

# *Genius at CAB (INTA-CSIC)*

*WP400: Data exploitation*

*Task 4.4: VO tools and services*

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CENTRO DE ASTROBIOLOGÍA  
ASOCIADO AL NASA ASTROBIOLOGY INSTITUTE



GOBIERNO  
DE ESPAÑA



**CSIC**  
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



Instituto Nacional de  
Técnica Aeroespacial

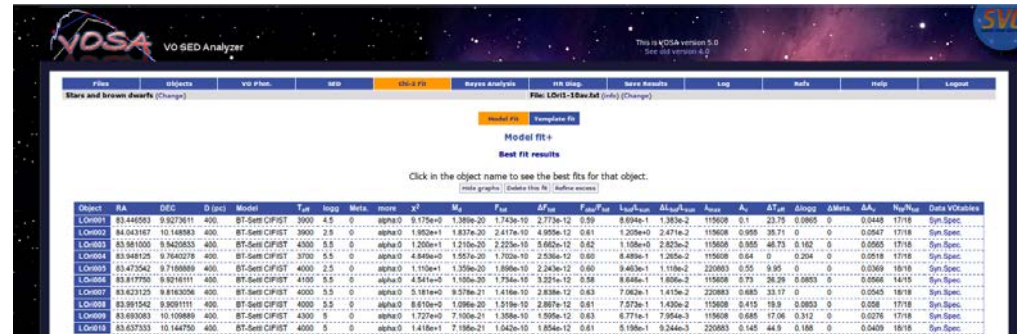
Goal: Determination of physical parameters ( $T_{\text{eff}}$ ,  $\log g$ ,  $[M/H]$ , radius, mass, age,...) from the SED fitting to theoretical models.

Available since 2008.

More than 800 users.

More than 1.000.000 objects.

More than 80 refereed papers.



DOI: 10.1051/0004-6361/200810303

**VOSA: virtual observatory SED analyzer**  
An application to the *Collinder 69* open cluster

A. Bayo<sup>1,2</sup>, C. Rodríguez Allard<sup>2</sup>

**The first planet detected in the WTS: an inflated hot Jupiter in a 3.35 d orbit around a late F star**  
M. Cappetta<sup>1</sup>, R. P. Soglia<sup>1,2</sup>, J. L. Birkby<sup>1,2</sup>, J. Koppenhafer<sup>1,2</sup>, D. J. Pitt<sup>1</sup>, P. Couf<sup>1</sup>, G. Kovács<sup>1</sup>, B. Spica<sup>1</sup>, D. Baranec<sup>1</sup>, B. Nefs<sup>1</sup>, V. V. Puzos<sup>1,3</sup>, L. C. del Burgo<sup>1,4,5,6</sup>, E. L. Martin<sup>1</sup>, C. Sestini<sup>1</sup>, J. Barnes<sup>1</sup>, A. Bayo<sup>1</sup>, D. A. C. M. C. Gilbre-Ortiz<sup>1,2</sup>, N. Guisard<sup>1</sup>, C. Hensler<sup>1</sup>, D. Isny<sup>1</sup>, H. R. Jones<sup>1</sup>, N. Lédoux<sup>1</sup>, F. Morneau<sup>1</sup>, D. Müller<sup>1</sup>, F. Murgas<sup>1,7,8</sup>, R. Najarietaki<sup>1</sup>, E. Palou<sup>1</sup>, A. Moya<sup>1</sup>, P. J. Amado<sup>1</sup>, D. Baranec<sup>1</sup>, A. García Hernández<sup>1</sup>, M. Alvarado<sup>1</sup>, B. Montesinos<sup>1</sup> and E. Acuña<sup>1,9</sup>

AGA 556, A144 (2013)

