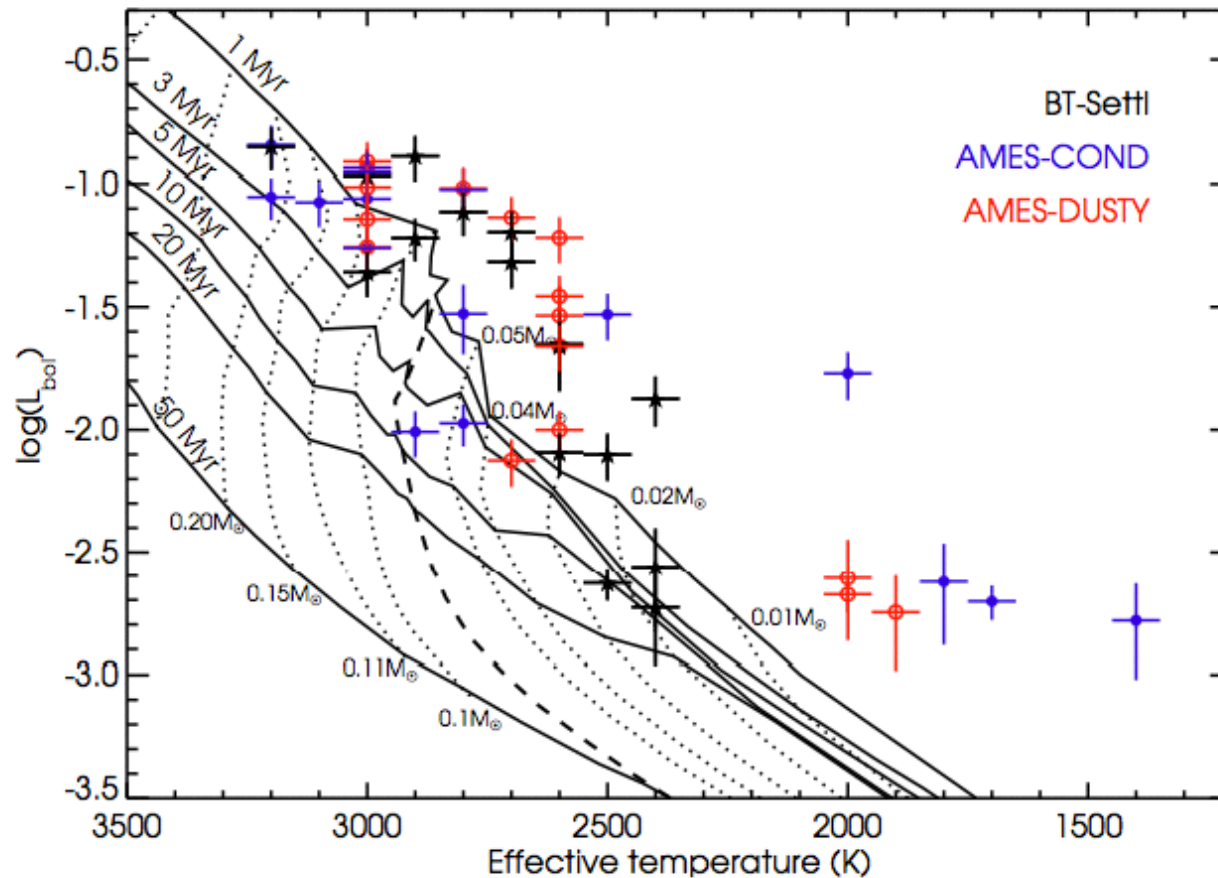
# VOSA results of the sample

- ✓ Good fits for most of the objects
- ✓ Significant parameters



# VOSA makes easy to compare the impact of dust treatment in determined masses -> IMF

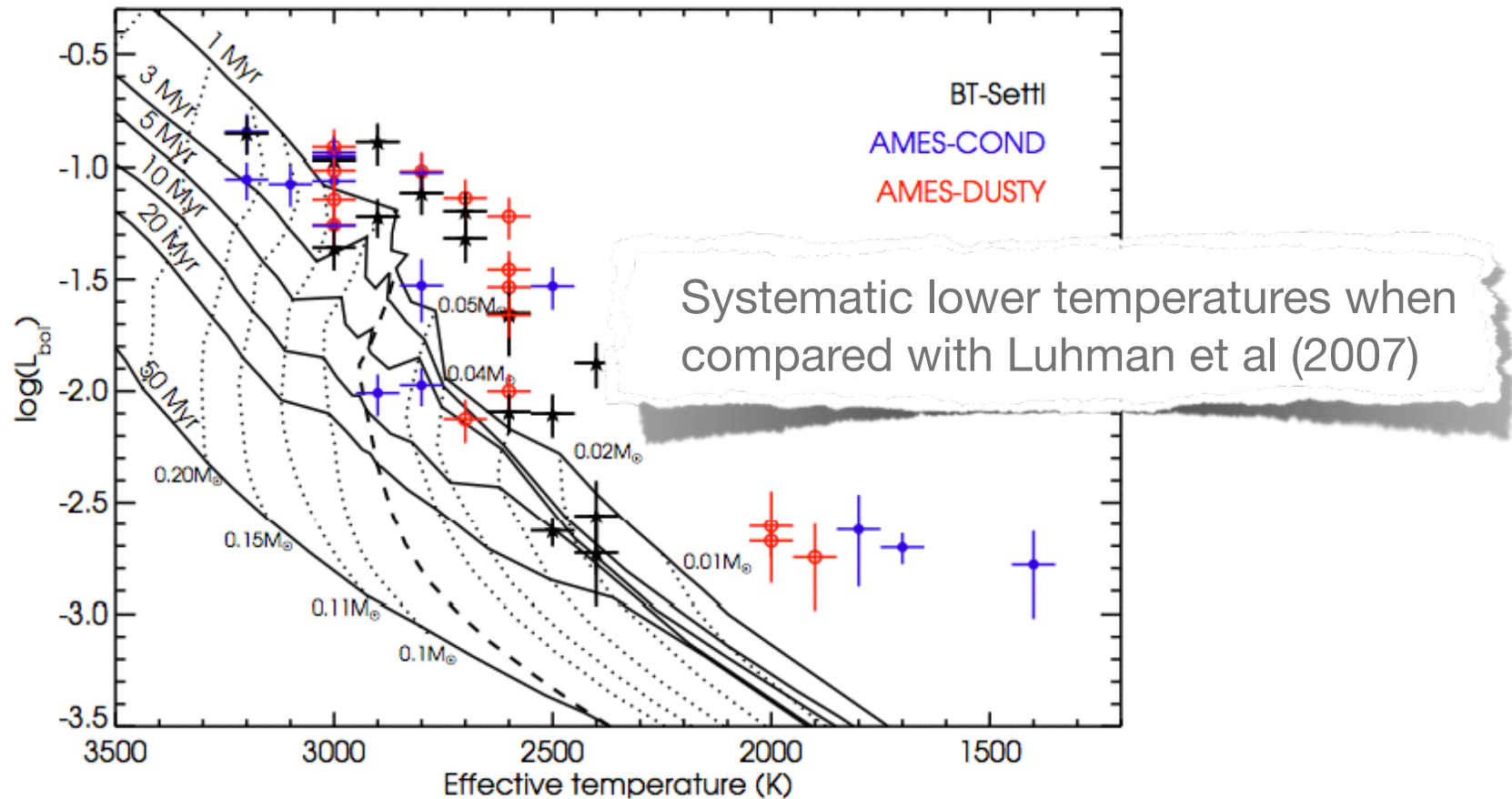
- Non-realistic masses with the limiting cases





