Baltic Astronomy, vol. 15, 85–90, 2006.

THE SUBDWARF DATABASE: RELEASED

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Received 2005 August 15

Abstract. The work on the Subdwarf Database, presented at the previous meeting, has been completed, and the tool is now publicly available. The first release contains data from close to 240 different literature sources, but more still awaits entry. The database interface includes advanced search capabilities in coordinate, magnitude and color space. Output tables can be generated in HTML with hyperlinks to automatically generated finding charts, the Aladin viewer and a detailed data sheet that displays all registered data for each target, including physical data such as temperature, gravity and helium abundance, together with a finding chart. Search results can be visualized automatically as interactive position, magnitude or color diagrams.

Key words: stars: hot subdwarfs – catalogs – surveys

1. INTRODUCTION

As presented at the last subdwarf meeting (Østensen 2004) a database has been designed and implemented based on the data in The Catalogue of Spectroscopically Identified Hot Subdwarf Stars (or the Subdwarf Catalogue, for short: Kilkenny et al. 1988) and its updates. This list contains more than 2300 unique hot subdwarf stars.

The database runs under MySQL[1] with interfaces in Perl for uploading and linking together the database entries. The WWW interface uses HTML forms and PHP[2].

2. WHAT'S NEW

In the past year the whole database has been completely redesigned. The first implementation was merely a searchable version of the original electronic table, but it soon became evident that there was a major problem with this simple solution. For instance, the table allows space for a small number of different classifications and several photometry entries, but there was no way to distinguish between the quality of two measurements of the same object. This applies both to photometric data, classifications and physical data.

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[1] MySQL (`www.mysql.com`) is an open source database.

[2] PHP (`www.php.net`) is a script language can produce HTML documents. The PHP code is interpreted when a page is requested, allowing the server to generate HTML in real time.

