The origin of Brown Dwarfs as seen by ESA missions

User Manual

A.M. Pérez, N. Huélamo

May 3, 2022

CHANGES REGISTER

Issue	Modification Date	Affected Section	Observations
1.0	30/05/2022		

Contents

1 Terms, definitions and abbreviated terms **4**

1.1 Acronyms 4

2 Introduction **4**

2.1 The formation of Brown Dwarfs 4

2.2 Identification of pre- and proto-BD candidates 6

3 Data base content **7**

3.1 Main data 7

3.2 Continuum Photometry 8

3.3 Derived physical parameters 9

3.4 Molecular lines 11

4 The Graphical User Interface of SUCANES DB **12**

4.1 The Search form 12

4.2 The Plot/Download Data form 13

4.2.1 SED plot 14

4.2.2 XY plot 15

4.2.3 Color-color diagram plot 15

4.2.4 Color vs magnitude or physical parameter plot 17

4.2.5 Download SUCANES DB data 17

Acknowledgement **19**

1 Terms, definitions and abbreviated terms

1.1 Acronyms

BD: **B**rown **D**warf
DB: **D**ata **B**ase
GUI: **G**raphicall **U**ser **I**nterface
SED: **S**pectral **E**nergy **D**istribution
SUCANES: **SU**bstellar **CAN**didates at the **E**arliest **S**tages
VeLLO: **V**ery **L**ow in **L**uminosity **O**bject
ZP: **Z**ero **P**oint

2 Introduction

The main purpose of this document is to describe the SUbstellar CANdidates at the Earliest Stages (SUCANES) data base (DB) for potential users, including the description of SUCANES Graphical User Interface (GUI), a tool developed to access the SUCANES DB. The aim of the SUCANES project was to compile the observational information of all pre- and proto-brown dwarfs in a homogeneous and systematic way, and to perform a statistical analysis of the different observables.

2.1 The formation of Brown Dwarfs

Brown dwarfs (BDs) are substellar objects with masses between ~80-13 M_{Jup}, so they are the bridge between low-mass stars and Jupiter-like planets.

Although abundant in star forming regions and the field, their formation mechanism remains a matter of debate. The fact that young BDs (~ 1-10 Myr) share properties with young late-type stars, like the presence of disks and jets, suggests that they form in the same way. However, BD masses are smaller than the Jean masses estimated for molecular clouds, so their formation cannot be simply explained as a scaled-down version of low-mass stars. Several mechanisms have been proposed to overcome this problem, and the most widely discussed are turbulent fragmentation [1,2], the ejection from multiple protostellar systems [3,4], highly erosive outflows [5] and disk fragmentation [6]. In the surroundings of high-mass stars, there are additional mechanisms that might form BDs, namely photo-evaporation of cores near massive stars [7], and gravitational fragmentation of dense filaments formed in a nascent cluster [8].

Since stars and BDs evolve very rapidly during the first million years, a way to understand the dominant BD formation scenario is to study the properties of BDs at the earliest stages of their evolution, when they are still embedded in their parental clouds. At this stage, and by analogy with low-mass protostars, they are called proto-BDs.

If BDs are a scaled-down version of low-mass stars, they are expected to form in isolation within molecular clouds with the same observational properties as protostars (e.g. envelopes, molecular outflows, or thermal radiojets). By analogy with protostars, we would expect to observe different evolutionary stages (see Fig. 1, [9]), which are characterized by different physical properties and spectral energy distributions (SED): in the earliest phases we find the pre-BDs, which are dense cores that will form a BD in a future but did not form an hydrostatic core yet (i.e., it is an analog