**Proper motions of young stars in Chamaleon II. New kinematical candidate members of Chamaleon I and II**  
Belén López Martí<sup>1</sup>, Francisco Jiménez-Esteban<sup>1,2,3</sup>, Anelisa Bayo<sup>4,5</sup>, David Barrado<sup>4,6</sup>, Enrique Solano<sup>3,7</sup>, Hervé Bouy<sup>8</sup> and Carlos Rodríguez<sup>1,2</sup>

AGA 554, A20 (2013)

**Age determination of the HR8799 planetary system using asteroseismology**  
A. Moya<sup>1</sup>, P. J. Amado<sup>1</sup>, D. Baranec<sup>1</sup>, A. García Hernández<sup>1</sup>, M. Alvarado<sup>1</sup>, B. Montesinos<sup>1</sup> and E. Acuña<sup>1,9</sup>

AGA 554, A20 (2013)

**A Virtual Observatory Census to Address Dwarfs Origins (AVOCADO)**  
I. Science goals, sample selection, and analysis tools  
R. Sánchez-Jones<sup>1</sup>, R. Amorín<sup>1</sup>, M. García-Vargas<sup>1</sup>, J. M. Gómez<sup>1</sup>, M. Baertens-Compañy<sup>1</sup>, F. Jiménez-Esteban<sup>6,7,8</sup>, M. Mollá<sup>1</sup>, P. Papaderos<sup>1</sup>, E. Pérez-Montero<sup>1</sup>, C. Rodríguez<sup>4,7</sup>, J. Sánchez-Almeida<sup>10,11</sup> and E. Solano<sup>4,7</sup>

AGA 550, A92 (2013)

**Searching for transits in the Wide Field Camera Transit Survey with difference-imaging light curves**  
J. Zendejas Domínguez<sup>1,2</sup>, J. Koppelhofer<sup>1,2,3</sup>, R. P. Soglia<sup>1,2</sup>, J. L. Birkby<sup>1,2</sup>, S. T. Hodgkin<sup>4</sup>, G. Kovács<sup>4</sup>, D. J. Pinfield<sup>5,6</sup>, B. Spica<sup>1</sup>, D. Barrado<sup>4,7</sup>, R. Bender<sup>2,3</sup>, C. del Burgo<sup>1</sup>, M. Cappetta<sup>1</sup>, E. L. Martin<sup>1</sup>, S. V. Nefs<sup>1</sup>, A. Riffeser<sup>1</sup> and B. Steele<sup>2</sup>

AGA 556, A163 (2014)

**High-resolution imaging of Kepler planet host candidates. A comprehensive comparison of different techniques**  
J. Lille-Box, D. Barrado and H. Bouy

AGA 541, A39 (2012)

**Warm debris disks candidates in transiting planets systems**  
A. Ribas<sup>1</sup>, R. Morin<sup>1</sup>, D. R. Arfida<sup>2</sup> and H. Bouy<sup>1</sup>

AGA 534, A57 (2015)

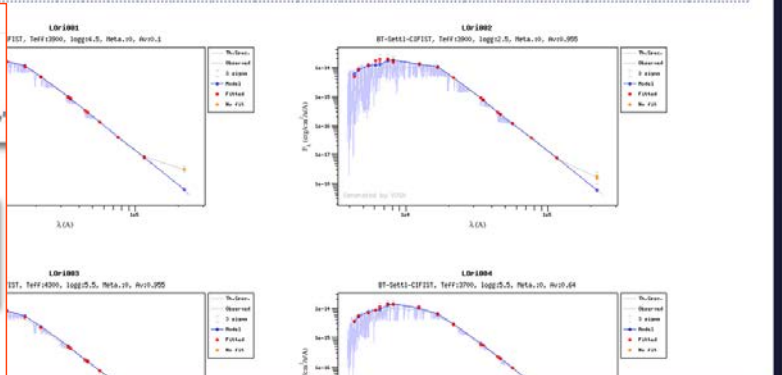
**The CoRoT chemical peculiar target star HD 49310\***  
Ana I. Gómez de Castro<sup>1</sup>, Javier López-Santiago<sup>1</sup>, Palma López-Martínez<sup>1</sup>, Néstor Sánchez<sup>1</sup>, Paúl A. Bayo<sup>1</sup>, W. W. Weiss<sup>2</sup> and T. Löffinger<sup>3</sup>