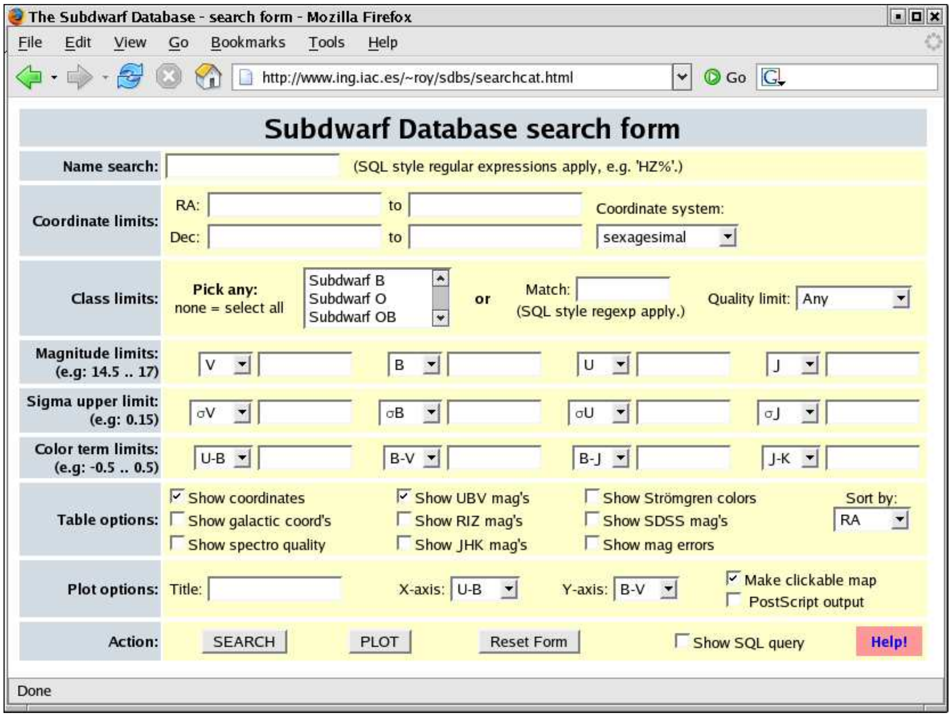
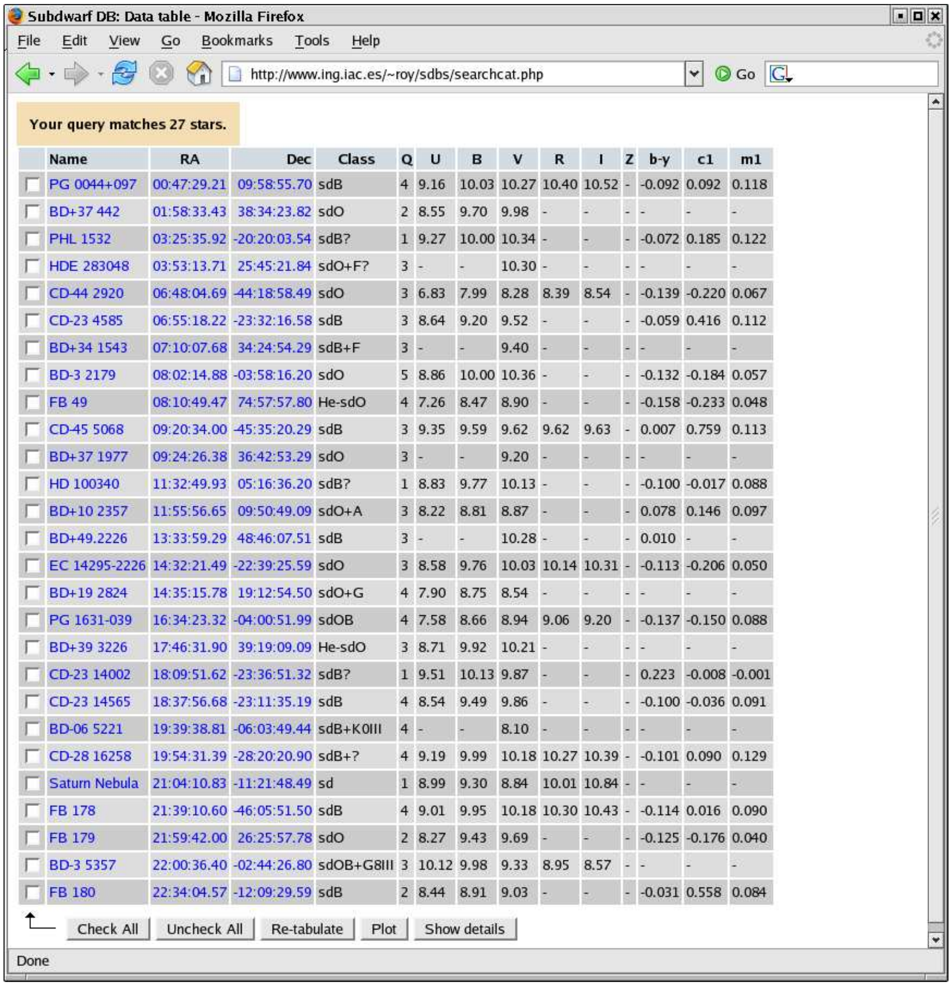


Fig. 1. The Subdwarf Database Search Form.

Obviously, if a particular object is observed and classified by several different authors, the reliability of the respective classifications will depend on the quality of the observations. If a classification entry was accompanied by a quality indicator, the system would be able to automatically adopt the classification with the highest quality flag, and thus vastly improve the reliability of the entries in the database. Thus, a scheme was implemented where a quality indicator of 1 signifies a photometric classification, a 2 signifies a classification based on a low resolution photographic spectrum, a 3 signifies a low to intermediate resolution spectrum (3–15 Å) – typically a photoelectric scan, a 4 signifies an intermediate resolution spectrum (1–3 Å) – typically a CCD observation in the blue part, and so on.