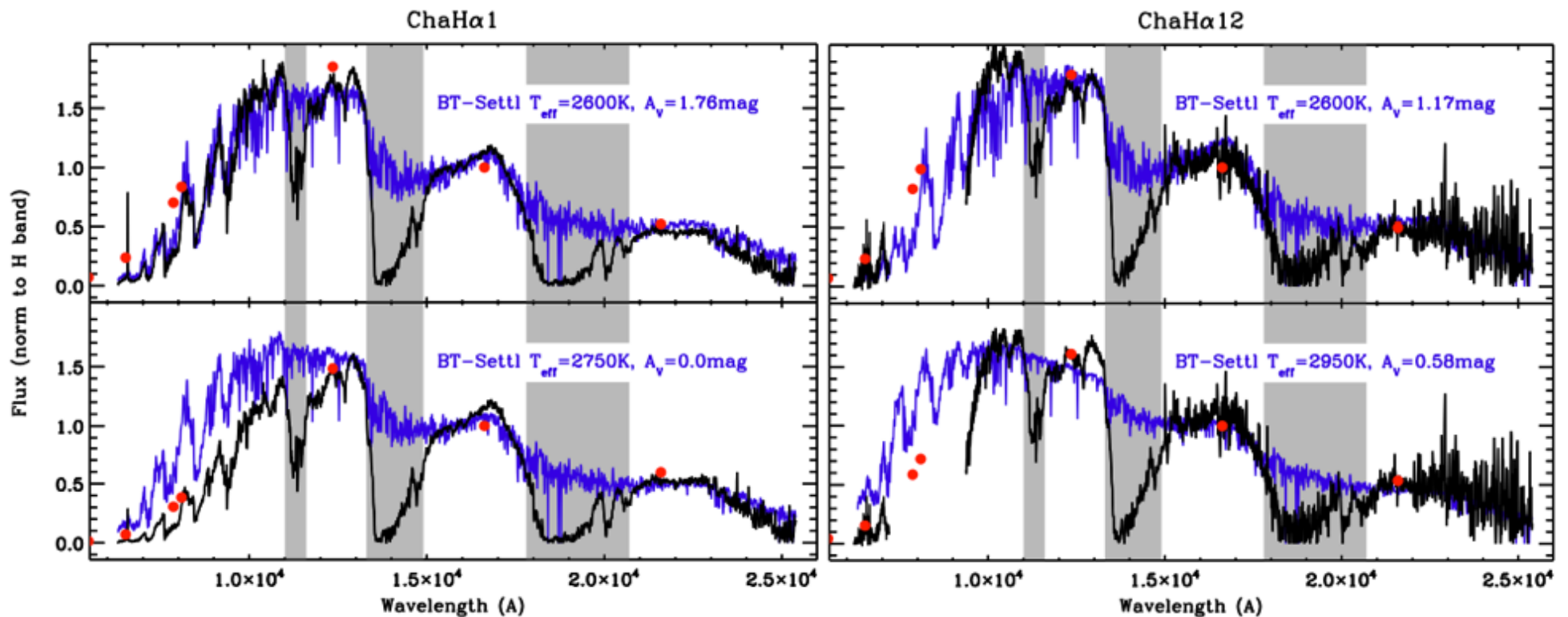
# VOSA makes easy to compare the impact of dust treatment in determined masses -> IMF

- Non-realistic masses with the limiting cases



Our determinations favored when reaching higher level of detail

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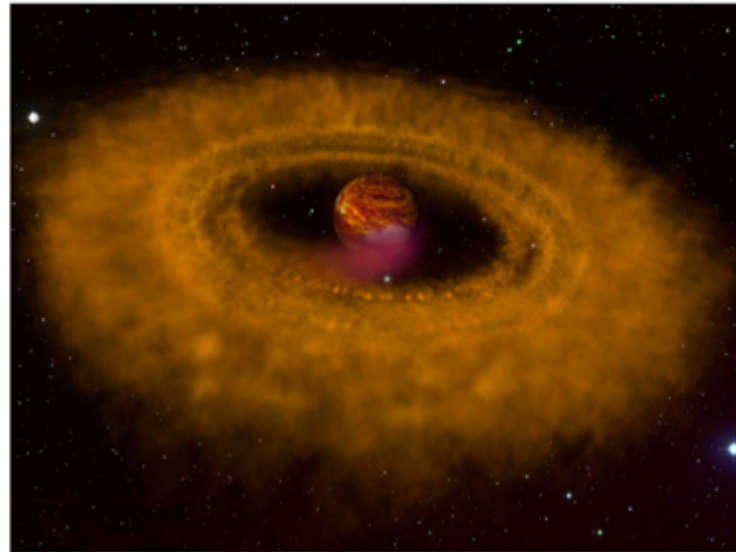


# Cases that benefit from (& not only) the new VOSA: A much COOLER object

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- Combined press-release: this is how our cool neighbors formed?

