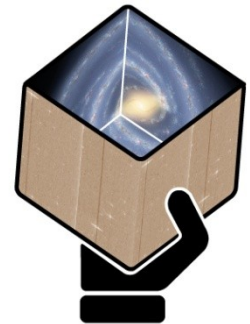


GENIUS
Final Report
for WP4-T4.4
(INTA)



gaia



Enrique Solano

Instituto Nacional de Técnica Aeroespacial
(INTA)



Overview

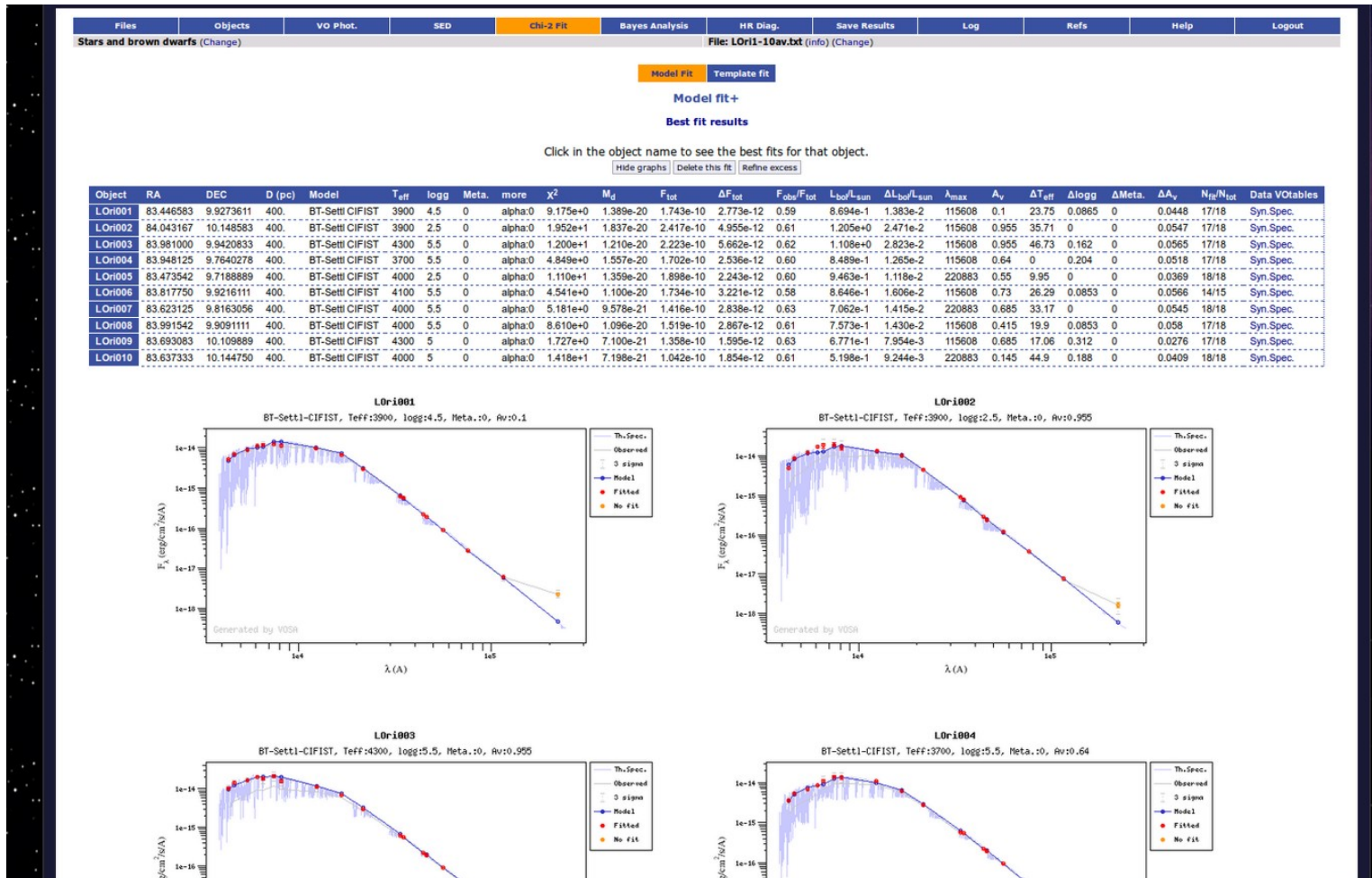
- **WP4:**
 - **Title:** *Tools for data exploitation*
 - **Goal:** *Development of powerful data exploitation tools allowing a scientific use of the Gaia data beyond the basic queries provided by the main archive interface.*
- **Task 4.4:**
 - **Title:** *VO tools and services*
 - *TOPCAT, VOSA, Clusterix*