With this scheme in place it is easy to distinguish between reliably classified objects, and objects with dubious classifications. Also, for the photometric data in the database, it was decided that all entries must be accompanied by an error bar – either a one sigma error estimate provided by the observer, or at the very least a crude estimate based on the technique applied. Furthermore, the system is now able to convert magnitudes from photometric systems like the *Strömgren* system or *SDSS* magnitudes to Johnson *UVBRIZ* with reasonable precision and while maintaining realistic error estimates. It will then load the *UBVRIZ* magnitudes with the lowest error estimates available into the searchable database, regardless if this is an observed or derived magnitude. The database also contains *Strömgren, SDSS* and 2MASS *JHK* magnitudes, but these are never derived by conversion.


Subdwarf DB: Data table - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.ing.iac.es/~roy/sdbs/searchcat.php

Your query matches 27 stars.

Name	RA	Dec	Class	Q	U	B	V	R	I	Z	b-y	c1	m1
PG 0044+097	00:47:29.21	09:58:55.70	sdB	4	9.16	10.03	10.27	10.40	10.52	-	-0.092	0.092	0.118
BD+37 442	01:58:33.43	38:34:23.82	sdO	2	8.55	9.70	9.98	-	-	-	-	-	-
PHL 1532	03:25:35.92	-20:20:03.54	sdB?	1	9.27	10.00	10.34	-	-	-	-0.072	0.185	0.122
HDE 283048	03:53:13.71	25:45:21.84	sdO+F?	3	-	-	10.30	-	-	-	-	-	-
CD-44 2920	06:48:04.69	-44:18:58.49	sdO	3	6.83	7.99	8.28	8.39	8.54	-	-0.139	-0.220	0.067
CD-23 4585	06:55:18.22	-23:32:16.58	sdB	3	8.64	9.20	9.52	-	-	-	-0.059	0.416	0.112
BD+34 1543	07:10:07.68	34:24:54.29	sdB+F	3	-	-	9.40	-	-	-	-	-	-
BD-3 2179	08:02:14.88	-03:58:16.20	sdO	5	8.86	10.00	10.36	-	-	-	-0.132	-0.184	0.057
FB 49	08:10:49.47	74:57:57.80	He-sdO	4	7.26	8.47	8.90	-	-	-	-0.158	-0.233	0.048
CD-45 5068	09:20:34.00	-45:35:20.29	sdB	3	9.35	9.59	9.62	9.62	9.63	-	0.007	0.759	0.113
BD+37 1977	09:24:26.38	36:42:53.29	sdO	3	-	-	9.20	-	-	-	-	-	-
HD 100340	11:32:49.93	05:16:36.20	sdB?	1	8.83	9.77	10.13	-	-	-	-0.100	-0.017	0.088
BD+10 2357	11:55:56.65	09:50:49.09	sdO+A	3	8.22	8.81	8.87	-	-	-	0.078	0.146	0.097
BD+49.2226	13:33:59.29	48:46:07.51	sdB	3	-	-	10.28	-	-	-	0.010	-	-
EC 14295-2226	14:32:21.49	-22:39:25.59	sdO	3	8.58	9.76	10.03	10.14	10.31	-	-0.113	-0.206	0.050
BD+19 2824	14:35:15.78	19:12:54.50	sdO+G	4	7.90	8.75	8.54	-	-	-	-	-	-
PG 1631-039	16:34:23.32	-04:00:51.99	sdOB	4	7.58	8.66	8.94	9.06	9.20	-	-0.137	-0.150	0.088
BD+39 3226	17:46:31.90	39:19:09.09	He-sdO	3	8.71	9.92	10.21	-	-	-	-	-	-
CD-23 14002	18:09:51.62	-23:36:51.32	sdB?	1	9.51	10.13	9.87	-	-	-	0.223	-0.008	-0.001
CD-23 14565	18:37:56.68	-23:11:35.19	sdB	4	8.54	9.49	9.86	-	-	-	-0.100	-0.036	0.091
BD-06 5221	19:39:38.81	-06:03:49.44	sdB+K0III	4	-	-	8.10	-	-	-	-	-	-
CD-28 16258	19:54:31.39	-28:20:20.90	sdB+?	4	9.19	9.99	10.18	10.27	10.39	-	-0.101	0.090	0.129
Saturn Nebula	21:04:10.83	-11:21:48.49	sd	1	8.99	9.30	8.84	10.01	10.84	-	-	-	-
FB 178	21:39:10.60	-46:05:51.50	sdB	4	9.01	9.95	10.18	10.30	10.43	-	-0.114	0.016	0.090
FB 179	21:59:42.00	26:25:57.78	sdO	2	8.27	9.43	9.69	-	-	-	-0.125	-0.176	0.040
BD-3 5357	22:00:36.40	-02:44:26.80	sdOB+G8III	3	10.12	9.98	9.33	8.95	8.57	-	-	-	-
FB 180	22:34:04.57	-12:09:29.59	sdB	2	8.44	8.91	9.03	-	-	-	-0.031	0.558	0.084