AGA 534, A57 (2015)

**HD 85567: A Herbig B[e] star or an interacting B[e] binary?**  
Resolving HD 85567's circumstellar environment with the VLTI and AMBER<sup>1,2</sup>

AGA 566, A163 (2014)

**Fundamental parameters of the close interacting binary HD 170582 and its luminous accretion disc**  
R. E. Mentenker<sup>1</sup>, G. Djanković<sup>1</sup>, M. Cabezas<sup>1</sup>, A. Cahn<sup>1</sup>, J. G. Roaño<sup>1</sup>, E. Nenczarek<sup>1</sup>, I. Anzo<sup>1</sup> and M. Cuel<sup>1</sup>



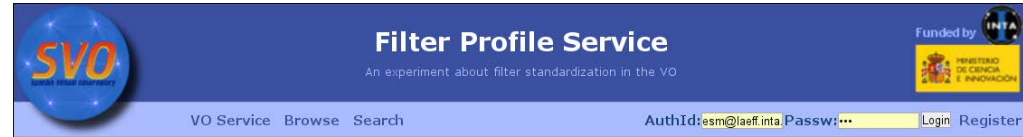


## From magnitudes to fluxes: The SVO Filter Profile Service

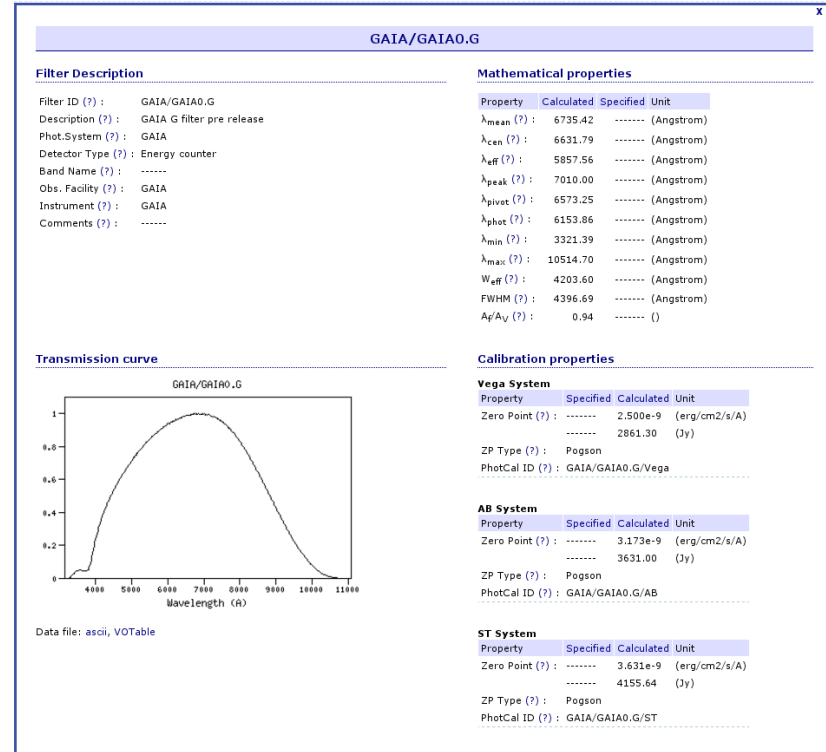
<http://svo2.cab.inta-csic.es/svo/theory/fps/>

VOSA takes advantage of the Filter Profile Service to get the needed information (i.e. zeropoints and other filter properties to, for instance, estimate flux overlapping).

Photometric systems described following the VO Photometric Data Model.