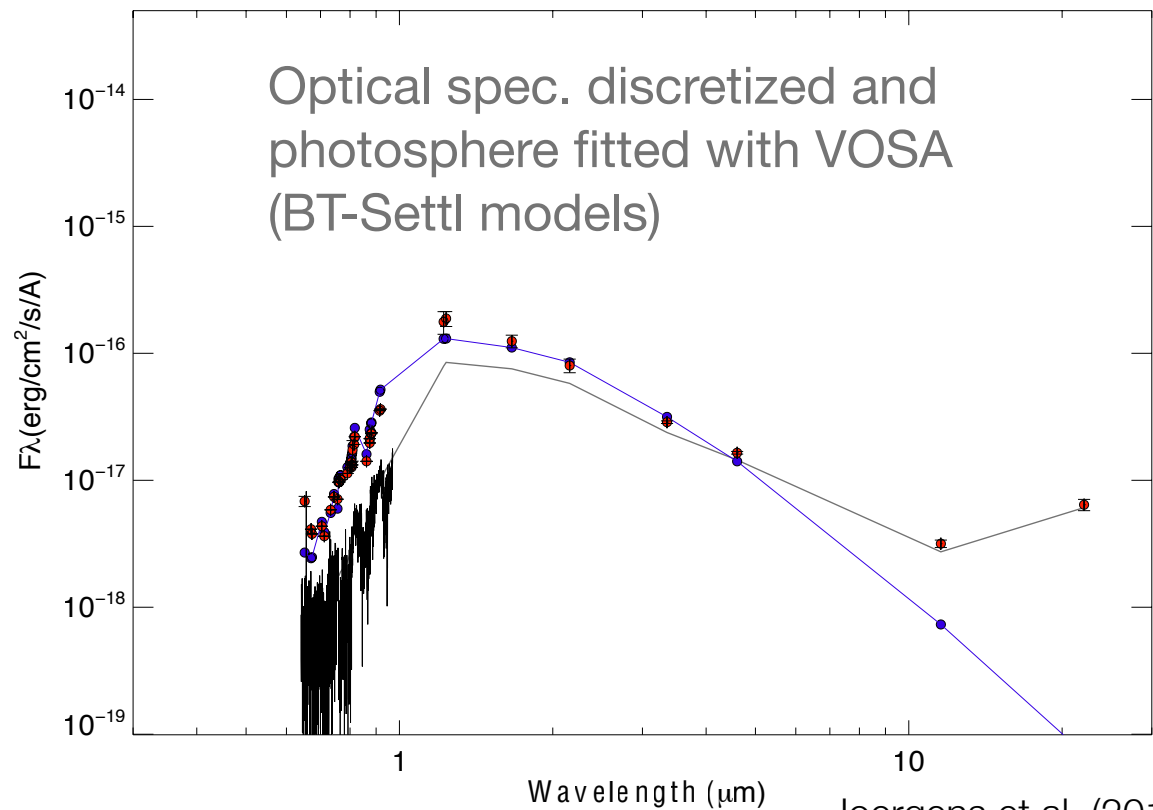
**Astronomers including Niall Deacon of the Max Planck Institute for Astronomy (MPIA) captured an image of an unusual free-floating planet. As the object has no host star, it can be observed and examined much easier than planets orbiting stars, promising insight into the details of planetary atmospheres. Can an object with as low a mass as this have formed directly, in the same way that stars form? Independent observations by a group led by MPIA's Viki Joergens suggest that this is the case: They discovered that a similar but much younger free-floating object is drawing material from its surrounding just like a young star. This has important consequences for star formation models in general.**



# Cases that benefit from (& not only) the new VOSA: A much COOLER object

- Combined press-release: this is how our cool neighbors formed?

**Astronomers including Niall D (MPIA) captured an image of host star, it can be observed a promising insight into the det low a mass as this have forme Independent observations by is the case: They discovered th drawing material from its surr consequences for star formati**



Joergens et al. (2013)