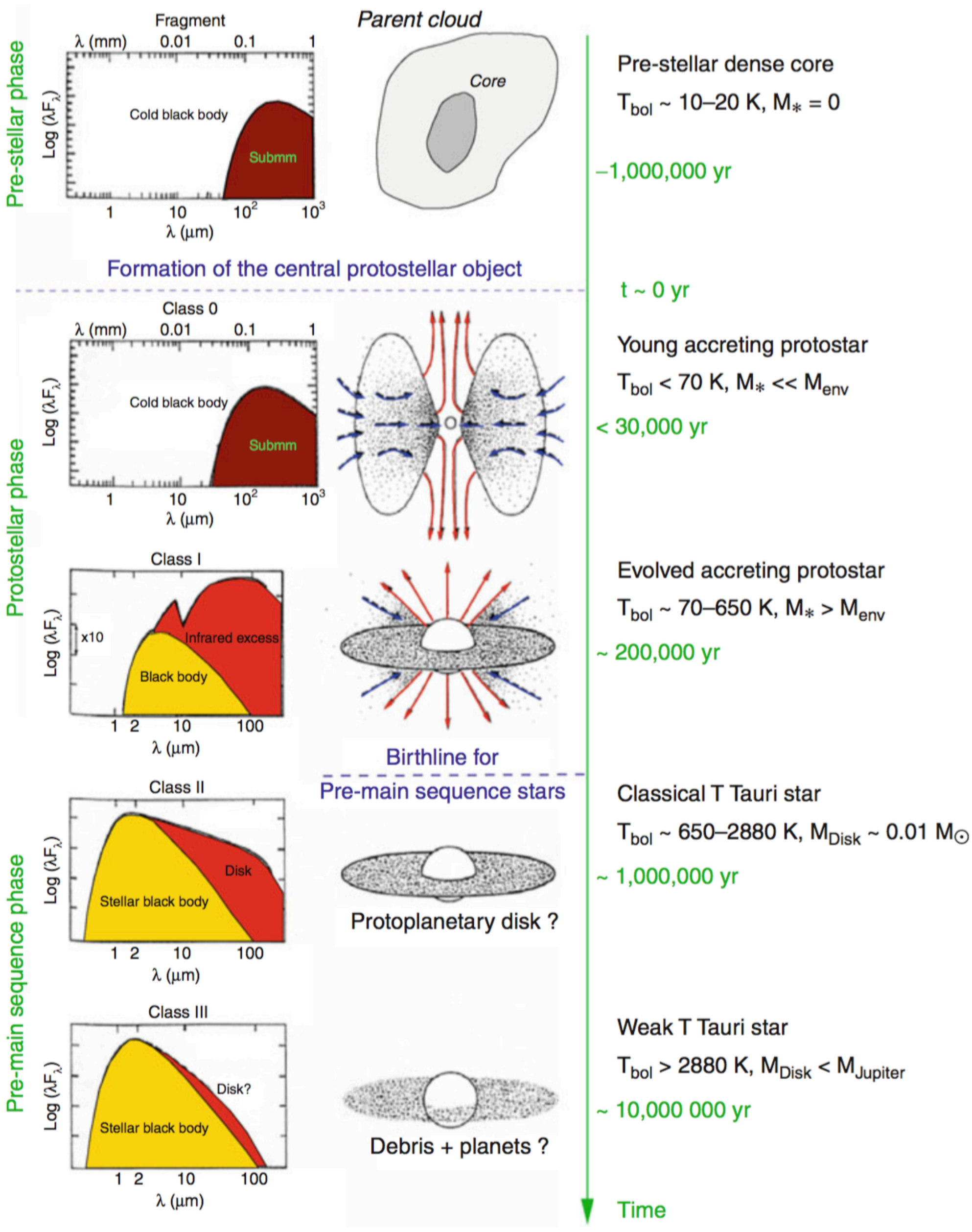


Figure 1: Evolutionary sequence of young stellar objects (adopted from [9]).

to the pre-stellar cores for higher masses). Class 0 proto-BDs consists on embedded cold cores with SEDs peaking at the (sub)mm regime. Finally, Class I proto-BDs are characterized by an infalling envelope feeding an accreting circumstellar disk, and with SEDs peaking in the far-infrared.

2.2 Identification of pre- and proto-BD candidates

The Spitzer Space Telescope allowed to identify a new family of objects called very low-luminosity objects, or VeLLOs [10,11], that were recognized as potential proto-BDs. They are deeply embedded objects characterized by internal luminosities (L_{int}) [1] below 0.1 $L_{\odot}$. Only a few of these VeLLOs have been studied in detail (e.g. [12, 13, 14, 15, 16]) and display properties consistent with proto-BDs. However, there is not a systematic search and characterization of VeLLOs to identify large samples of proto-BDs.

Another group of objects with by very low internal luminosities are the so-called First Hydrostatic Cores (FHCs). They are supposed to form during the first stages of collapse, once the density is large enough to turn the collapse from isothermal to adiabatic, providing the required pressure to balance gravity. The predicted properties of FHCs are low internal luminosities, very low masses, SEDs peaking around 100μm and association with low-velocity outflows. Thus, the properties of FHCs are similar to the properties expected for a deeply embedded Class 0- like proto-BD; it is the mass reservoir in the envelope (much larger for FHCs than for proto-BDs) that is the key distinguishing parameter between the two. Only a few of these objects have been identify so far (see [13] for a compilation).

As explained above, the pre-brown dwarf (pre-BD) cores are also potential substellar objects: they are cores with no infrared/optical counterparts which are gravitationally bound but have very low masses (near substellar) and thus they will not be able to form a stellar object even if accreting all the reservoir of mass within the core. So far, there is only one confirmed pre-BD [17], and several candidates [e.g. 18, 19].

The SED of all these objects is also used to classify them as possible young substellar objects, and subsequent observations (e.g. deep sub-milimeter data) are needed to characterize them and confirm them as bona-fide pre- or proto-BDs.

As it follows, there are several studies that have identified pre- and proto-BD candidates in different star forming regions, but the number of confirmed objects is still very small. These studies show different observational approaches, so a comprehensive study comparing the properties of all the candidates is needed in order to shed light on their formation mechanism.

[1] Padoan, P., & Nordlund, Å, 2004, ApJ, 617, 559

[2] Hennebelle, P., & Chabrier, G. 2008, ApJ, 684, 395

[3] Reipurth, B., & Clarke, C. 2001, AJ, 122, 432

[4] Bate, M.R., 2012, MNRAS 419, 3115

[5] Machida M. N., Inutsuka, S.-i., & Matsumoto, T. 2009, ApJL, 699, L157

[6] Whitworth, A.P. & Stamatellos, D., 2006, A&A 458, 817

[7] Whitworth, A. P., & Zinnecker, H., 2004, A&A, 427, 299

[8] Bonnell, I.A., Clarke, C. & Bate, M.R., 2008, MNRAS 389, 1556

[9] Andre, P., Encyclopedia of Astrobiology, DOI 10.1007/978-3-642-11274-4, Springer Verlag

[10] Young, C.H., Jorgensen, J.K., Shirley, Y.L. et al., 2004, ApJS 154, 396

[1] The internal luminosity is defined as the total luminosity arising from a central object and its disk (including both accretion and photospheric luminosity) and excluding any luminosity arising from external heating of the surrounding dense core by the interstellar radiation field.