**SVO** Filter Profile Service  
 An experiment about filter standardization in the VO  
 VO Service Browse Search AuthId:esm@laef.inta Passw: Login Register



**GAIA/GAIA0.G**

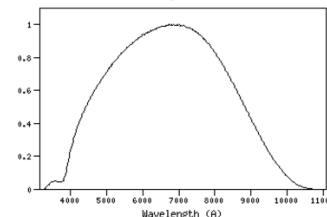
**Filter Description**

Filter ID (?): GAIA/GAIA0.G  
 Description (?): GAIA G filter pre release  
 Phot.System (?): GAIA  
 Detector Type (?): Energy counter  
 Band Name (?): .....  
 Obs. Facility (?): GAIA  
 Instrument (?): GAIA  
 Comments (?): .....

**Mathematical properties**

Property	Calculated	Specified	Unit
$\lambda_{\text{mean}}$ (?)	6735.42	.....	(Angstrom)
$\lambda_{\text{cen}}$ (?)	6631.79	.....	(Angstrom)
$\lambda_{\text{eff}}$ (?)	5857.56	.....	(Angstrom)
$\lambda_{\text{peak}}$ (?)	7010.00	.....	(Angstrom)
$\lambda_{\text{pivot}}$ (?)	6573.25	.....	(Angstrom)
$\lambda_{\text{phot}}$ (?)	6153.86	.....	(Angstrom)
$\lambda_{\text{min}}$ (?)	3321.39	.....	(Angstrom)
$\lambda_{\text{max}}$ (?)	10514.70	.....	(Angstrom)
$W_{\text{eff}}$ (?)	4203.60	.....	(Angstrom)
FWHM (?)	4396.69	.....	(Angstrom)
$A_p/A_v$ (?)	0.94	.....	()

**Transmission curve**



**Calibration properties**

**Vega System**

Property	Specified	Calculated	Unit
Zero Point (?)	.....	2.500e-9	(erg/cm2/s/A)
	.....	2861.30	(Jy)
ZP Type (?)	Pogson		
PhotCal ID (?)	GAIA/GAIA0.G/Vega		

**AB System**

Property	Specified	Calculated	Unit
Zero Point (?)	.....	3.173e-9	(erg/cm2/s/A)
	.....	3631.00	(Jy)
ZP Type (?)	Pogson		
PhotCal ID (?)	GAIA/GAIA0.G/AB		

**ST System**

Property	Specified	Calculated	Unit
Zero Point (?)	.....	3.631e-9	(erg/cm2/s/A)
	.....	4155.64	(Jy)
ZP Type (?)	Pogson		
PhotCal ID (?)	GAIA/GAIA0.G/ST		

Data file: ascii, VOTable

**Phys. parameter determination:** TGAS distances available from VOSA to estimate bolometric luminosities.

This is VOSA version 5.1 See old version 4.0

This project has received funding from the European Union's Seventh Framework Programme (FP7-SPACE-2013-1) for research, technological development and demonstration under grant agreement no. 606740

Files **Objects** Build SEDs Analyse SEDs HR Diag. Results Help

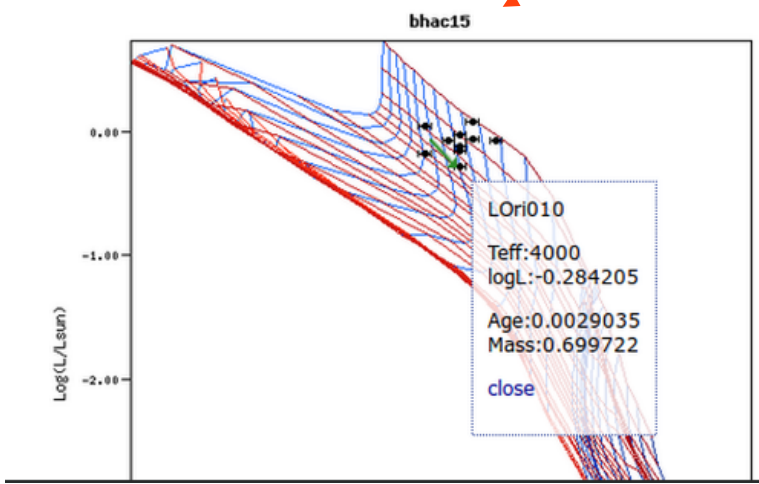
Test: Stars and brown dwarfs (Change) File: RA:---, DEC:--- (Info) (Change)