VOSA

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

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





VO SA

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

Available since 2008.

More than 800 users.

More than 1.600.000 objects.

More than 80 refereed papers.

An application to the Collinder 69 open cluster

A. Bayo^{1,2}, C. Rodrigo Allard³

The first planet detected in the WTS: an inflated hot Jupiter in a 3.35 d orbit around a late F star

M. Cappetta^{1,2}, R. P. Saglia^{1,2}, J. L. Birkby^{1,2}, J. Koppenhoefer^{1,2}, D. J. Pinfield³, P. Cruz⁴, G. Kovács⁵, B. Sipőcz⁶, D. Barado^{1,2}, B. Nefs⁷, Y. V. Pavlenko⁸, L. C. del Burgo^{10,11,12}, E. L. Martín¹³, I. Snellen¹⁴, J. Barnes¹⁵, A. Bayo¹⁴, D. A. C. M. C. Gálvez-Ortiz¹⁶, N. Goulding¹⁷, C. Haswell¹⁸, O. Ivanyuk¹⁹, H. R. Jones²⁰, N. Lodin²¹, F. Marocco²², D. Molis²³, F. Margas^{24,25}, R. Nagiwotak²⁶, E. Palis²⁷, L. Sano Baro¹⁰, E. Solano^{28,29}, P. Steele³⁰, H. Stover³¹, R. Tolo^{32,33} and J. Zendejas

Age determination of the HR8799 planetary system using asteroseismology

A. Moya¹, P. J. Arado², D. Barado^{1,2}, A. García Hernández², M. Abuswail³, B. Montesinos⁴ and A&A 554, A20 (2013)

Proper motions of young stars in Chamaeleon I and II: II. New kinematical candidate members of Chamaeleon I and II

Belén López Martí¹, Francisco Jiménez-Esteban^{1,2,3}, Amelia Bayo^{4,5}, David Barrado^{1,6}, Enrique Solano^{1,7}, Hervé Bouy⁸ and Carlos Muñoz^{1,2}

A&A 550, A144 (2013)

Searching for transits in the Wide Field Camera Transit Survey with difference-imaging light curves

J. Zendejas Domínguez^{1,2}, J. Koppenhoefer^{2,3}, R. P. Saglia^{2,4}, J. L. Birkby⁴, S. T. Hodgkin⁵, G. Kovács⁶, D. J. Pinfield⁷, B. Sipőcz⁸, D. Barrado⁹, R. Bender^{2,4}, C. del Burgo⁶, M. Cappetta², E. L. Martín⁹, S. V. Nefs¹⁰, A. Kifner¹¹ and P. Steele¹²

A&A 500, A92 (2013)

The Seven Sisters DANCE

I. Empirical isochrones, luminosity, and mass functions of the Pleiades cluster^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100}

H. Bouy¹, E. Bertin², L. M. Sarro³, D. Barrado⁴, E. Moraux⁵, J. Bourdin⁶ and V. Belitsky⁷

A&A 574, A57 (2015)

A GALEX-based Search for the Sparse Young Taurus-Aurigae Star Forming Region

Ana I. Gómez de Castro¹, Javier Lopez-Santiago², Fatima López-Martínez³, Néstor Sánchez⁴, Paolo Manzoni Corradi⁵ and Javier Yañez-Costa⁶

A&A 558, A116 (2013)

The CoRoT chemical peculiar target star HD 49310*

W. W. Weiss¹ and T. Lüftinger²

A&A 561, A163 (2014)

HD 85567: A Herbig B[e] star or an interacting B[e] binary? Resolving HD 85567's circumstellar environment with the VLT and AMBER