Check All | Uncheck All | Re-tabulate | Plot | Show details

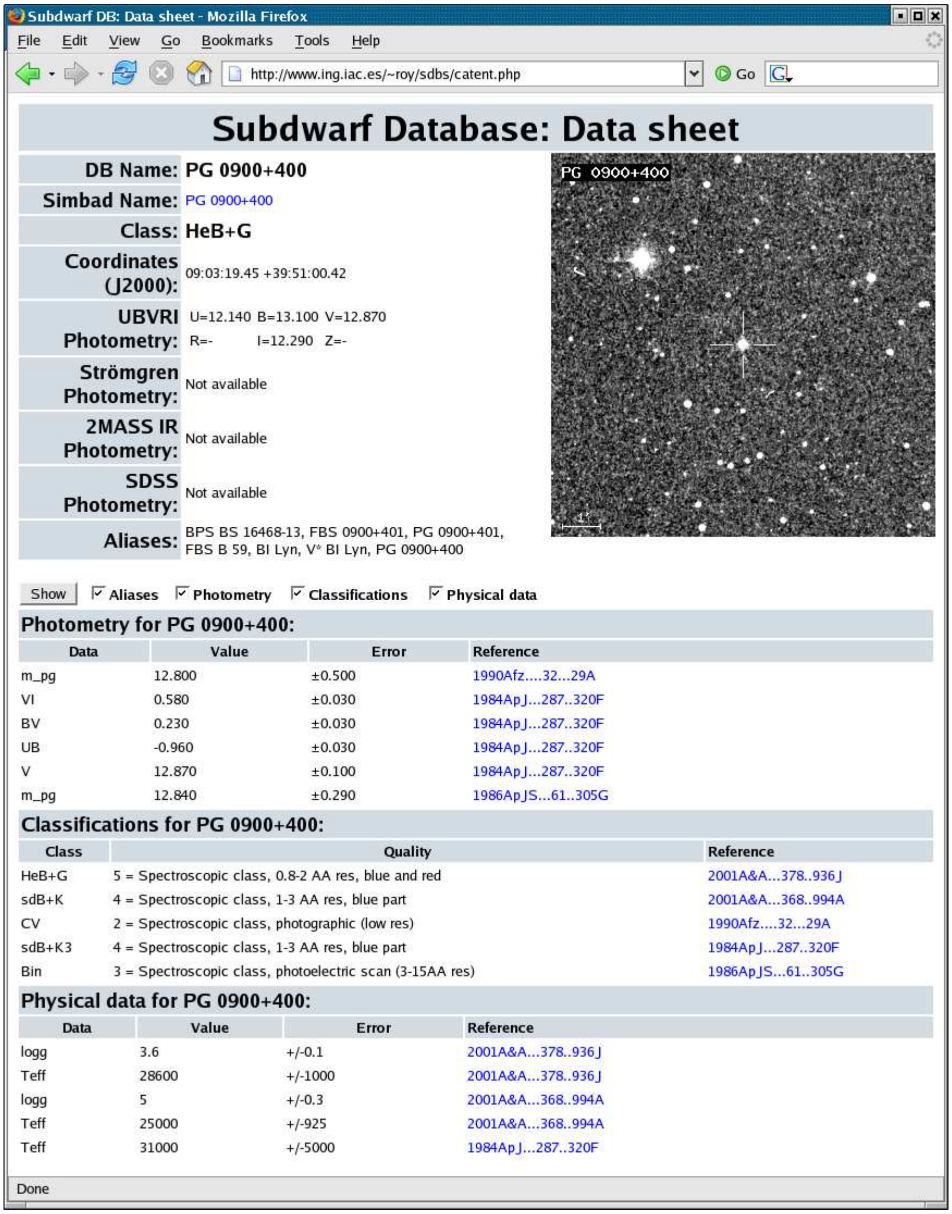
Done

Fig. 2. Sample output from a magnitude limited search in the Subdwarf Database.