Coordinates **Distances** Extinction

### Object distance

Object Name	Object		Final		User		$\Delta$ (arcsec)	RA (deg)	DEC (deg)	Pl (mas)	$\Delta$ Plx (mas)	D (pc)	$\Delta$ Ds (pc)
	RA (deg)	DEC (deg)	Dis (pc)	$\Delta$ Dis (pc)	D (pc)	$\Delta$ Dis (pc)							
AK_Pic	99.501523980	-61.533387245	21.295	0.367	21.295	0.367	---	---	---	---	---	---	---
BD-034778	301.205833	-2.655556	66.907	2.836	66.907	2.836	1.4874278531513	301.20577672353807	-2.6559653324222907	14.946160262675168	0.6334445535189698	66.907	2.836
CP-681894	200.53125	-69.636667	98.892	3.477	98.892	3.477	0.62841099688041	200.53096654040246	-69.63681101855927	10.112062527326222	0.35555658147693964	98.892	3.477
EG_Cha	129.234167	-78.946111	102.264	6.427	102.26	6.427	0.86741015893762	129.23358291137242	-78.94589766116239	9.77865609415897	0.6145318505980452	102.264	6.427
HD_217379	345.116473141	-26.311887527	32.009	0.277	32.009	0.277	2.978832064554	345.1170290326822	-26.31254811756945	31.241380996286175	0.2701321530637279	32.009	0.277

Gaia TGAS





## New architecture to scale VOSA to Big Data:

Distributed environment.

Parallelized computing.

Asynchronous jobs.

Front-end redesigned

**VOSA is now able to handle files with thousands of objects.**

Files	Objects	Build SEDs	Analyse SEDs	HR Diag.	Results	Help
Test: Stars and brown dwarfs (Change)				File: jplus2 (info) (Change)		

Model Fit	Template fit	Model Bayes Analysis	Template Bayes Analysis	Binary fit
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### Model fit

The fit process has been submitted asynchronously.

