

The Amateur Virtual Observatory

Exercise 10: Find all the G2V stars in Simbad and then plot them in Aladin.

This exercise uses the all sky progressive mode introduced in Aladin V7 so you need to ensure you have Aladin V7 or later loaded.

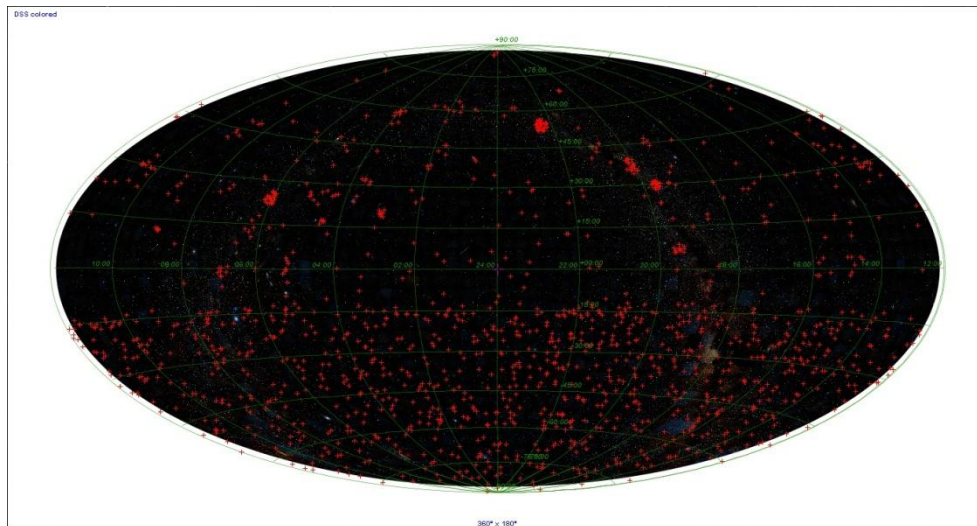
This exercise will introduce you to querying the Simbad database to locate objects with particular characteristics. The results from Simbad are saved in the Virtual Observatory VOTable format and then plotted on a whole sky image to show their distribution. You can use the principals you will learn in this exercise for many other investigations.

- 1) Open the Simbad webpage at <http://simbad.u-strasbg.fr/simbad/>
- 2) Under 'Queries' select the 'by criteria' option. Have a look at the Examples on the right hand side and also scroll down and have a look at the large range of field that can be queried. We have already met 'OTYPE' in some of the earlier exercises.
- 3) Before we write and submit our query we need to select the form that the output will be in, Return to the top of the page and select the 'Output Options' tab.
- 4) The output options has two functions – it allows you to select the format of the output and if it will be displayed in your browser or sent to a file. The second part allows you to select what is shown for an object or for a list. Since we want to see the initial output in a browser window we need to ensure the output format is set to HTML and the 'file output' and 'compressed' boxes are not ticked. The default options for the other output fields should be ok. Then click the 'Save' button
- 5) **NB** Your settings are remembered between uses so if you have to go back and reset the options if you have used the Simbad query function previously and perhaps selected a different format or set the option to a file. As a result it is always worthwhile checking the output options first. The second reason for doing this is that selecting the output options after you have written your query will result in the query page being cleared and you will have to re-enter your query !
- 6) Now click the criteria query tab to allow you to enter the query. To check that your query is working we will first set the 'Return' field to object count by selecting the box. This saves producing a very large amount of output if the query has failed. You can also use the display option and select a low maximum number of objects so you can check the individual records that are returned to see if the results are what you expect. For the moment we will just count the number of records.
- 7) In the search expression box type *sptype* = "G2V" , this is asking for all the records where the stars spectral type is shown as G2V similar to the Sun. Then click the 'Submit query' button.

- 8) After a short delay the count of the number of G2V stars in Simbad will be shown, At the time of writing this was about 1400. If you want to save the query you can follow the instructions on the bottom of the page.
- 9) Assuming you have a sensible answer use your browsers back button to return to the query page. If you have a lot more or non you have probably typed the query wrongly.
- 10) To see what the results look like we will now look at the individual records. In the return box select the display option and select maximum 10 objects. This will display only the first 10 records of the 1400 or so G2V stars. After you have done this click the submit query button again.
- 11) After a short delay a table should appear showing the details of the first 10 stars. You can use the 'Plot this list of objects' but we will download all the objects into a format that can be understood by Aladin and other VO applications.
- 12) To save all the objects in the VO format we now need to reset the output options. Click on the output options tab.
- 13) The VO does not understand HTML tables very well – it has it's own format called a VOTable, In the drop down box select 'VOTable' – note you can also select various spreadsheet compatible formats that can be used with spreadsheets and other programmes. Then select the file output box. If you don't do this the output will appear on your screen. Press 'Save' otherwise your choices will be ignored. Now return to the criteria query tab.
- 14) When you return to the criteria tab you will note that the form has reset to the default values. We need to retype our query (if it was long we could have bookmarked it at the earlier stage). Then set the return to display and a maximum of 10000 objects. (Select the lowest number that is greater than the number of objects you found in stage 8). Now press the submit query button.
- 15) After a short delay a popup window should appear in your browser asking if you want to save the returned file which will be named something like 'SIMBAD.xml'. Select a suitable place to download it to on your computer. When the download has completed – it should be around 5 to 6 Mbytes – switch to the folder containing the file.
- 16) It is probably worth renaming the file at this stage as any other files you download from Simbad will also be named Simbad.xml. Use something meaningful like all G2V Stars (leave the file extension as xml if you have them displayed on your computer).
- 17) The XML file can be opened as a catalogue directly in Aladin. You can either right click on the file and select 'open with' and then Aladin or else open Aladin as normal and then use file 'open local file' then navigate to the file location and open it.
- 18) Aladin should then display an 'all sky view' with all the G2V stars marked by a plus sign. To show these on the sky use the 'Allsky Opt'

button to load an optical image of the sky. The display will probably show a circular image – I prefer the Aitoff projection as it fits my monitor better. Click the properties button for the DSS Coloured image and select 'Aitoff' from the 'Used Projection' box. You may need to zoom out a bit to see the whole sky. Turn on the grid at the lower left to show the RA and declination grid.

- 19) There appears to be a very different distribution of G2V stars South of -15deg declination to those in the North. It is not a function of the local galaxy as the galactic plane can be seen outlined by the path of the stars of the Milky Way. It seems more likely that it is a function of the catalogues and surveys in Simbad. This probably also explains the clumps of G2V stars in the Northern Hemisphere. Try selecting the areas and look at the catalogue number of the stars to see if there is any connection. The image below should give you an idea of what you should have obtained.



- 20) Having got some familiarity with this try other queries in Simbad and view the results – White Dwarfs, Pulsars & Globular Clusters are interesting objects to try as well as very hot O & B type stars.
- 21) Keep the VOTable of G2 stars – we may use it in another exercise.