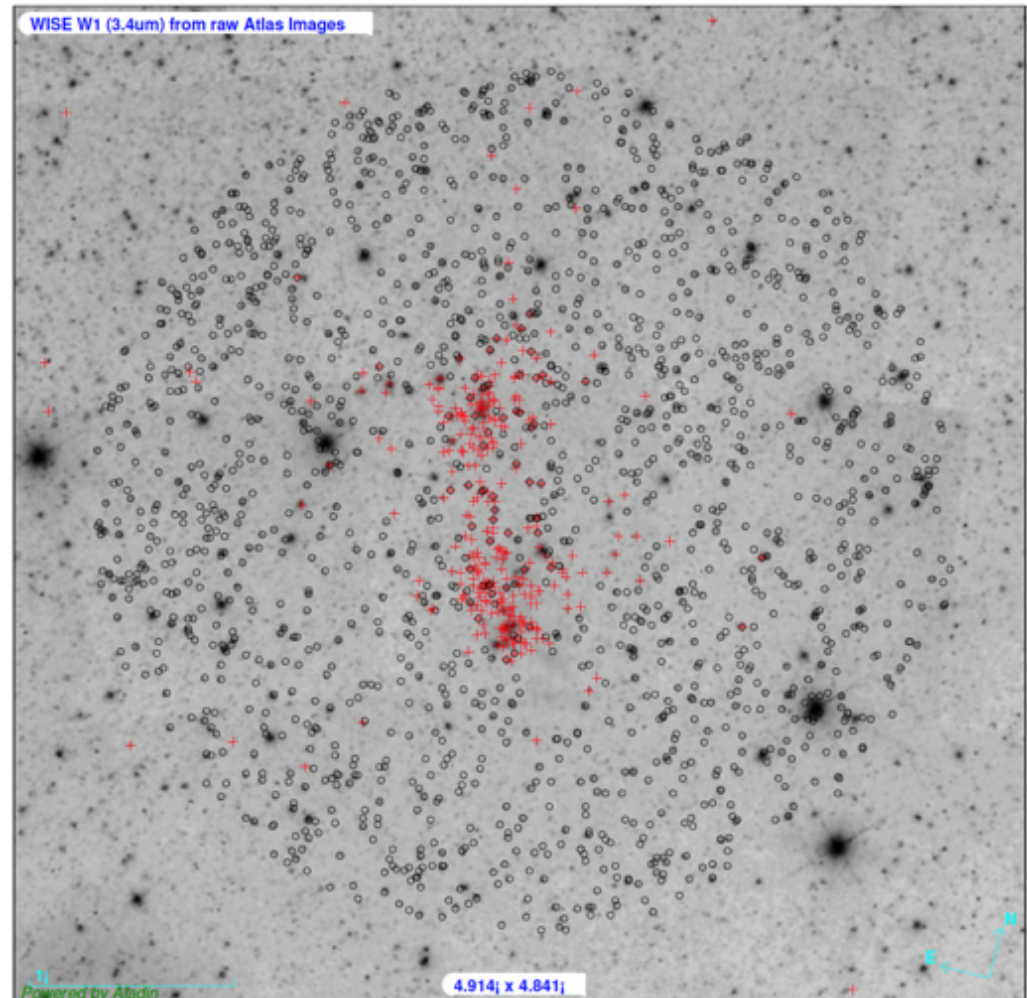




# Cases that benefit from (& not only) the new VOSA: Mine archives to achieve complete censuses

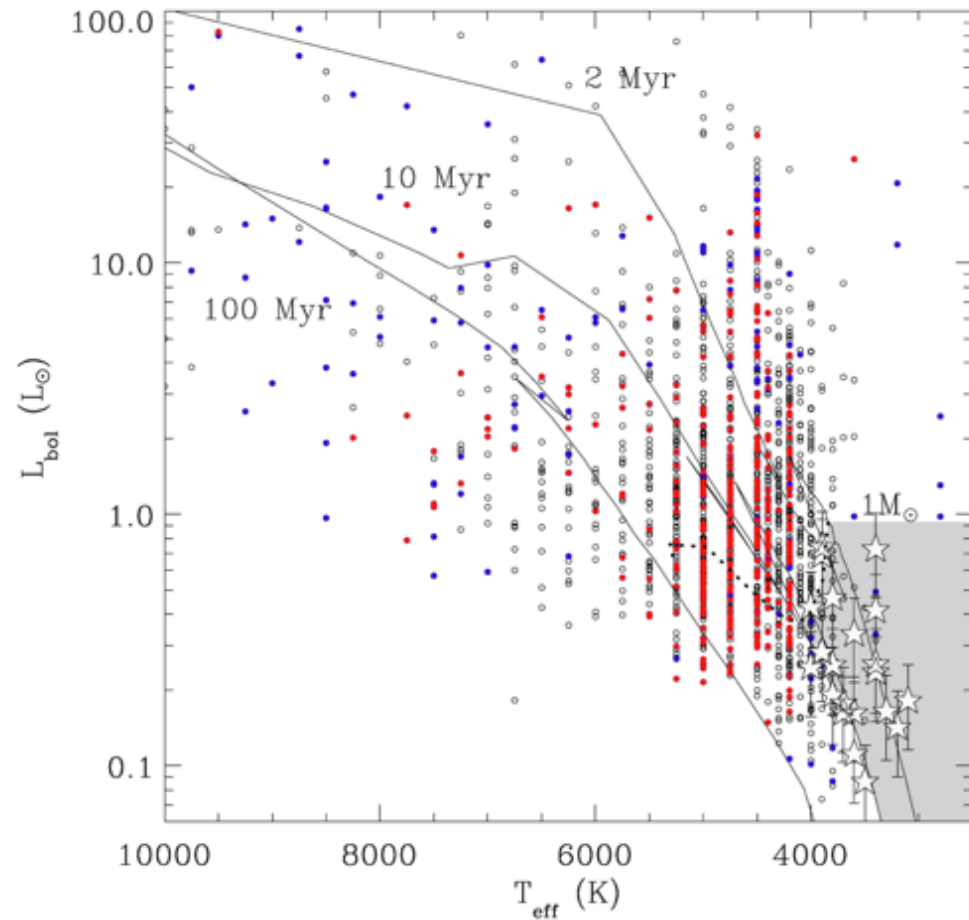
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- Every WISE source in a 2deg radius (~5.8 pc) with photospheric colors



# Cases that benefit from (& not only) the new VOSA: Mine archives to achieve complete censuses

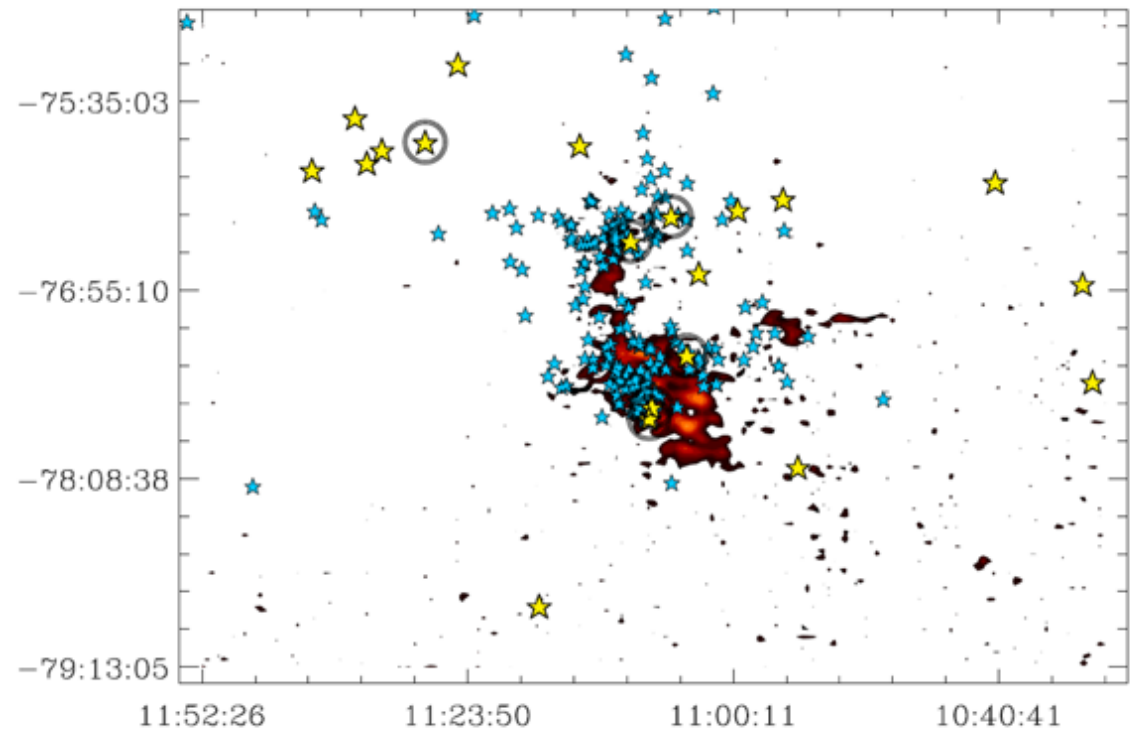
- Every WISE source in a 2deg radius ( $\sim 5.8$  pc) with photospheric colors
- Build SEDs with VOSA, fit models  $\rightarrow$  determine physical parameters