H. E. Wechbright, G. Weigelt, A. Gill, W. W. Weiss¹ and T. Lüftinger²

A&A 541, A38 (2012)

High-resolution imaging of Kepler planet host candidates: A comprehensive comparison of different techniques*

J. Libe-Bos, D. Barrado and H. Bouy

Warm debris disks candidates in transiting planets systems

Á. Ribas¹, B. Merín¹, D. R. Ardila² and H. Bouy³

Fundamental parameters of the close interacting binary HD 170582 and its luminous accretion disc

R. E. Mennickent^{1,2}, G. Djuradević³, M. Cabezas⁴, A. Čukir⁵, J. G. Rosales⁶, E. Niennzczura⁷, I. Anaya⁸ and M. Cuel⁹





VOSA

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

SED building: Gaia DR1 included in the list of photometric catalogues VOSA uses to build the SED.

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)

VO Photometry | SED edit/visualize

Search radius: arcsec
Show flux limits

FEPS Catalog
FEPS Spitzer and Ancillary Data
Filters: Spitzer/IRAC.11 Spitzer/IRAC.12
 Spitzer/IRAC.13 Spitzer/IRAC.14
 Spitzer/MIPS.24mu Spitzer/MIPS.70mu
Search radius: arcsec
Show flux limits

UKIDSS Large Area Survey DR10
UKIDSS Large Area Survey DR10
More Info.
The search is restricted to class -1 (star) or -2 (probable star) objects.
Filters: UKIRT/UKIDSS.Y UKIRT/UKIDSS.J
 UKIRT/UKIDSS.I UKIRT/UKIDSS.H
 UKIRT/UKIDSS.K
Search radius: arcsec
Show magnitude limits

UKIDSS Galactic Clusters Survey DR10
UKIDSS Galactic Clusters Survey DR10
More Info.
The search is restricted to class -1 (star) or -2 (probable star) objects.
Filters: UKIRT/UKIDSS.Z UKIRT/UKIDSS.Y
 UKIRT/UKIDSS.J UKIRT/UKIDSS.H
 UKIRT/UKIDSS.K
Search radius: arcsec
Show magnitude limits

UKIDSS Galactic Plane Survey DR8
UKIDSS Galactic Plane Survey DR8
More Info.
The search is restricted to class -1 (star) or -2 (probable star) objects.
Filters: UKIRT/UKIDSS.J UKIRT/UKIDSS.H
 UKIRT/UKIDSS.K
Search radius: arcsec
Show magnitude limits

UKIDSS Ultra Deep Survey DR10
UKIDSS Ultra Deep Survey DR10
More Info.
The search is restricted to class -1 (star) or -2 (probable star) objects.
Filters: UKIRT/UKIDSS.J UKIRT/UKIDSS.H
 UKIRT/UKIDSS.K
Search radius: arcsec
Show magnitude limits

UKIDSS Deep Extragalactic Survey DR10
UKIDSS Deep Extragalactic Survey DR10
More Info.
The search is restricted to class -1 (star) or -2 (probable star) objects.
Filters: UKIRT/UKIDSS.J UKIRT/UKIDSS.H
 UKIRT/UKIDSS.K
Search radius: arcsec
Show magnitude limits

WISE
All WISE Data Release (Cutri+ 2013)
More Info.
Filters: WISE/WISE.W1 WISE/WISE.W2
 WISE/WISE.W3 WISE/WISE.W4

VVV - VISTA Variables in the Via Lactea, DR2
The VVV survey will target the galactic bulge and a piece of the adjacent plane in Z, Y, J, H, and Ks. The total area of this survey is 520 square degrees and contains 355 open and 33 globular clusters.
More Info.