[11] di Francesco et al., 2013, Evans, N., Caselli, P. et al., 2007, Protostars and Planets V, 17
[12] Bourke, T.L., Myers, M., Evans, N. et al. 2006, ApJ 649, L37
[13] Palau, A., Zapata, L. A., Rodriguez, L.F. et al., 2014, MNRAS 444, 833
[14] Dunham, M.M., Crapsi, A., Evans, N. et al. 2008, ApJS 179, 249
[15] Palau, A., de Gregorio-Monsalvo, I.; Morata, O., et al. 2012, MNRAS 424, 2778
[16] Morata, O., Palau, A., González, R.F., et al., 2015, ApJ 807, 55
[17] André, P.; Ward-Thompson, D.; Greaves, J. 2012, Science 337, 69
[18] Huélamo, N., de Gregorio-Monsalvo, I., Palau, A., et al. 2017, A&A 597, 17
[19] Santamaria-Miranda, de Gregorio-Monsalvo, I., Plunkett, A.L. et al. 2021, A&A 646, 10

3 Data base content

The main goal of SUCANES is to compile all the data available for identified pre- and proto-BD candidates. Data gathering has been done using literature, public DBs (VizieR) and catalogues. We have included all objects already classified as pre- and proto-BDs candidates. In addition, we have also considered unclassified VeLLOs and FHCs as suitable pre- or proto-BD candidates. Therefore, the objects included in the SUCANES are those with these properties:

- Published works have classified the candidates as pre- or proto-BD
- Published works have classified the candidates as VeLLOs
- The candidates above have been classified as Class 0, 0/I, I, Flat or their class is unknown, that is, we have not included Class II objects.
- Young objects with $L_{int} < 0.1\ L_\odot$
- For objects classified as FHCs, those with $M_{env} < 0.25\ M_\odot$

3.1 Main data

The SUCANES DB includes a main table with the name of each object, and another one with basic information for each registered object. This information is summarized below:

- Identity table:
  - Identification number (ID)
  - Name
  - Other name
- Position table:
  - Identification number (ID)
  - RA and Dec coordinates (sexagesimal, degrees)

- Sky region
- Distance and error (pc)
- Type (VeLLO, pre- BD, proto-BD, FHC)
- Classification (0, I, 0/I, Flat)
- Bibliography

The ID is the unique identifier for each object in SUCANES Data Base. All tables are linked by this number.

3.2 Continuum Photometry

SUCANES DB contains continuum photometry covering from the optical to the cm range (Optical, NIR, Spitzer, Herschel, sub-mm and cm). All the magnitudes/fluxes have an associated error. Whenever this error value is equal to 0, the corresponding flux is an upper limit.

Description of the photometric data:

- Optical and NIR photometry:
  - Identification number (ID)
  - Flux (Vega magnitude)
  - Flux error (Vega magnitude)
  - Filter
  - Reference
- Spitzer and Herschel photometry:
  - Identification number (ID)
  - Flux (mJy)
  - Flux error (mJy)
  - Filter
  - Reference
- Sub-mm and cm photometry:
  - Identification number (ID)
  - Variabilility
  - Wavelength (micron)
  - Flux density (mJy)
  - Flux density error (mJy)
  - Peak of flux (mJy/beam)
  - Error peak of flux (mJy/beam)
  - Integrated flux (mJy)

- Error of integrated flux (mJy)
- Beam of observations (arcsec)
- Position Angle of observations (degrees)
- Angular Size of object in x direction (arcsec)
- Angular Size of object in y direction (arcsec)
- Resolved
- Position Angle (degrees)
- Instrument
- Reference

An auxiliary table describes the filters used for the photometric data. The parameter Filter (Optical, NIR, Spitzer, Herschel) is a number that links each photometric data with this auxiliary table:

- Filter Identification
- Filter name
- Central wavelength (micron)
- FWHM (micron)
- Zero point Vega (Jy)
- Zero point Vega (erg/cm^2/s)

3.3 Derived physical parameters

The SUCANES DB contains two tables with derived physical parameters: Internal luminosity ($L_{\rm int}$), bolometric luminosity $L_{\rm bol}$, bolometric temperature ($T_{\rm bol}$), dust mass ($M_{\rm dust}$) and total mass ($M_{\rm total}$).

- Internal Luminosity: The internal luminosity is defined as the total luminosity arising from a central object and its disk (including both accretion and photospheric luminosity), and excluding any luminosity arising from external heating of the surrounding dense core by the interstellar radiation field. The internal luminosity (in units of solar luminosity) is estimated using the flux at 70 μm (from PACS@Herschel or MIPS@Spitzer) and the distance D, following the prescription by Dunham et al (2008):

$$L_{int}\,(L_{\odot}) = 3.3 * 10^{8}\ [F_{70} \times (D/140)^{2}]^{0.94} \tag{1}$$

where F_{70} is the 70 μm flux in erg/s/cm^2, and D is the distance in parsecs.

- Bolometric luminosity: The bolometric luminosity of an object ($L_{\rm bol}$) has been estimated integrating its Spectral Energy Distribution (SED), and then using its distance D to convert the flux into luminosity. To calculate it, we have imposed that, at least, the object should be detected in three different wavelength ranges (i.e., three different photometric tables) to ensure a significant spectral coverage. If the object does not fullfill this condition, the bolometric luminosity is not included in the DB.