3. A FLEXIBLE INPUT FORMAT

Instead of the old system where the database merely reflected the entries in an electronic table with a fixed number of columns, the new system allows free format tables. Each data file under the new scheme contains information from one (or a related set of) publications with standardized tags to identify authors, title and a reference code. After a valid reference is given, each line contains data on one object in a format that specifies a list of names identifying the object followed by a colon and a list of data entries. The data entries are given in the form of a comma separated list of tag-value associations. Errors or quality flags are provided either on a separate line for all entries in the file, or as a number in brackets after each data value.

When the database is initialized, each data file is parsed and the data loaded


Subdwarf DB: Data sheet - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.ing.iac.es/~roy/sdbs/catent.php Go

Subdwarf Database: Data sheet

DB Name:	PG 0900+400
Simbad Name:	PG 0900+400
Class:	HeB+G
Coordinates (J2000):	09:03:19.45 +39:51:00.42
UBVRI Photometry:	U=12.140 B=13.100 V=12.870 R=- I=12.290 Z=-
Strömgren Photometry:	Not available
2MASS IR Photometry:	Not available
SDSS Photometry:	Not available
Aliases:	BPS BS 16468-13, FBS 0900+401, PG 0900+401, FBS B 59, BI Lyn, V* BI Lyn, PG 0900+400

Show ☑ Aliases ☑ Photometry ☑ Classifications ☑ Physical data

Photometry for PG 0900+400:

Data	Value	Error	Reference
m_pg	12.800	±0.500	1990Afz....32...29A
VI	0.580	±0.030	1984ApJ...287..320F
BV	0.230	±0.030	1984ApJ...287..320F
UB	-0.960	±0.030	1984ApJ...287..320F
V	12.870	±0.100	1984ApJ...287..320F
m_pg	12.840	±0.290	1986ApJS...61..305G

Classifications for PG 0900+400:

Class	Quality	Reference
HeB+G	5 = Spectroscopic class, 0.8-2 AA res, blue and red	2001A&A...378..936J
sdB+K	4 = Spectroscopic class, 1-3 AA res, blue part	2001A&A...368..994A
CV	2 = Spectroscopic class, photographic (low res)	1990Afz....32...29A
sdB+K3	4 = Spectroscopic class, 1-3 AA res, blue part	1984ApJ...287..320F
Bin	3 = Spectroscopic class, photoelectric scan (3-15AA res)	1986ApJS...61..305G

Physical data for PG 0900+400:

Data	Value	Error	Reference
logg	3.6	+/-0.1	2001A&A...378..936J
Teff	28600	+/-1000	2001A&A...378..936J
logg	5	+/-0.3	2001A&A...368..994A
Teff	25000	+/-925	2001A&A...368..994A
Teff	31000	+/-5000	1984ApJ...287..320F

Done

Fig. 3. Sample data sheet from the Subdwarf Database. Different observers have given many different classifications for this composite system.

into a number of database tables. The list of object names are loaded into one table, and coordinates, classifications, references and physical data are loaded into separate tables. Each entry is associated with its reference code, and there is no longer any limit on the number of entries for the same object.