GAIA DR1
Gaia DR1 contains positions (RA,DEC) and G magnitudes for all sources observed between 25 July 2014 and 16 September 2015 (1142679769 sources). [More Info.](#)
Filters: GAIA/GAIA0.G
Search radius: arcsec
You can apply limits so that magnitudes out of the specified range are not shown

Min mag <= GAIA/GAIA0.G <= Max mag

[Hide magnitude limits](#)





VOSA

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

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

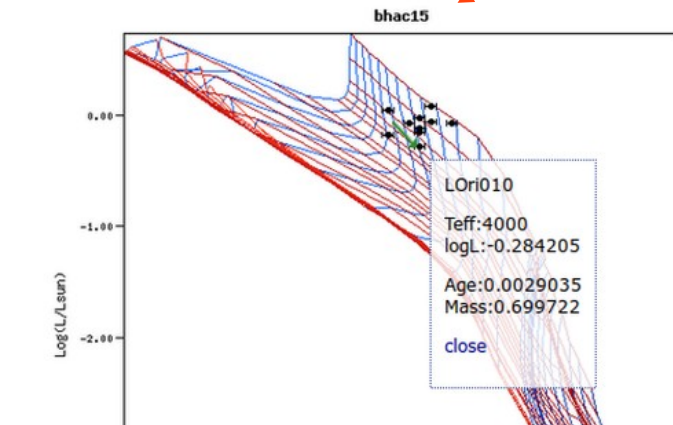
Files | **Objects** | Build SEDs | Analyse SEDs | HR Diag. | Results | Help

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

Coordinates | **Distances** | Extinction

Object distance

Object			Final		User		Gaia TGAS		PI		D		ΔDis	
Name	RA (deg)	DEC (deg)	Dis (pc)	ΔDis (pc)	D (pc)	ΔDis (pc)	Δ (arcsec)	RA (deg)	DEC (deg)	PI (mas)	PI (mas)	D (pc)	ΔDis (pc)	ΔDis (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	0.633445535189698	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	9.77865009415897	0.6145318505980452	102.264	6.427	
HD_217379	345.116473141	-26.311887527	32.009	0.277	32.009	0.277	2.978832064554	345.1170290328822	-26.31254811756945	31.241380996286175	0.2701321530637279	32.009	0.277	





VOSA

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

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 tens of 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
-----------	--------------	----------------------	-------------------------	------------

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



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)

Search by Id Usage: ID M45 Radius 5 deg Catalogue TGAS/DR1 Search	Search by Coordinates Usage: RAJ2000(deg),DEJ2000(deg) Radius arcmin Catalogue GAIA/DR1
Search in Webda ?	Search by file? Choose file No file chosen

Clear

Clusterix 2.0 is the result of a collaboration agreement between the Centro de Astrobiología (CAB, INTA-CSIC) and the Universidad de Barcelona based on a previous work done at the Masaryk University. It has been developed in the framework of the GENIUS project and is maintained by the Spanish Virtual Observatory at the Data Archive Unit of the CAB (INTA-CSIC). If you use this service in your research, please include the following acknowledgment in any resulting publications: "Based on Clusterix 2.0 service at CAB (INTA-CSIC)".

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SVO - CAB (INTA-CSIC). Version 1.0



Step 2/3: Region selection

Cluster info: M45_5_deg_TGAS

Selection of the "cluster" and "field" regions

Area type: Polygon Circle

Cluster (shift):

Field (ctrl):

Membership determination parameters

Maximum μ (mas/yr):

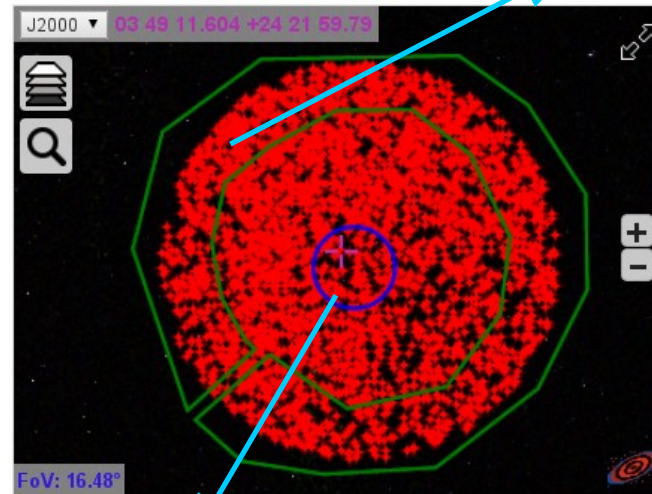
Maximum μ err (mas/yr):

Smooth param (no unit):

Silverman rule: 6.420576433

γ threshold:

$$\Psi_f^k(\mu_{xi}, \mu_{yj})$$



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.

$$\Psi_{c+f}^k(\mu_{xi}, \mu_{yj})$$

Clicking on the image. After the second point you will see the **shift/ctrl** and click on the image. That will close the polygon. 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.

