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A Spanish-VO tool to estimate the spatial distribution of galactic interstellar extinction

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Abstract. The interstellar medium in our Galaxy is very inhomogeneus. The interstellar gas and dust are distributed irregularly in clouds, filaments arcs, bubbles and superstructures of different density from very high to extremely low. The knowledge of the spatial distribution of these features is of capital importance for different areas of the galactic and extragalactic astronomy. We present here a tool, developped in the frame of the Spanish Virtual Observatory, to know the variation of the extinction in any observing direction.

Key words. Stars: distances, extinction – ISM: extinction – Galaxy: local interstellar matter – Galaxy: open clusters and associations

1. Introduction

Maps of the spacial distribution of interstellar reddening traditionally were based in individual stellar data (FitzGerald,1968; Neckel et al.,1980; Arenou et al, 1990) but, due to the scarcity of good quality distance measurements, many theoretical models have been developed which must be tested with real data. The huge quantity of observational data (Hipparcos, Tycho, SDSS, ASCC,...), from ground and from the space, published in the last few years will make now possible this effort. We are going to make all this available data accesible from the spanish virtual observatory through a page with easy and quick access. We present here a tool to visualize the distribution of the interstellar extinction. Using published photometric, spectroscopic and trigonometric data we have built a database of published and calculated by us distances and reddenings of 200 000 stars and growing. Open and globular clusters are added, being part of the data base. In the framework of the Spanish Virtual Observatory we have developed a tool called ”Extinction Map” that allows queries to the database by name or coordinates and provides as output, extinction-related data (distance, Av, Rv and E(B-V) . If

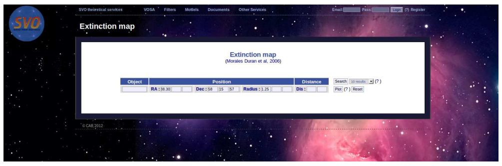

Fig. 1. Entering object query or coordinates in the SVO tool “Extinction Map”.

Extinction map
(Morales Duran et al, 2006)

Object	Position			Distance	
	RA : 38.30	Dec : 58 15 57	Radius : 1.25	Dis :	Search 10 results (?) Plot (?) Reset

54 files found.