# Cases that benefit from (& not only) the new VOSA: Mine archives to achieve complete censuses

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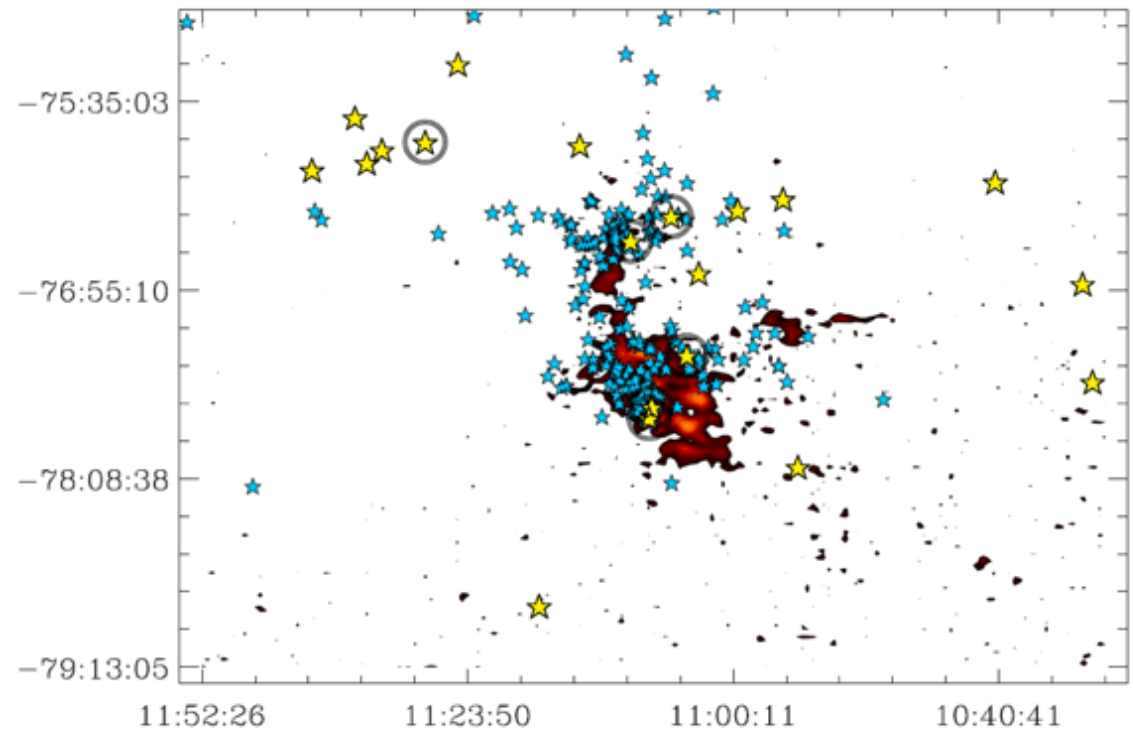
- Every WISE source in a 2deg radius ( $\sim 5.8$  pc) with photospheric colors
- Build SEDs with VOSA, fit models  $\rightarrow$  determine physical parameters
- Select candidates: different spatial distribution?



# Cases that benefit from (& not only) the new VOSA: Mine archives to achieve complete censuses

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- Every WISE source in a 2deg radius ( $\sim 5.8$  pc) with photospheric colors
- Build SEDs with VOSA, fit models  $\rightarrow$  determine physical parameters
- Select candidates: different spatial distribution?
- Confirm candidates: NTT/EFOSC2 data (preliminary)  $\rightarrow$  65% success





# Cases that benefit from the new VOSA: Disk evolution in low-mass stars

**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:**  No file selected.

**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)

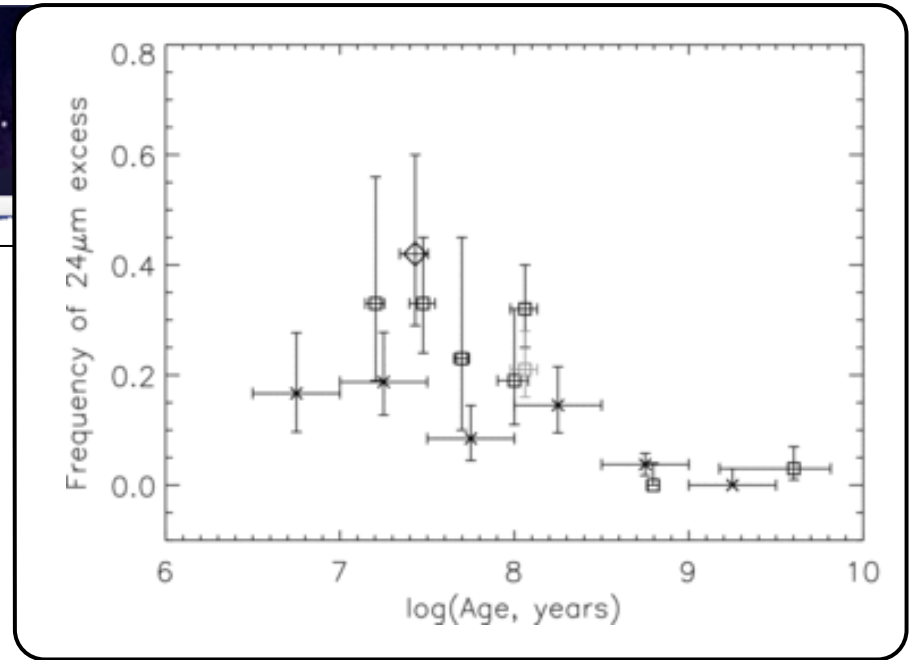
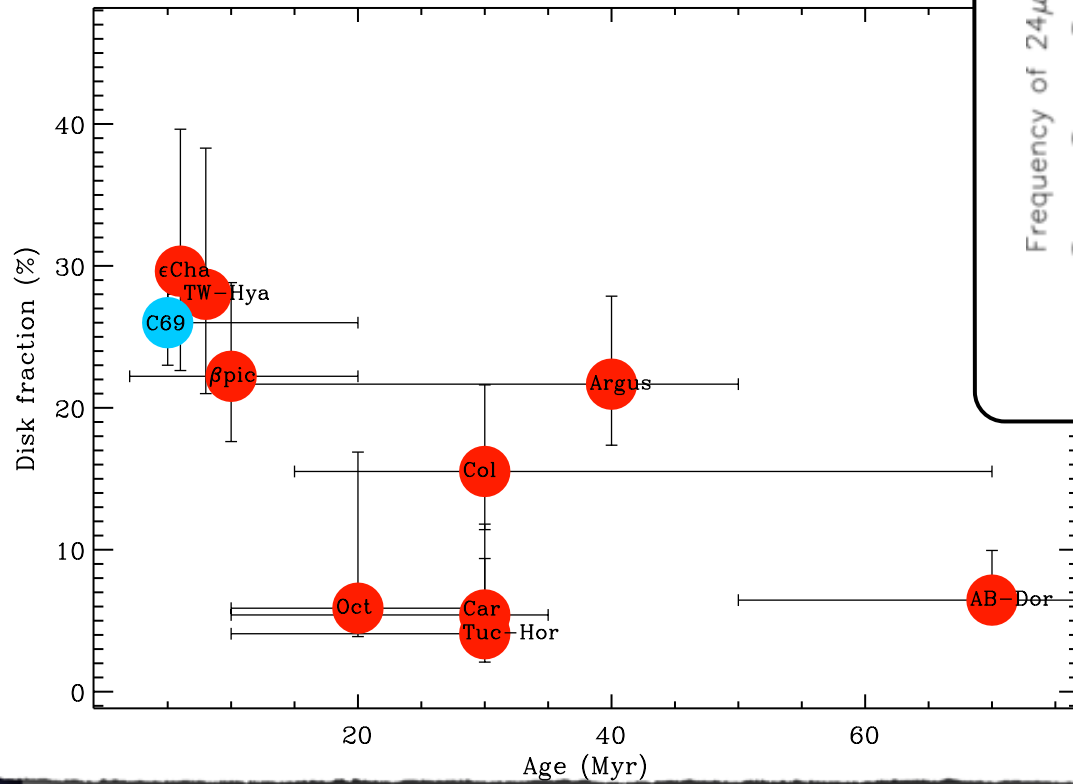
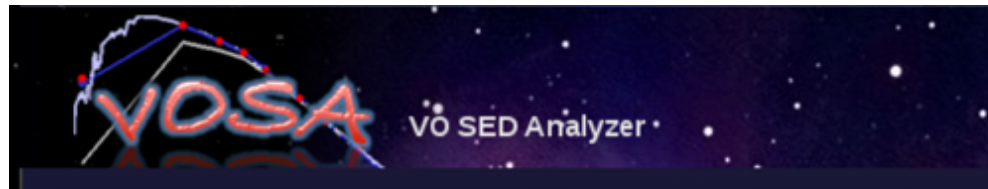
**Obj.Name:**