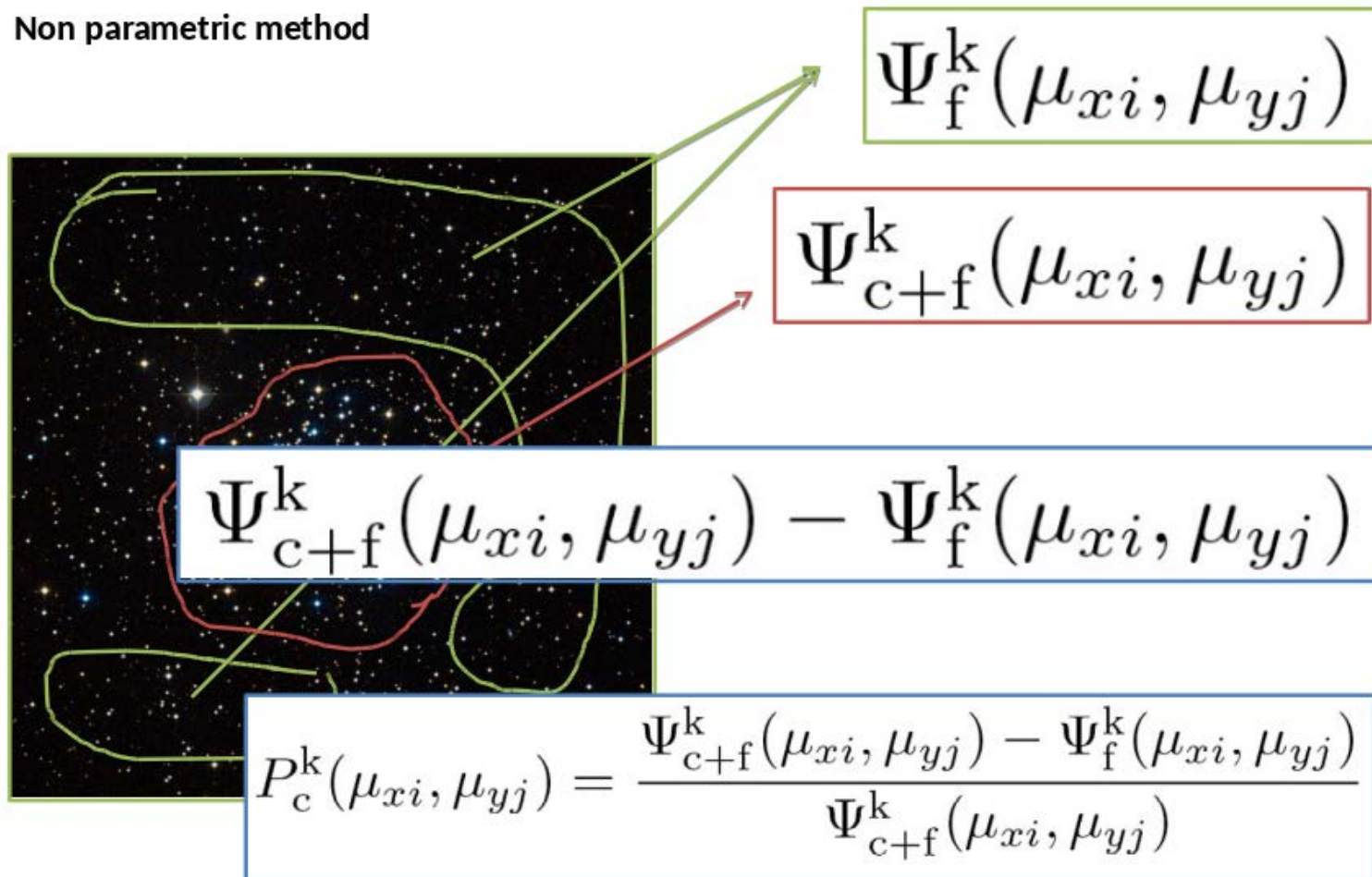


6.73% completed

I expect the whole process to take around 34 minutes to finish

Please, refresh this page again in a while for updated info

Non parametric method



## Clusterix 2.0

*Clusterix 2.0 is an interactive web-based application to calculate the grouping probability of a list of objects using proper motions and the non parametric method described in Galadí-Enríquez et al. 1998. It also allows the possibility of gathering physical parameters (parallaxes, radial velocities, proper motions,...) from Vizier and estimating effective temperatures, surface gravities and metallicities using VOSA.*

### Step 1/3: Information gathering (coordinates and physical parameters)

Search by Id

Usage: ID

Radius  arcmin

Catalogue GAIA/DR1

Search by Coordinates

Usage: RAJ2000(deg),DEJ2000(deg)

Radius  arcmin

Catalogue GAIA/DR1

Search in Webda

ngc2682

Search

Membership from proper motions

Search by file?

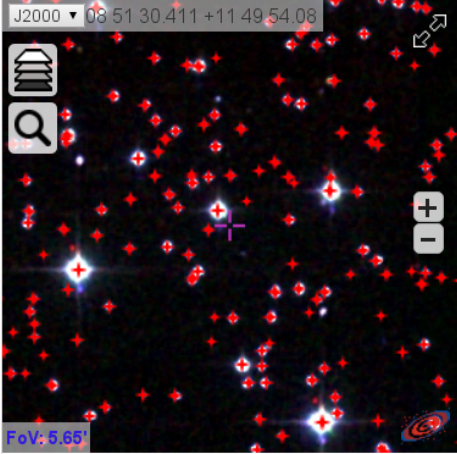
Choose file No file chosen

Clear

A list of 8783 objects has been created

Download

J2000 03 51 30.411 +11 49 54.08



FoV: 5.65'