- Bolometric temperature: The bolometric temperature ($T_{\rm bol}$) of an object with an spectrum F_ν is defined as the temperature of a blackbody whose spectrum has the same mean frequency ($\bar{\nu}$) as the observed spectrum (Myers & Ladd 1993), and can be derived using the following expression:

$$T_{\rm bol} = 1.25 \times 10^{-11} \bar{\nu} KHz^{-1} \tag{2}$$

where $\bar{\nu}$ is defined as the ratio of the first and the zeroth frequency moments of the spectrum (Ladd et al. 1991):

$$\bar{\nu} = \frac{\int_0^{\nu_{max}} \nu F_\nu \, d\nu}{\int_0^{\nu_{max}} F_\nu \, d\nu} \tag{3}$$

Basically, $\bar{\nu}$ provides a measurement of the *redness* of a given SED.

As in the calculation of the bolometric luminosity, it is necessary that the object has three detections in three different photometric tables to obtain the bolometric temperature.

Both, $L_{\rm bol}$ and $T_{\rm bol}$ are estimated with a simple numerical integration using photometric points from the NIR to the mm range. Note that the tabulated values can be different from those reported in previous works, either because the SEDs show a different sampling (in general, the SUCANES SEDs include a larger number of datapoints since we have compiled data from multiple catalogues) and/or because a different method for calculation was applied. In any case, since all our estimations are done in a systematic way, they are useful to compare and classify the objects within the SUCANES DB.

- Dust mass: The value of dust mass is taken from the literature. Usually, dust masses are estimated from a given sub(mm) continuum flux density at a given wavelength (S_λ), using the equation:

$$M_{dust} = \frac{S_\lambda D^2}{\kappa_\lambda \, B_\lambda(T_{dust})} \tag{4}$$

where D is the distance to the source (in *pc*), B_λ is the , κ_λ is the opacity per dust+gas mass at the observing wavelength of S_λ. This value is calculated by an interpolation of the dust opacities for thin ice mantle models at 10^6 cm^{-3} (κ column 5 of Table 1 in Ossenkopf & Henning 1994) and T_{dust} is the dust temperature in Kelvin.

- Total mass: As dust mass, total mass values are taken from literature. Normally, it is assumed a gas-to-dust mass ratio of 100, so that M_{total}/M_{dust}=100.

The two tables including the derived ($L_{\rm int}, L_{\rm bol}, T_{\rm bol}$) and adopted ($M_{\rm dust}, M_{\rm total}$) physical parameters are described below:

- Dust_properties
  - Identification number (ID)
  - Wavelength (micron)
  - Beam of observations (arcsec)

- Dust temperature (K)
- Opacity ($cm^2 g^{-1}$)
- Dust mass (solar masses)
- Total mass (solar masses)
- Reference

- LumTbol
  - Identification number (ID)
  - Internal luminosity (solar luminosities)
  - Internal luminosity error (solar luminosities)
  - Bolometric luminosity (solar luminosities)
  - Bolometric temperature (K)

3.4 Molecular lines

While continuum observations of very young substellar objects provide information about their dust content, the observations in different gas molecules are relevant to further characterize the objects, revealing important properties like e.g. the presence of molecular outflows, their chemical composition, or their belonging to a particular star forming region.

Only a small fraction of the SUCANES objects have been observed in gas molecules. Since these observations are scarce and inhomogeneous, we have constructed a table providing information about the availability of gas observations, but without providing fluxes. The table contains a list of the molecules explored, together with the bibliographic reference where these molecules have been studied. We encourage the user to check the corresponding publication to learn more about a particular object.

In addition to the studied molecules, and when available in the literature, we have also provided information about the presence of molecular outflows (detected/non-detected), and some of the their derived physical properties (e.g. momentum rate or mass-loss rate.).

The final table, named 'Molecules' contains the corresponding columns:

- Identification number (ID)
- CO available data: Yes (1)/ No (0)
- C available data : Yes (1)/ No (0)
- HCN/HNC available data: Yes (1)/ No (0)
- HCO available data: Yes (1)/ No (0)
- N_2H available data: Yes (1)/ No (0)
- CS available data: Yes (1)/ No (0)
- CN available data: Yes (1)/ No (0)

- CH_3OH available data: Yes (1)/ No (0)
- SiO available data: Yes (1)/ No (0)
- Reference(s)
- Log of Centimeter luminosity (at 3.6cm)
- Outflow detected: Yes (1)/ No (0)
- Molecule of outflow detection
- Flux (K)
- Reference of outflow detection
- Mass loss rate ($M_\odot$/yr)
- Momentum rate ($M_\odot$/km/s/yr)
- Reference for parameters of outflow

Finally, note that, for simplicity, we have only included in the table the name of the studied molecule. To look for the particular transition that was observed, the user should check the bibliographic reference(s) provided for each source.

4 The Graphical User Interface of SUCANES DB

The access to the SUCANES database is provided through a Graphical User Interface (SUCANES GUI herafter) to be implemented in a public web page. The SUCANES GUI allows the user to do queries, to download the required information in CSV files and to plot them in different graphics. The main page of the SUCANES GUI is shown in Figure 2.