**Description:**

**Your files**

Folder	Filename	Descrip	Last Used	Obj.type	N.Obj.	
Default folder	TWA_1	TWA	2013-11-06 09:34:24	star	25	Select
	ECH_1	ECH	2012-10-01 20:45:38	star	27	Select
	ARG_1	ARG	2012-09-22 23:24:24	star	60	Select
	OCT_1	OCT	2012-09-22 22:33:44	star	17	Select
	CAR_1	CAR	2012-09-22 22:33:04	star	37	Select
	BPI_1	BPI	2012-09-22 22:32:12	star	54	Select
	ABD_1	ABD	2012-09-22 22:30:22	star	93	Select
	COL_1	COL	2012-09-22 22:22:19	star	58	Select
	THA_1	THA	2012-09-11 02:09:29	star	49	Select

# Cases that benefit from the new VOSA: Disk evolution in low-mass stars



BPI_	BPI
ABD_	ABD
COL_	COL
THA_	THA

Last Used	Obj.type	N.Obj.	
2013-11-06 09:34:24	star	25	Select
2012-10-01 20:45:38	star	27	Select
2012-09-22 23:24:24	star	60	Select
2012-09-22 22:33:44	star	17	Select
2012-09-22 22:33:04	star	37	Select
2012-09-22 22:32:12	star	54	Select
2012-09-22 22:30:22	star	93	Select
2012-09-22 22:22:19	star	58	Select
2012-09-11 02:09:29	star	49	Select

# The happy endings...

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- Data related:
  - CDS wonders vs pain of getting, for example, IOP tables
  - The “sasmirala” atlas
- Tool related (development)
  - The final AVO science demo
  - The birth of VOSA (and its continuous development)
  - The DUNES-VO tool

# The DUNES prep. work



## DUNES: DUST around NEARBY Stars A Herschel Key Programme

You are not logged in.

### Navigation

- Home
- The Proposal
- Consortium Members
- Announcements
- Documents
- Public Outreach
- Links
- Contact

### User Login

Username: \*

Password: \*

Log in

### Cold Disks around Nearby Stars. A Search for Edgeworth-Kuiper Belt Analogues

Debris  
counter,  
belt and  
prevale

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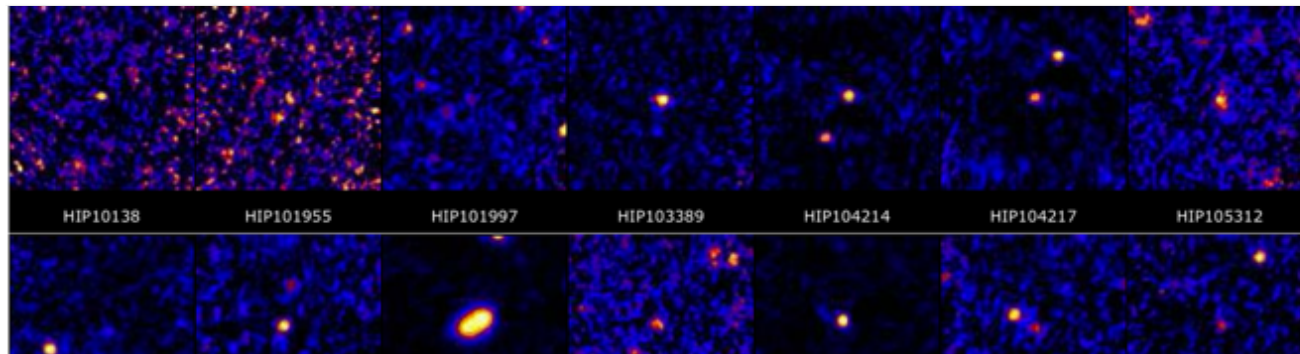
systems formation in disks around young stars.

- ✓ System. survey for faint, cold debris disks (EKB)
- ✓ Around 133 (up to 250) stars. Volume-limited sample (distances 25 pc)
- ✓ Detecting extremely faint excesses requires a very detailed knowledge of the photospheric level → fundamental parameters

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planetary





# The DUNES prep. work



## VO Discovery Tool

Developed in the framework of the DUNES and GASPS projects, this Virtual Observatory tool allows accessing, visualizing, filtering and retrieving relevant information already available in astronomical archives and services.

List of object names (one line each)

List of object coordinates (one line each)

**Format allowed:**

350.123456 -17.33333

20 54 05.689 37 01 17.38

10:12:45.3 -45:17:50

**Radius:**

- arcmin  
 arcsec

# The DUNES prep. work



## VO Discovery Tool

Developed in the framework of the DUNES and GASPS projects, this Virtu visualizing, filtering and retrieving relevant information already available in

### VO Services

- Catalogs
- Images
- Spectra

### Physical Parameters (search radius 30 arcsec)

<b>Teff , logg , [Fe/H] , E(B-V)</b>	Explore Vizier: <input type="checkbox"/> Teff	<input type="checkbox"/> logg	<input type="checkbox"/> [M/H]	<input type="checkbox"/> E(B-V)
<b>Vsini</b>	<input type="checkbox"/> Gleboki (2000)	<input type="checkbox"/> Reiners - Schmitt (2003)	<input type="checkbox"/> Explore vizier	
<b>Period</b>	<input type="checkbox"/> Explore vizier			
<b>Spec. Type</b>	<input type="checkbox"/> Explore vizier			
<b>Age</b>	<input type="checkbox"/> Explore vizier			
<b>Radial Velocity</b>	<input type="checkbox"/> Explore vizier			
<b>Proper Motion</b>	<input type="checkbox"/> Hipparcos	<input type="checkbox"/> Tycho-2	<input type="checkbox"/> Explore vizier	
<b>Space Velocity</b>	<input type="checkbox"/> Explore vizier			
<b>Parallax</b>	<input type="checkbox"/> Hipparcos	<input type="checkbox"/> Explore vizier		

### Filters:

#### Exclude CCDM sources:

- CCDM astrometric binaries.
- CCDM sources with known orbit.
- CCDM sources with rho <  arcsec
- All CCDM sources.