After all available data files have been loaded into the set of database tables,

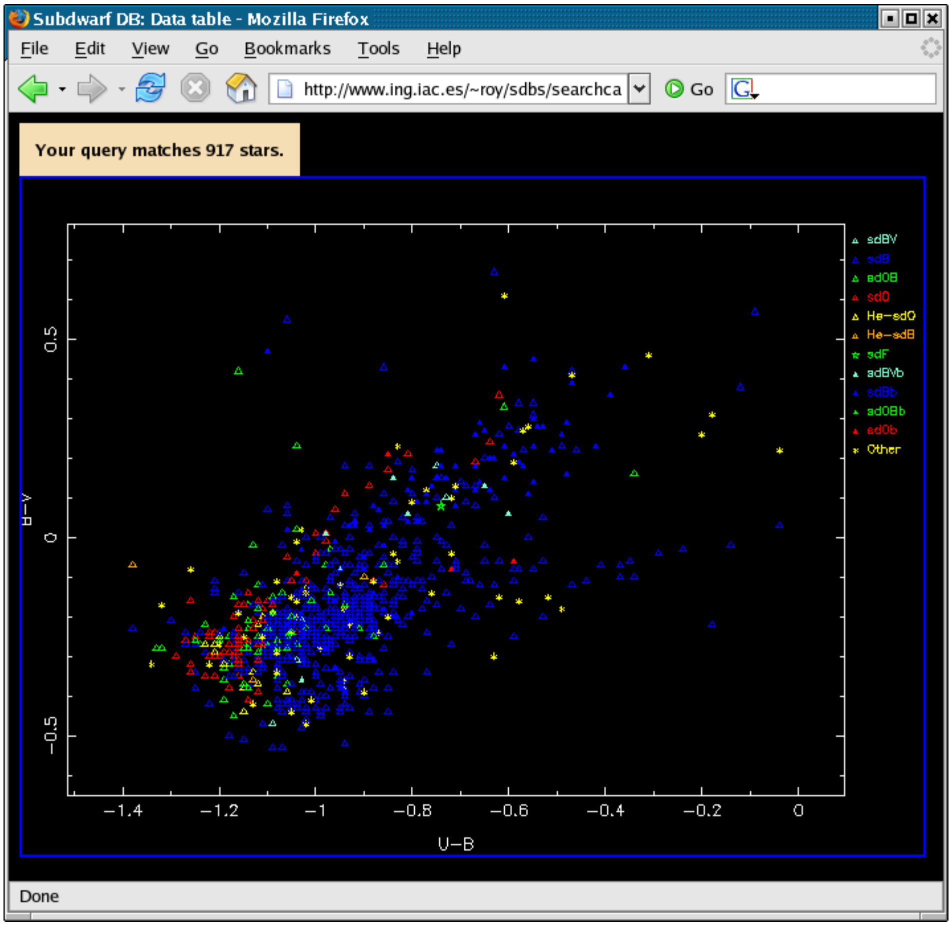


Fig. 4. A color-color plot auto-generated from the database with set limits on photometric quality. The plot is interactive in the sense that moving the pointer over a symbol will show the name of the star, and clicking on a symbol will produce the data sheet for that object.

a table containing compiled data is constructed. The script that does this job searches the table of classifications for entries of hot subdwarf stars. This list is then cross-checked so that each entry has a pair of valid coordinates associated with it. For each entry, all classifications and photometric data are loaded from the respective tables, derived magnitudes are computed, and only the best values are loaded into the compiled database. The entry that is created may actually not be that of a subdwarf star. All stars that have at one time been classified as a hot subdwarf star will be registered in the database, but the classification recognized is the one with the highest quality flag (e.g., Figure 3).

4. TO DO

The released database contains all the 146 references from the original Subdwarf Catalogue, with the exception of a few references that I have not been able to access. About 100 additional sources have been added to this collection, but this is still far away from exhausting the available sources. Many more papers still need to be recognized, and their data must be entered into tables. This is a work that can hardly ever be completed, and in order for the situation to improve, I will have to rely on people sending me notifications of old papers that have been missed as well as new papers being released. It would also be a great help if authors could provide electronic tables of their data that I can convert to the database format, thereby avoiding introducing further typing errors to the collection of discrepancies that already exist. If you spot any, please let me know.

The database is currently hosted at `http://www.ing.iac.es/~roy/sdbs/`. A more permanent home is being sought.

REFERENCES

Kilkenny D., Heber U., Drilling J. S. 1988, SAAOC, 12, 1, with updated electronic edition (1992)

Østensen R. H. 2004, Ap&SS, 291, 263