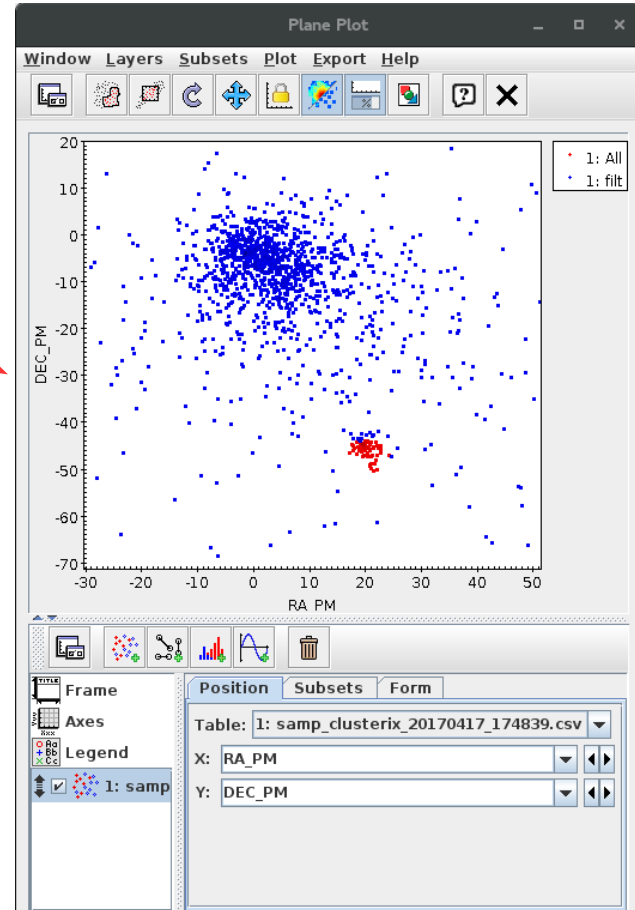
Coordinates must be in J2000 (deg)

Step 3/3. Determination of membership probabilities

$$P_c^k(\mu_{xi}, \mu_{yj}) = \frac{\Psi_{c+f}^k(\mu_{xi}, \mu_{yj}) - \Psi_f^k(\mu_{xi}, \mu_{yj})}{\Psi_{c+f}^k(\mu_{xi}, \mu_{yj})}$$

```

SAMP Save as
# Results were retrieved using Clusterix software
# http://clusterix.cab.inta-csic.es/
# In case of problems, please, report to: clusterix_archive_support@cab.inta-csic.es
#
# Labels:
#
# STAR_NO  identifier of star retrieved from the input data
# RA       right ascension of a star
# DEC      declination of a star
# PM_RA    proper motion in alpha
# PM_DEC   proper motion in delta
# PROB     probability that star belongs to evaluated open cluster
# FLAG     M=Membership  NM=No membership
#
# Parameters:
#
# CLUSTER INFO: M45_5_deg_TGAS
# PROPER MOTION CUTOFF: 100.00 mas/yr
# PROPER MOTION ERR CUTOFF: 10.00 mas/yr
# SMOOTH PARAMETER: 6.42
# GAMMA FACTOR: 3.00
#
# Boundaries can be circles (Ra(J2000)-center,Dec(J2000)-center, radius degrees) or
# polygons (Ra,Dec Ra,Dec Ra,Dec ...). Each boundary is separated by ;
#
# CLUSTER BOUNDARIES:
# 56.9489,23.9631,1.0275;
#
# FIELD BOUNDARIES:
# 59.2397,21.7632 57.1368,20.4117 54.4734,20.9335 52.9596,22.7285 52.6240,24.6696 53.6630,26.7712 55.2726,27.2971
# 59.6181,29.1955 53.9118,29.2663 51.9734,27.9665 50.4601,25.6624 50.5435,23.2572 51.9978,20.8227 54.7811,20.8227
#
# EXPECTED NUMBER OF MEMBERS: 61
#
# For Webda clusters, STAR_NO is the merge of the Data source reference and the star number: Ref_Star
#
#STAR_NO    RA (J2000)    DEC (J2000)    PM_RA    PM_DEC    PROB    FLAG    Initial guess
117         57.820366    23.826412    20.27    -47.40    0.97    M       C
152         57.987022    23.901766    19.73    -47.15    0.97    M       C
11          56.657089    23.787523    19.65    -47.11    0.97    M       C
162         57.714436    23.328882    19.51    -47.28    0.97    M       C
    
```