Name	cat	RA	Dec	Δ	Dis	Vmag	B-V	E(B-V)	Rv	Av	SPT
HD15752	8	38:32:50	58:24:20	00:11:26	1.932	8.74	0.49			2.42	30100
BD+57586	8	38:21:19	58:35:34	00:19:41	2.999	10.11	0.61			2.7	20110
HD15449	11	37:51:45	58:01:29	00:20:01	0.128	6.575	1.42	0.26		0.94	K2.III
HD15620	8	38:13:11	57:55:45	00:20:20	2.292	8.35	0.92			3.01	11180
HD15620	1	38:13:13	57:55:45	00:20:20	2.09	8.35	0.92	0.95	2.867158	2.72	B8Iab
HD15620	11	38:13:13	57:55:45	00:20:20	1.928	8.35	0.92	0.95		3.12	B8.IAB
HD15619	11	38:12:43	58:36:35	00:20:50	0.328	8.076	1.039	0.069		0.24	G9.III
HD16025	8	39:11:44	58:07:13	00:29:38	0.341	8.97	0.17			0.77	50190
HD16025	11	39:11:46	58:07:12	00:29:39	0.431	8.97	0.17	0.27		0.86	B9.V
HD16025	1	39:11:46	58:07:12	00:29:39	0.4	8.97	0.17	0.245	2.849715	0.698	B9V
USN2502	8	37:21:35	58:12:54	00:29:50	2.657	9.86	0.48			2.32	30110
BD+57593	8	38:58:16	57:48:20	00:34:52	2.14	9.92	0.61			2.73	30110
BD+57593	11	38:58:00	57:47:21	00:35:34	1.955	9.92	0.61	0.87		2.8	B1.III
V*V425Per	1	37:58:20	57:41:51	00:35:38	1.9	6.98	0.79	0.85	2.831858	2.4	B6Ia
HD15497	8	37:58:18	57:41:50	00:35:39	1.867	7.03	0.782			2.61	10160
6.10092134	8	38:38:22	58:50:34	00:36:12	2.4					2.43	99990
HD15316	8	37:29:40	57:49:14	00:36:58	1.651	7.23	0.77			2.36	11230
HD15316	11	37:29:38	57:49:14	00:36:59	1.646	7.227	0.77	0.71		2.35	A3.IAB
HD15964	11	39:03:23	57:43:41	00:40:14	0.489	8.88	0.09	0.2		0.64	B9.V
HD16012	8	39:08:52	57:43:14	00:42:22	0.481	8.48	0.07			0.46	30190
HD16012	11	39:08:53	57:43:14	00:42:24	0.604	8.42	0.075	0.175		0.58	B9.III
BD+57579	1	37:33:30	57:40:30	00:42:34	1.54	10.09	0.49	0.755	2.765854	2.08	B1V
BD+57579	11	37:33:30	57:40:30	00:42:34	1.374	10.09	0.49	0.75		2.41	B1.V
BD+57579	8	37:33:04	57:39:50	00:43:16	1.968	10.09	0.49			2.39	50110
HD15690	8	38:23:26	57:32:36	00:43:25	1.564	9.82	0.57			2.63	50110
HD15690	2	38:23:11	57:32:14	00:43:47	2.488	8	0.66	0.83	2.92	2.42	B2Ib
HD15690	1	38:23:11	57:32:14	00:43:47	1.64	8.01	0.67	0.85	2.765976	2.35	B2Ib
HD15690	8	38:23:10	57:32:13	00:43:48	1.539	8.005	0.658			2.63	12115
BD+00957	8	38:19:10	57:30:15	00:45:41	2.25					2.4	880
HD236971	8	38:54:26	57:29:13	00:50:34	1.799	9.55	0.5			2.4	40110
HD236971	1	38:54:27	57:29:13	00:50:35	1.56	9.55	0.5	0.765	2.926144	2.23	B1IV

Fig. 2. Partial list of the objects found by the SVO tool "Extinction Map" around the entered coordinates or object name.

the queried object is not in the database, the system returns the information of all the stars located within a cone of variable radius.

2. Query by coordinates

We show here a preliminary example of a query. You enter the coordinates of the region of interest (Fig. 1) and the SVO tool provides you with a list of the stars present in the database inside a cone of radius chosen (Fig. 2). Also it provides with a representation of visual absorption versus distance and a second representation of the stellar coordinates (Fig. 3).

You may find in your search that certain stars have been studied by different researchers at different times or with different methods. If uncertainties are provided you can delete from the list the worst values and made the representation again, but uncertainties are only provided for the very recent observations. Clicking on the column cat you may find the origin of the data and information about the original values. In the figure (Fig. 4) we have the Aitoff projection of the stars present by today on the database.

Many more published catalogues and our own computed distances and reddenings will be soon implemented and will be continuosly implemented.

3. Potentiality

The interstellar extinction law shows a sharp rise in the extinction value from the visible towards the ultraviolet. Being able to know the proper amount of reddening in front of any astronomical object observed in the optical and specially in the UV is fundamental and more and more important as we go towards smaller wavelengths. Other potential users of this tool are astronomers whose objects by its intrinsic characteristics are not suitable to obtain easily the E(B-V) and therefore its distance. A preliminary version of this tool is available as a web page (`http://svo2.cab.inta-csic.es/theory/exmap/`) and also as a ConeSearch Virtual Observatory service.