The navigation bar on top of the main page contains four links:

- Home: Main page
- Search: Access to SUCANES DB and plots
- Documentation: User Manual (this pdf document)
- About: Summary of the project and team members

4.1 The Search form

This form allows to easily search for data in the SUCANES DB (see Figure 3). The query can be done using a name (or part of it), the coordinates and/or an object type (e.g. proto-BD, pre-BD), that is, the user can select only by name, only by coordinates, only by 'type', both 'name' and 'type' or both 'coordinates' and 'type'. The only combination that is not allowed is 'name' and 'coordinates'.

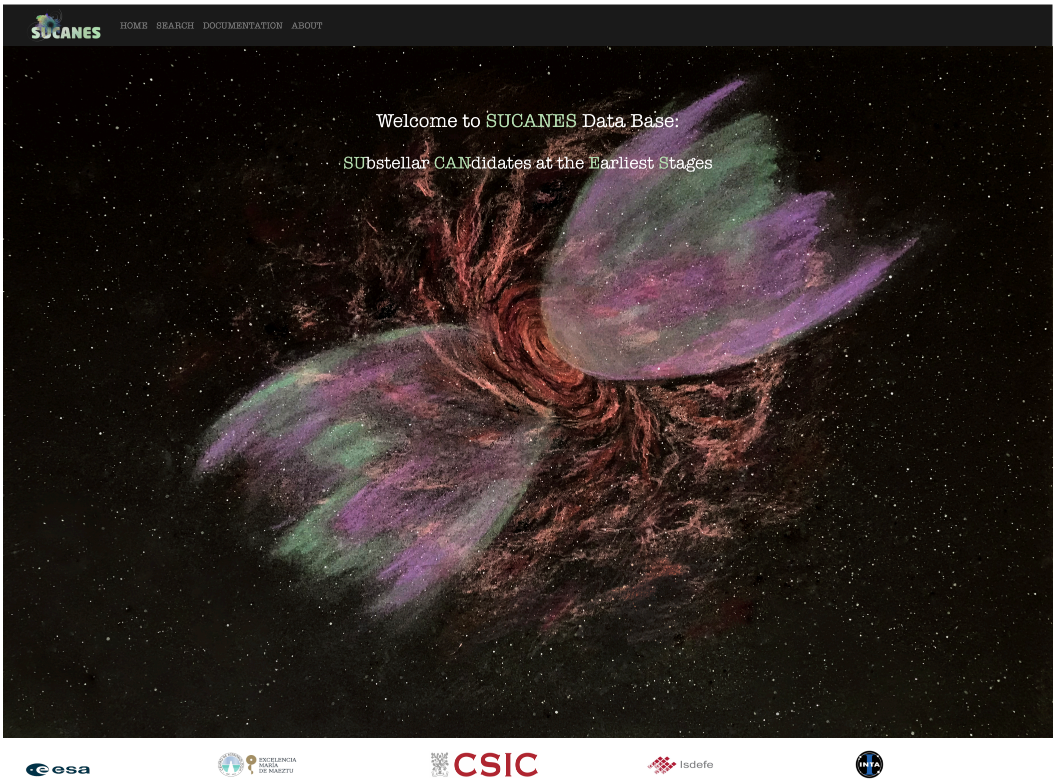


Figure 2: Main page of SUCANES GUI

- Name: search for a specified pattern in Name or Other name in table Identity (see Section 3.1)
- Coordinates: search using celestial coordinates RA and Dec (in degrees) in table Position (see Section 3.1), and *radius* (in arcmin). The value of *radius* is 10 arcmin by default.
- Type: select among All, FHC, Proto-BD, Pre-BD, VeLLO, or Protostar.

The output of a query, if there are objects in the SUCANES DB that fullfill the search conditions, is a html table that is displayed in a new page (see Figure 4). This page includes all the capabilities of the SUCANES GUI, that are described in the next section.

4.2 The Plot/Download Data form

The output html table shows basic information about the objects: name, celestial coordinates, sky region, type and class. In addition, a boolean column (molecular emission) indicates if the object has been observed in some gas molecule. Finally, a button (*sed*) at the end of each row allows the user to plot the Spectral Energy Distribution of the individual objects included in the table.

As shown in Figure 4), the top and bottom navigation bars show three plot options (left side) and two additional buttons to extract and download data (right side). These buttons allow the user to plot or download data of individual objects, or of all the objects in the table. To select individual