## Clusterix 2.0

*Clusterix 2.0 is an interactive web-based application to calculate the grouping probability of a list of objects using proper motions and the non parametric method described in [Galadi-Enriquez et al. 1998](#). It also allows the possibility of gathering physical parameters (parallaxes, radial velocities, proper motions,...) from Vizier and estimating effective temperatures, surface gravities and metallicities using [VOSA](#).*

### Step 1/3: Information gathering (coordinates and physical parameters)

#### Gather information from VO services

- |  |                             |          |            |
|--|-----------------------------|----------|------------|
| <input type="checkbox"/> Proper Motion     | Radius <input type="text"/> | arcsec ▾ | TGAS ▾     |
| <input type="checkbox"/> Radial Velocity   | Radius <input type="text"/> | arcsec ▾ | Gaia ESO ▾ |
| <input type="checkbox"/> Parallax          | Radius <input type="text"/> | arcsec ▾ | TGAS ▾     |
| <input type="checkbox"/> VOSA Photometry ? |                             |          |            |

## Clusterix 2.0

### Step 2/3: Region selection

Cluster info: ngc2682

Selection of the "cluster" and "field" regions

Area type:  Polygon  Circle

Cluster (shift):

132.86499075502223,11

Field (ctrl):

132.46894916352724,11

Membership determination parameters

Maximum  $\mu$  (mas/yr):

15.0

Maximum  $\mu$  err (mas/yr):

10.0

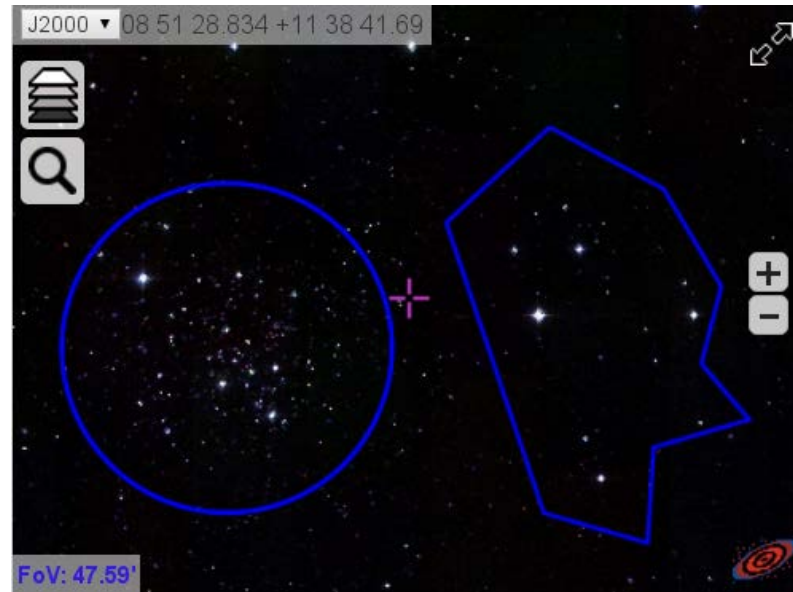
Smooth param (no unit):

2.273286441

Silverman rule: 2.273286441

$\gamma$  threshold:

3.0



To draw areas select the area type (polygon or circle) in the radio button and press **left-shift** key for defining a **cluster** or **left-ctrl** key for defining a **field**.

- Polygons: Keep pressing **shift** or **ctrl** and start clicking on the image. After the second point you will see the edges of the polygon. When you are done release **shift/ctrl** and click on the image. That will close the polygon.
- Circle: Keep pressing **shift/ctrl** and click in the center of the polygon. A small blue circle will appear to remember you the center. Release the **shift/ctrl** key and click on the desired outer limit/radius of the circle you want to draw. The blue circle will disappear and the final circle will appear.