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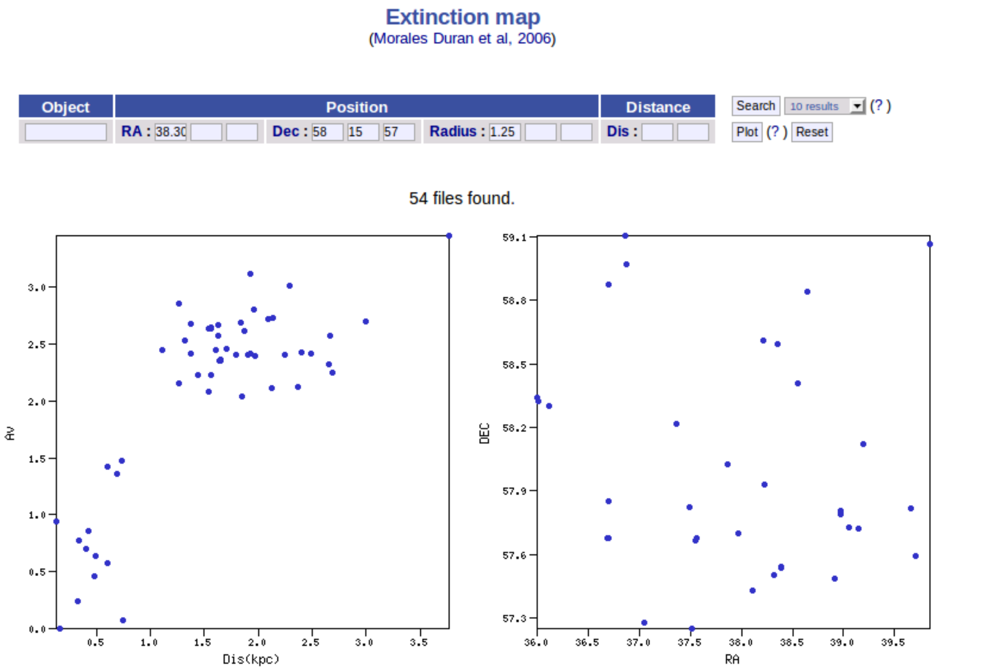

Fig. 3. Left: Representation of visual absorption versus distance, and Right: representation of the stellar coordinates.

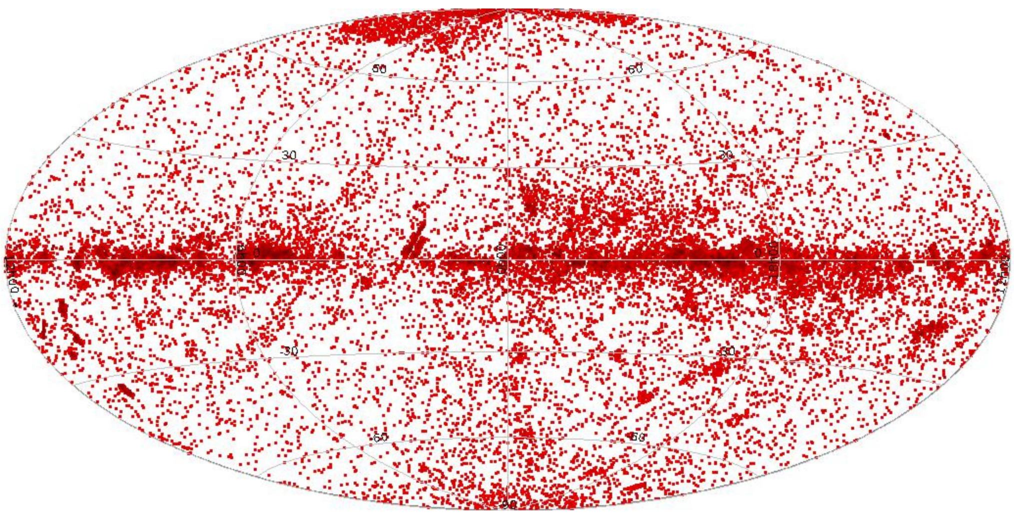

Fig. 4. Aitoff projection of the stars present by today on the database.