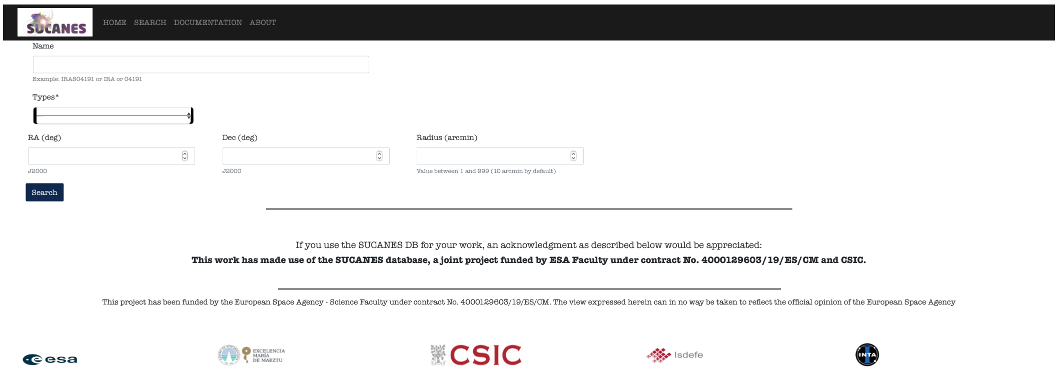


Figure 3: Search page of SUCANES GUI

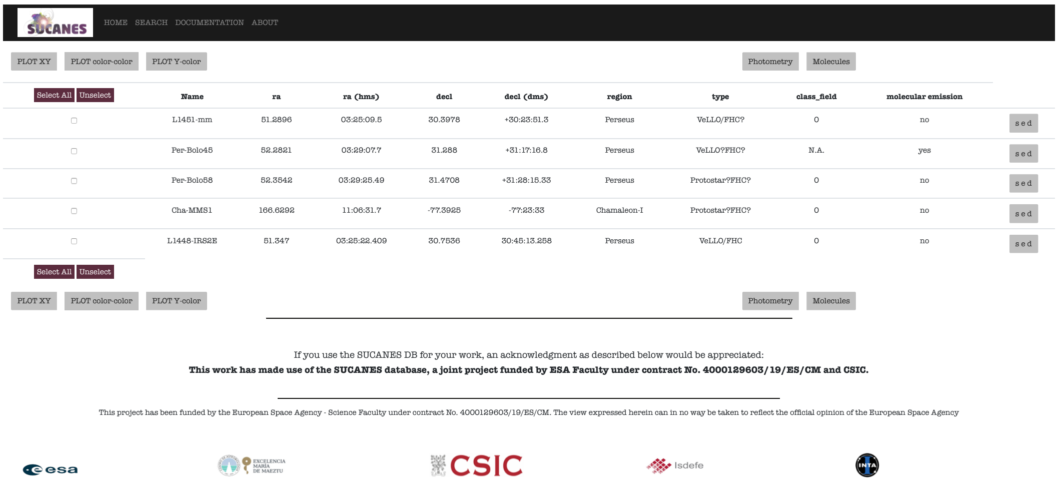


Figure 4: Output of the search form in the SUCANES GUI. Note that this page is also the Plot/Data form in SUCANES GUI.

objects, the user should click the box at the left of each row. To select all the objects, the user should click the *Select all* button at the top/bottom of the page.

4.2.1 SED plot

This option plots the SED of each object, i.e., the X-axis displays the wavelength (in microns) and the Y-axis the corresponding flux (in mJy), covering from the optical to the cm range. After clicking the *sed* flap, the graph is displayed in a new page. Figure 5 shows one example with the SED of the object L1451-mm. As seen, each photometric table (displayed at the top left of the figure) is plotted with different colors. The plot includes error bars or upper limits for each photometric value. The user can save the output in one png file by clicking the *Download png* button. The button *Go back* returns to the previous page, i.e., to the html table with the selected objects (Figure 4).

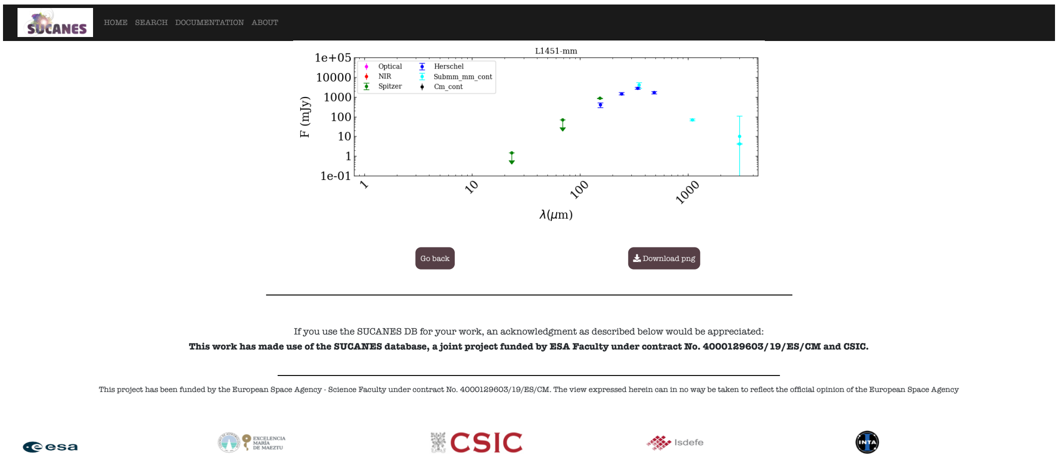


Figure 5: Example of a SED plot for the object L1451-mm. Note that the data from different photometric tables are plotted with different colors.