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 ?			

Clear

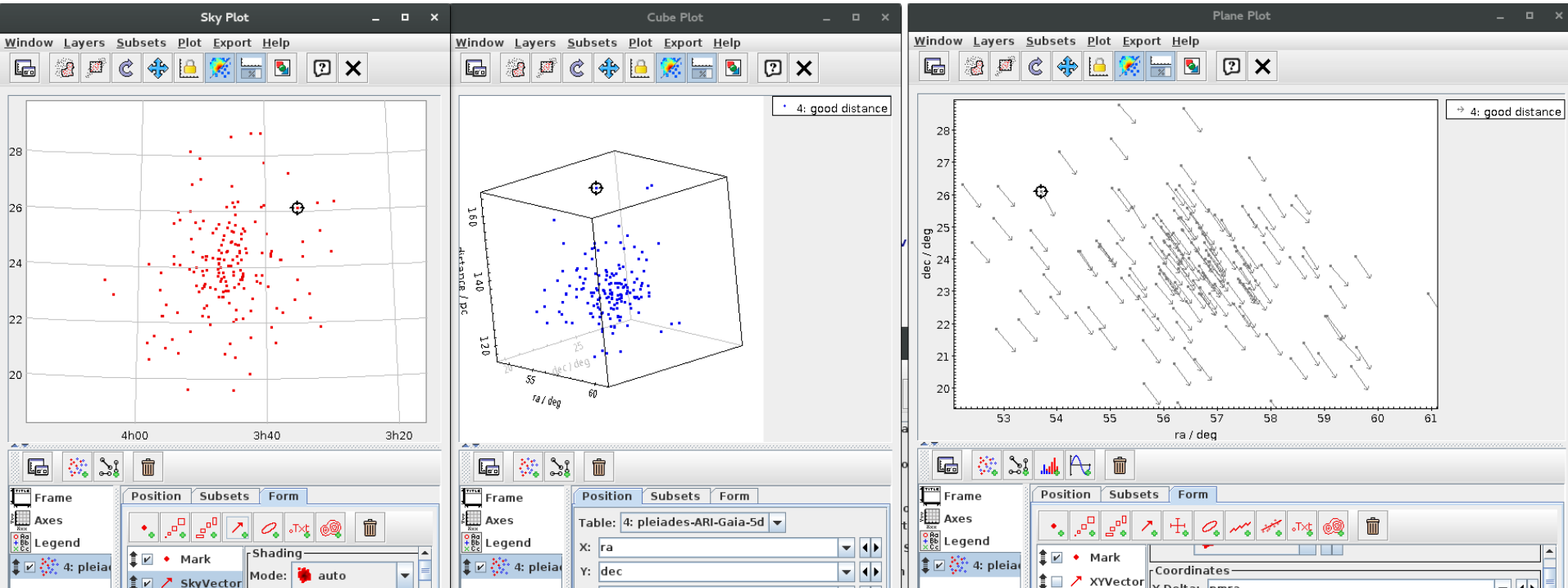
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SVO - CAB (INTA-CSIC). Version 1.0





Sustainability

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

- *VOSA and Clusterix have been developed in the framework of the Spanish Virtual Observatory, a project hosted at INTA since 2004.*
- *Maintenance and new developments (on a best effort basis) are guaranteed.*

Future enhancements:

Tangencial velocities instead of proper motions.

Access to Gaia DR2 data.

N-dimensional scenario.

Asynchronous jobs.

Clusterix 2.0