#### Exclude stars in SB9

#### Exclude stars in Catalogue of Eclipsing Binari

#### Exclude stars in WDS

### Services:

#### Photometric Data

<b>uvby<math>\beta</math> Strömgen photometry</b>	<input type="checkbox"/> Hauck - Herbig-Haro	Radius: <input type="text" value="10"/>	<input checked="" type="radio"/> arcsec
<b>JHK photometry</b>	<input type="checkbox"/> 2MASS	Radius: <input type="text" value="5"/>	<input type="radio"/> arcmin
<b>IRAS photometry</b>	<input type="checkbox"/> Point Source Catalogue	Radius: <input type="text" value="20"/>	<input checked="" type="radio"/> arcsec
	<input type="checkbox"/> Faint Source Catalogue	Radius: <input type="text" value="20"/>	<input type="radio"/> arcmin
<b>Tycho-2 photometry</b>	<input type="checkbox"/> The Tycho-2 Catalogue of the 2.5 Million Brightest Stars	Radius: <input type="text" value="5"/>	<input checked="" type="radio"/> arcsec

OBJ	HIP
HIP 171	171

### Photometry

OBJ	HIP
HIP 171	171

Source	distance (arcmin)
Strömgren (II/215)	
Strömgren (II/215)	
Strömgren (II/215)	
Strömgren (II/215)	
2MASS (II/246)	0.01517
2MASS (II/246)	0.01517
2MASS (II/246)	0.01517
IRAS/PSC (II/125)	
IRAS/PSC (II/125)	
IRAS/PSC (II/125)	
IRAS/PSC (II/125)	
IRAS/FSC (II/156A)	
IRAS/FSC (II/156A)	
IRAS/FSC (II/156A)	
IRAS/FSC (II/156A)	
Tycho-2 (I/259 /tyc2)	
Tycho-2 (I/259 /tyc2)	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
NSIED	
Spitzer/FEPS	
Spitzer/FEPS	
Spitzer/FEPS	
Spitzer/FEPS	
Spitzer/FEPS	
Spitzer/FEPS	
Spitzer/FEPS	

### Teff

Catalog Name	Catalog Code	Distance (deg)
Thevenin, 1998	III/193	0.0000
Prugniel+ 2007	III/251	0.0000

### logg

Catalog Name	Catalog Code	Distance (deg)
Thevenin, 1998	III/193	0.00000
Prugniel+ 2007	III/251	0.00000

### [M/H]

Catalog Name	Catalog Code	Distance (deg)
Thevenin, 1998	III/193	0.00
Prugniel+ 2007	III/251	0.00

### E(B-V)

Catalog Name	Catalog Code	Distance (deg)
CPiRSS	I/270	
Casagrande+, 2011	J/A+A/530/A138	

### Vsini

Catalog Name	Catalog Code	Distance (deg)
Hoffleit+, 1991	V/50	0.000
Herrero+, 2012	J/A+A/537/A147	0.000
Takeda+, 2005	J/PASJ/57/13	0.000005

### Sptype

Catalog Name	Catalog Code	Distance (deg)	Sptype	Sptype error	NomCol	Units	UCD
Luyten 1979	I/87B	0.0007	G1		Sp		src.spType
Roeser+, 1988	I/146	0.000536	G0		Sp		src.spType

### Age

Catalog Name	Catalog Code	Distance (deg)	Age	Age error	NomCol	Units	UCD
Holmberg+, 2009	V/130	0.00038	14.7		age	Gyr	time.age
XHIP	V/137D	0.002928	14.7		age	Gyr	time.age
Casagrande+, 2011	J/A+A/530/A138	0.00038	7.24		ageEP	Gyr	time.age

### Space Velocity

Catalog Name	Catalog Code	Distance (deg)	SpaceV	SpaceV error	NomCol	Units	UCD
XHIP	V/137D	0.002928	74.4		vT	km/s	phys.veloc
XHIP	V/137D	0.002928	82.8		UVW	km/s	phys.veloc

### Proper Motion

Catalog Name	Catalog Code	Distance (deg)	ProperM	ProperM error	NomCol	Units	UCD
Luyten 1979	I/87B	0.0007	1.295		pm	arcsec/yr	pos.pm
Bakos+ 2002	I/279	0.000215	1.29		pm	arcsec/yr	pos.pm
Bakos+, 2002	I/279	0.000215	1.295		pm	arcsec/yr	pos.pm

### Parallax

Catalog Name	Catalog Code	Distance (deg)	Parallax	Parallax error	NomCol	Units	UCD
Turon+ 1993	I/196	0.000577	86	4	Pix	mas	pos.parallax.trig
ESA 1997	I/239	0.002928	80.63	3.03	Pix	mas	pos.parallax.trig
Kharchenko+	I/289B	0.002928	80.63	3.03	Pix	mas	pos.parallax.trig

### Bolometric Luminosity

Catalog Name	Catalog Code	Distance (deg)	BolomLumin	BolomLumin error	NomCol	Units	UCD
XHIP	V/137D	0.002928	0.67		Lum	Lsun	phys.luminosity
Takeda+, 2007	J/PASJ/59/335	0.002925	-0.16		logL	[solLum]	phys.luminosity
Takeda+, 2007	J/PASJ/59/335	0.002925	-0.164		logL2	[solLum]	phys.luminosity
Biazzo+, 2007	J/AN/328/938	0.000005	-0.22	0.03	logL	[10-7W]	phys.luminosity
Herrero+, 2012	J/A+A/537/A147	0.000	0.0000	0.0000	Pix	mas	pos.parallax.trig
Takeda+, 2005	J/PASJ/57/13	0.000005	3		vsini	km/s	phys.veloc.rotat

• For NSiED and

# The happy endings...

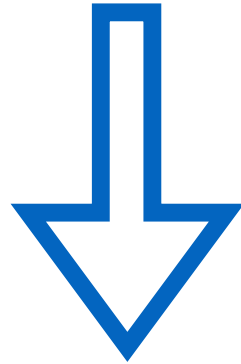
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- Data related:
  - CDS wonders vs pain of getting, for example, IOP tables
  - The “sasmirala” atlas
- Tool related (development)
  - The final AVO science demo
  - The birth of VOSA (and its continuous development)
  - The DUNES-VO tool
- Tool related (exploitation)
  - High proper motion object characterization (UCSD, HSD) , galaxy morphology, .....