4.2.2 XY plot

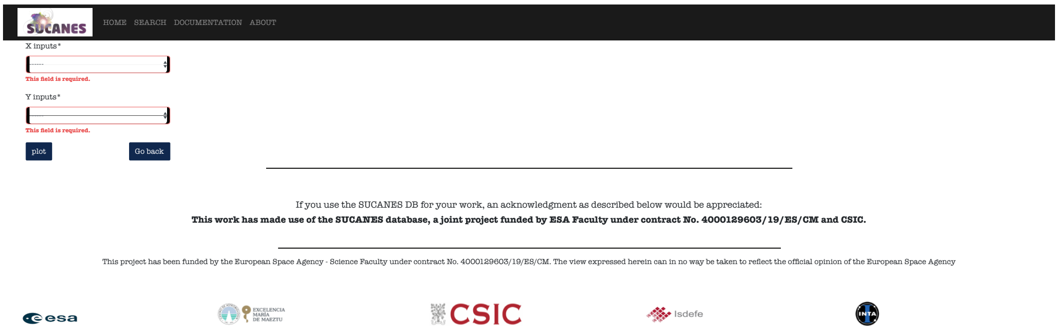
This graph plots a bidimensional plane, with generic X and Y quantities. X and Y can be any photometric flux[2] (in mJy) included in the DB, or a derived physical parameter, e.g. $L_{\rm int}$, $L_{\rm bol}$, $T_{\rm bol}$. Once the selection of objects is done, clicking the *PLOT XY* button opens a new page where the user can select the quantities to plot. This new page contains two buttons (*X inputs* and *Y inputs*) that display the list of all tables and eligible parameters to plot (see Figure 6). Once XY are selected, put the cursor on *Plot* flap and click. Figure 7 (left panel) shows an example of a graphics output, where two infrared fluxes from the Spitzer/IRAC instrument have been represented. The XY diagrams always include error bars and upper limits, except in the case of plots with $L_{\rm bol}$ and $T_{\rm bol}$, since these two quantities do not have associated uncertainties (see Section 3.3). Note that the user has the option of saving the graph in one png file by clicking the *Download png* button.

Finally, note that if the quantities selected are $T_{\rm bol}$ (X axis) and $L_{\rm bol}$ (X axis), the graph includes vertical lines defining the Class 0/I and Class I/II $T_{\rm bol}$ boundaries defined by Chen et al. (1995), and several evolutionary tracks from Myers et al. (1998) and Young & Evans (2005) for different stellar masses. Figure 7 (right panel) shows an example of this diagram. Finally, the button *Go back* returns to the previous page, i.e., the Plot XY display. The user can then choose another XY parameters and plot them.

4.2.3 Color-color diagram plot

This option plots color-color diagrams (in magnitudes). Clicking the *PLOT Color-Color* button opens a new page where the user select the quantities to plot. In both axis, X and Y, there are two tabs showing photometric tables and filters. Only Optical NIR, Spitzer and Herschel tables appear as eligible. In this case, the user selects in the corresponding X1 and X2 tabs the photometric tables that contain the desired fluxes to build the color, for example Spitzer-IRAC-3.6μm in X1

[2] Note that the photometric data points provided in magnitudes are converted into fluxes using the Zero Points from the auxiliary table described in 3.2.



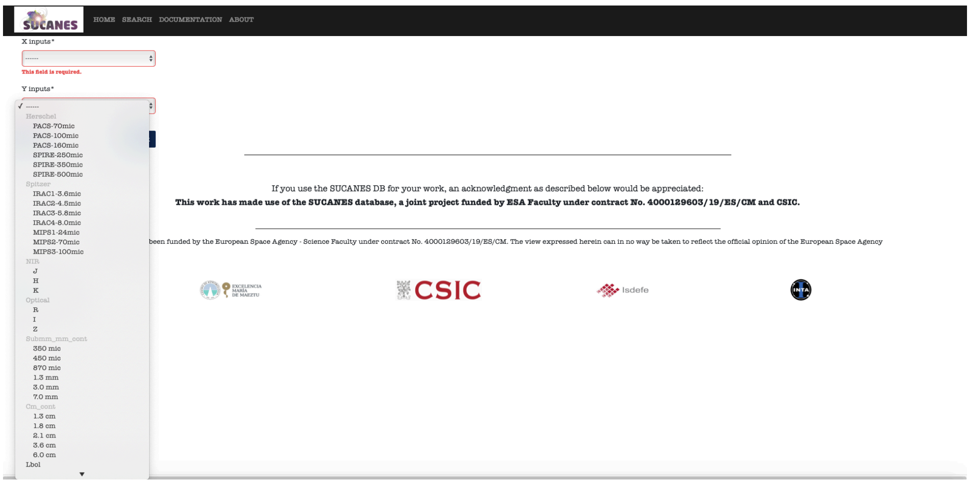


Figure 6: Page for selection of XY plot (top). Same page with the menu of X eligible parameters displayed (bottom).

and Spitzer-IRAC-4.5μm in X2, so that the (3.6μm-4.5μm) color is computed (see Figure 9). The same procedure should be followed for the Y axis (Y1 and Y2). Then, the user should place the cursor on the *plot* flap and click. Figure 8 (left panel) shows an example with the graphics output, where we have represented a diagram with infrared colors from Spitzer/IRAC data. Error bars and upper/lower limits are included in the graph. If any color is build with two upper limit fluxes, the point is represented with a blue dot. Again, the user can download the graph in png format, by clicking the *Download png* button.

The button *Go back* returns to the previous page, i.e., Plot color-color page, where the user can

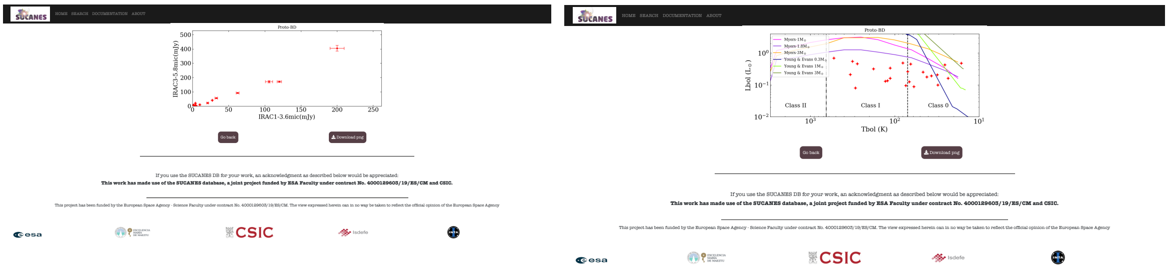


Figure 7: Left: An example of Plot XY output. Right: L_{bol} vs T_{bol} for Proto-BDs in SUCANES DB. Black vertical lines define the Class 0/I and I/II T_{bol} boundaries defined by Chen et al. (1995). Colored lines represent evolutionary tracks from Myers et al. (1998) and Young & Evans (2005) for different values of the stellar mass.