## Step 3/3. Determination of membership probabilities

SAMP

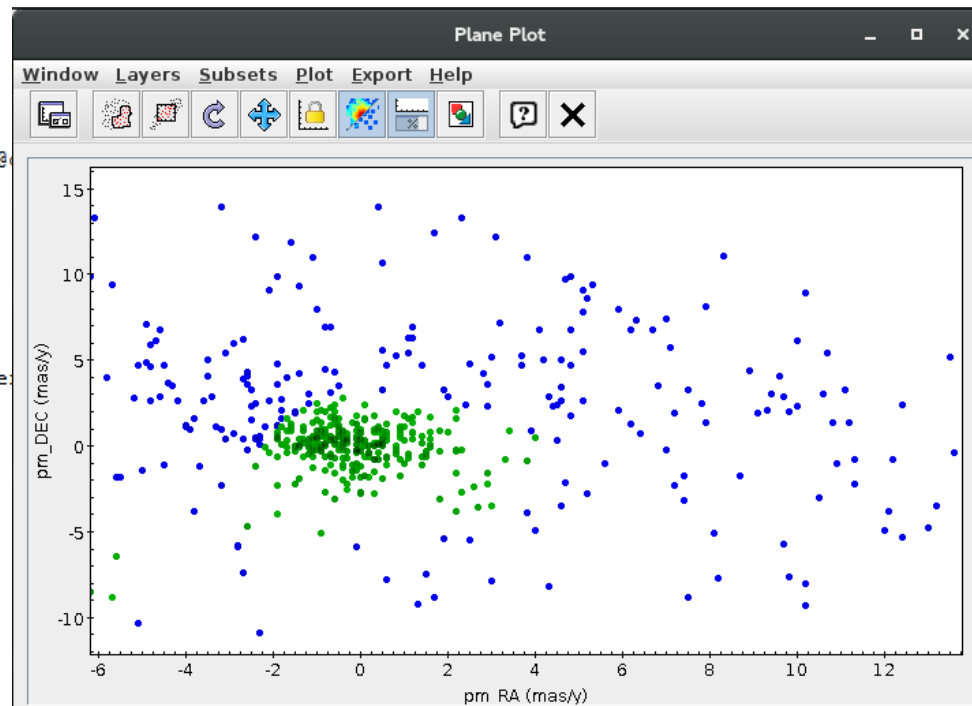
Save as

### Clusterix Results

SAMP

```

#
# Results were retrieved using Clusterix software
# http://clusterix.cab.inta-csic.es/
# In case of problems, please, report to: clusterix_archive_support@
#
# Labels:
#
#   STAR_NO  identifier of star retrieved from the input data
#   RA       right ascension of a star
#   DEC      declination of a star
#   RA_PM    proper motion in alpha
#   DEC_PM   proper motion in delta
#   PROB     probability that star belongs to evaluated open cluster
#
# Parameters:
#
#   CLUSTER RA: 132.816497803
#   CLUSTER DEC: 11.752399921
#   CLUSTER INNER RADIUS: 20 arcmins
#   CLUSTER OUTER RADIUS: 40.00 arcmins
#   PROPER MOTION CUTOFF: 15.00 mas/yr
#   PROPER MOTION ERR CUTOFF: 10.00 mas/yr
#   SMOOTH PARAMETER: 1.50
#   GAMMA FACTOR: 3.00
#
#   EXPECTED NUMBER OF MEMBERS: 290
#
#STAR_NO      RA              DEC              RA_PM   DEC_PM   PROB  FLAG
#-----
23            132.714996    11.802800    -6.10  13.30  0.98  T
2152         133.046005    11.530400   -10.60  -3.70  0.98  T
218          132.925995    11.835400   -10.70  -4.20  0.98  T
    
```



## Future enhancements:

Tangential velocities instead of proper motions.

Access to Gaia DR2 data.

N-dimensional scenario.

Asynchronous jobs.