# What do these cases have in common?

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Opportunity (timely combination of the right people in the right place or the right links)





# The “to be continued” stories...

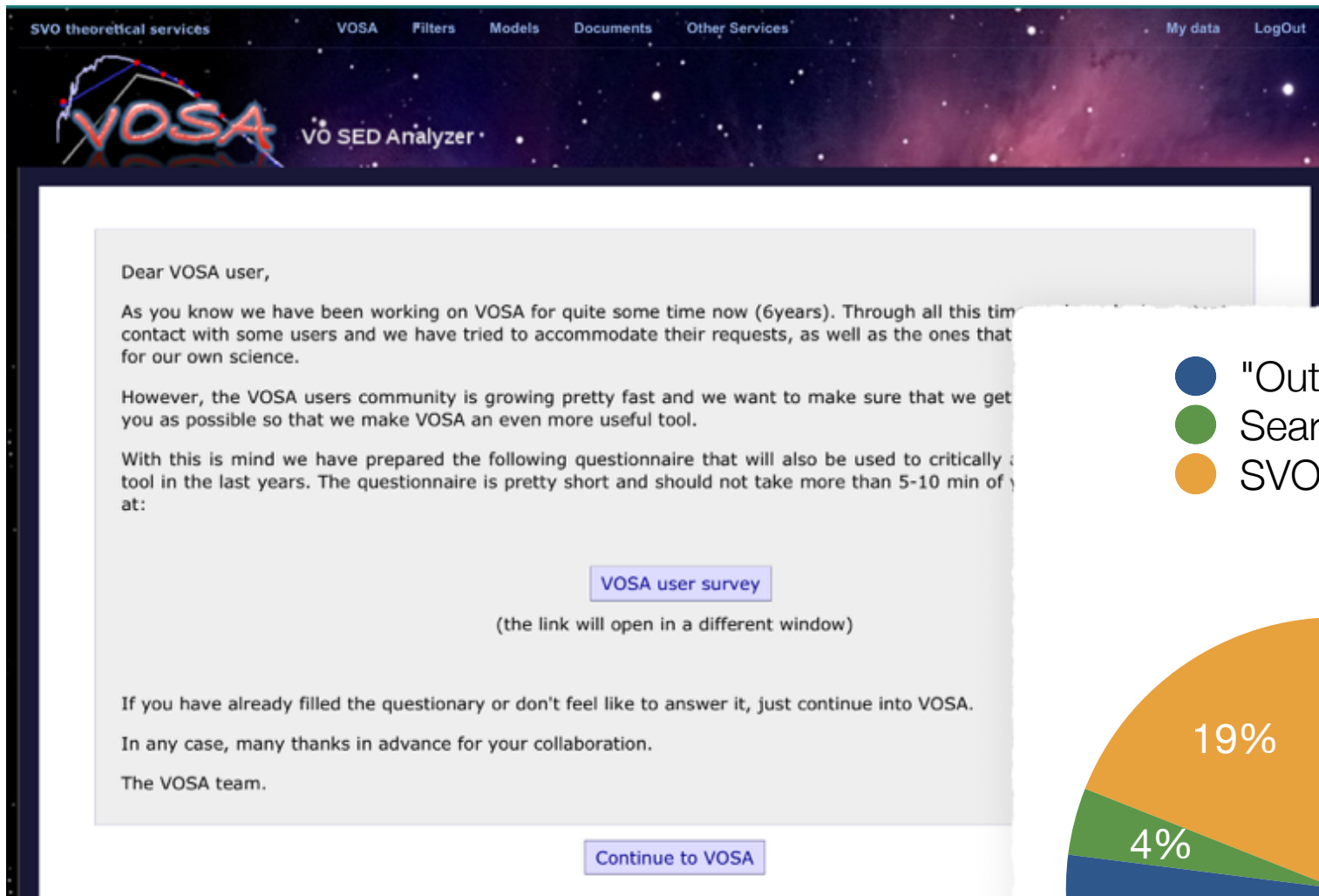
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- Multiple epochs of spectra of multiple objects (maybe CASSIS? and the new data-link options?): only specific wl range, systematic line characterization (EW, FWHM, etc) ...
- What we hear in science conferences when talking about the VO:
  - “Didn’t that started 10 years ago and it is still not working?”  
(that I got in a job interview)
  - “Where can I even find the list of software? where do I start?” (download the VO)
- The most common comment from the International Workshop on Spectral Stellar Libraries (IWSSL13):
  - “Why should I go through the effort of making my library VO-compliant?”
  - “What is really useful in the VO for spectra?”
- More synth. models in the VO (example going on: all the phoenix “family”, connect with the successful cases)

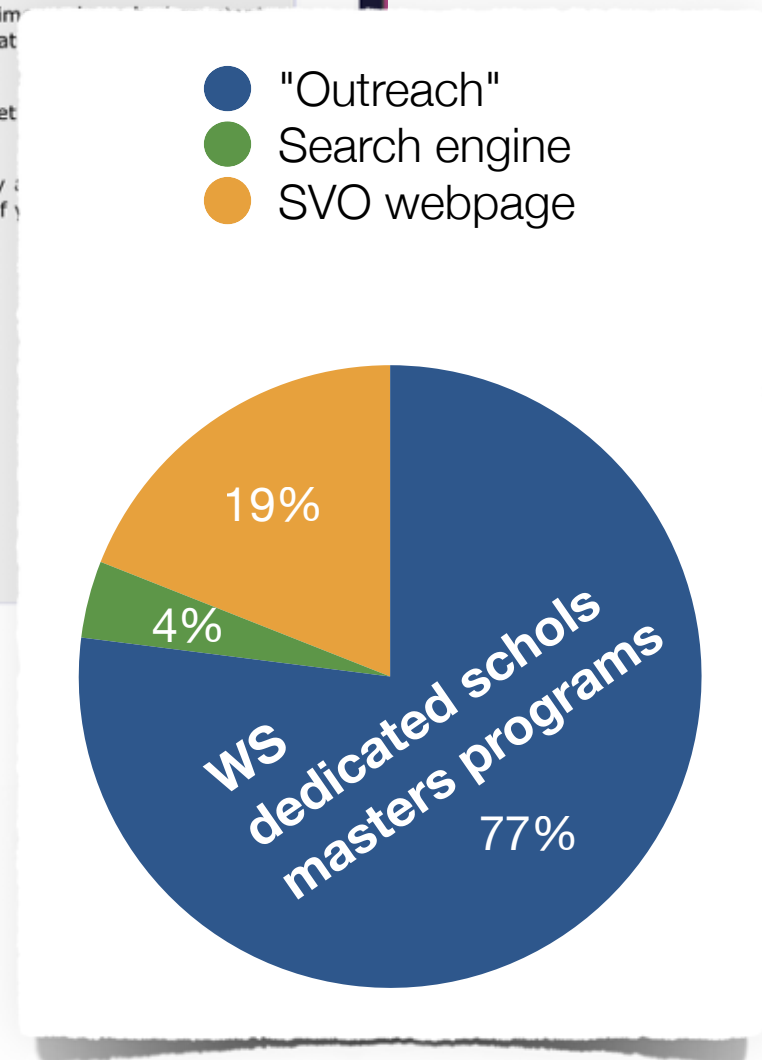
# My two cents?

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- Maybe include a bit more of astronomer's presentations of the kind:
  - “This is my problem and this is what I cannot do in the VO”
- Important to choose from the right crowd that can “speak the language” (or are willing to try, but there are quite a few! :))
- Try to keep up with “outreach” through schools, it does work!



- How did you know about VOSA and start to use it?



**Thank you  
for your attention!**