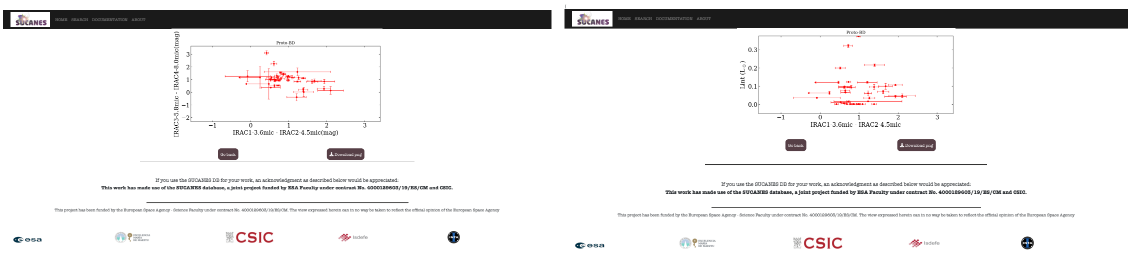


Figure 8: Example of color-color diagram (left) and color-magnitude diagram (right).

choose different colors and plot them.

4.2.4 Color vs magnitude or physical parameter plot

This option plots color-magnitude or color-physical parameter diagrams. In the X-axis, two tabs allow the user to select different photometric tables to choose two fluxes and build a color. Only Optical NIR, Spitzer and Herschel tables appear as eligible. For Y axis, the user selects in the corresponding Y tab the desired flux (from all photometric tables) or a physical parameter (L_{int}, L_{bol}, T_{bol}) and M_{dust}. By clicking the *Plot* flap, the diagram is shown in the screen. Figure 8 right panel) shows the graphics output. In this case, we have represented an infrared color using two Spitzer/IRAC fluxes versus the internal luminosity. As in the plot XY and color-color diagrams, the user can download the graph in png format, clicking the *Download png* button, and return to the previous page using the *Go back* button.

4.2.5 Download SUCANES DB data

As we mentioned before, the right side of top and bottom navigation bars contain two additional buttons: *Photometry* and *Molecules* (see Figure 4).

Clicking the button *Molecules*, the full table 'Molecules' (see Section 3.4 is downloaded as a csv file (molecules.csv). For this step, it is not required to select objects in the html table.

If the user wants to download continuum photometric data and the derived parameters, it is manda-

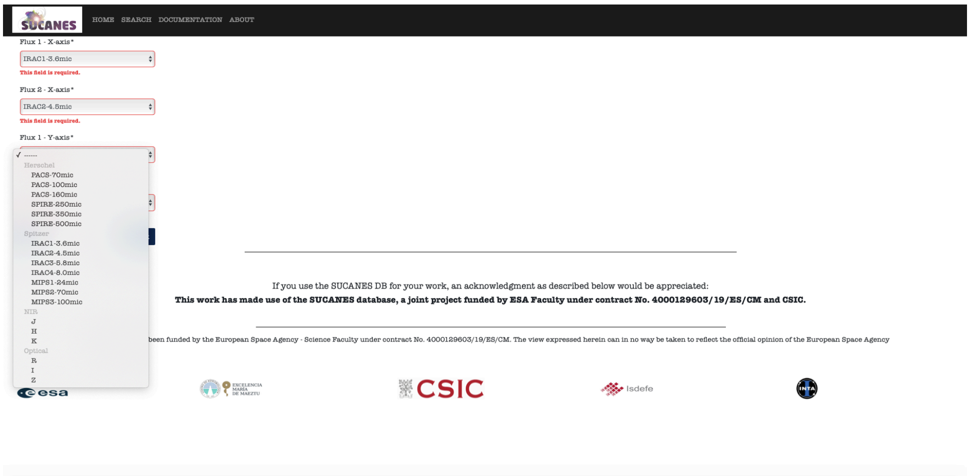


Figure 9: Page for selection of color-color plot (top). Same page with the menu of Y2 inputs displayed (bottom)

tory to select at least one object in the table using the boxes on the left of each row. It is possible to choose more than one object or all (using the button Select All). Then, by clicking the *Photometry* button, a csv file is downloaded (filename-%.csv). This file contains ALL the data available in the DB for the selected objects, i.e., basic information included in the Identity and Position tables, photometric magnitudes or fluxes from the Optical to the centimeter range, derived parameters (luminosities and bolometric temperature), dust masses, etc. In addition, the references for the photometric data are also provided in the same file. To see the meaning and units of each column, see Section 3.1.

Acknowledgement

This project has been funded by the European Space Agency - Science Faculty under contract No. 4000129603/19/ES/CM. We acknowledge to CAB(CSIC-INTA) for its support.