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The Asiago Database of Spectroscopic Databases (ADSD)⋆,⋆⋆

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ABSTRACT

Databases of observed stellar spectra are continuously being published and made publicly available, and the average number of stars per database is increasing. This paper reviews the current status. The Asiago Database of Spectroscopic Databases (ADSD) aims to provide a census of publicly available libraries of observed stellar spectra, to document their content and to homogenize their parameters for easier consultation and access. Refereed journals, conference proceedings and personal web pages have been searched for libraries of a given minimum size, properly documented and with data made publicly and directly accessible. A total of 294 databases (54 ultraviolet, 183 optical, 50 infrared and 7 combined) have been found to match the selection criteria and have been included in ADSD. They provide spectra of 16046 different stars in electronic or printed formats. A card for each library describes in a homogeneous way its aims, content, type of data, caveats, data download links, source paper, properties of included stars and more. A dedicated web page allows direct access to ADSD, plans future updates, and provides interrogation tools to search all the libraries matching given characteristics or including any given star.

Key words. astronomical data bases: miscellaneous – catalogs – surveys – atlases – stars: general

1. Introduction

The production of libraries of observed stellar spectra has been increasing in recent decades, with both an increase in the number of datasets and in the number of stars included. This is arguably the result of an increasing observational efficiency (from spectral scanners, to single array Reticon, to CCD, to multiple object spectroscopy via fiber feeding), of a larger amount of observational time being allocated to survey projects on medium size telescopes, and of the increasing use by astronomers of electronic media to support and publicize their research work.

A census, a parameter homogenization and a web interrogation tool of libraries of observed stellar spectra are needed. To this aim we have created the *Asiago Database on Spectroscopic Databases* (ADSD). Our effort aims to prevent (unnecessary) duplication of observational efforts, increase the awareness of the enormous wealth of already existing data and information, stimulate a critical review and comparison of their content, provide a guided access to them and speed up the identification and selection of data of interest. Early efforts on this project were described by Sordo & Munari (2003), while some statistical applications were presented by Munari & Sordo (2005). We have surveyed refereed journals, conference proceedings, personal web pages, CDS/ADC on-line catalog repositories and astro-ph documents to search for existing libraries of optical, ultraviolet and infrared spectra of stars. We are confident that the large majority of existing libraries have been located and included in ADSD. The effort is updated to the time of manuscript submission. At the time of writing the ADSD includes 294 spectroscopic databases. Their subdivision into optical, ultraviolet and infrared branches and electronic, printed and graphical types is outlined in Table 1. The total number of stars whose spectrum is included in the electronic or printed databases (thus excluding those providing data in graphical form only) is 16 046. It is divided into 9405 different stars included in optical libraries, 3184 in UV libraries and 6095 in IR libraries. Tables 2–4 provide a list of the 294 libraries censused in ADSD.

Table 1. How the 294 libraries censused in ADSD distribute between optical, ultraviolet and infrared ranges and electronic, tabular or graphical data type.

range	*λλ interval*	*total n.* libraries	*electronic*	*printed*	*graphical*
Ultraviolet	70–3000 Å	54	32	12	10
Optical	3000–10000 Å	183	85	52	46
Infrared	1–25 μm	50	21	1	28
Combined		7	6		1

2. Full size ADSD web edition

The ADSD is composed of a printable book-size version and by a web portal providing browsing facilities and search/interrogation tools described below.

The printable book-size version is too long (~400 pages) for formal publication here, and it is instead offered for download from the project website: http://web.pd.astro.it/adsd/index.html. Full details and explanatory notes are provided there.

⋆ Tables 2–4 are only available in electronic form at http://www.edpsciences.org

⋆⋆ A printable book-size version of ADSD can be downloaded from the project web site http://web.pd.astro.it/adsd/index.html

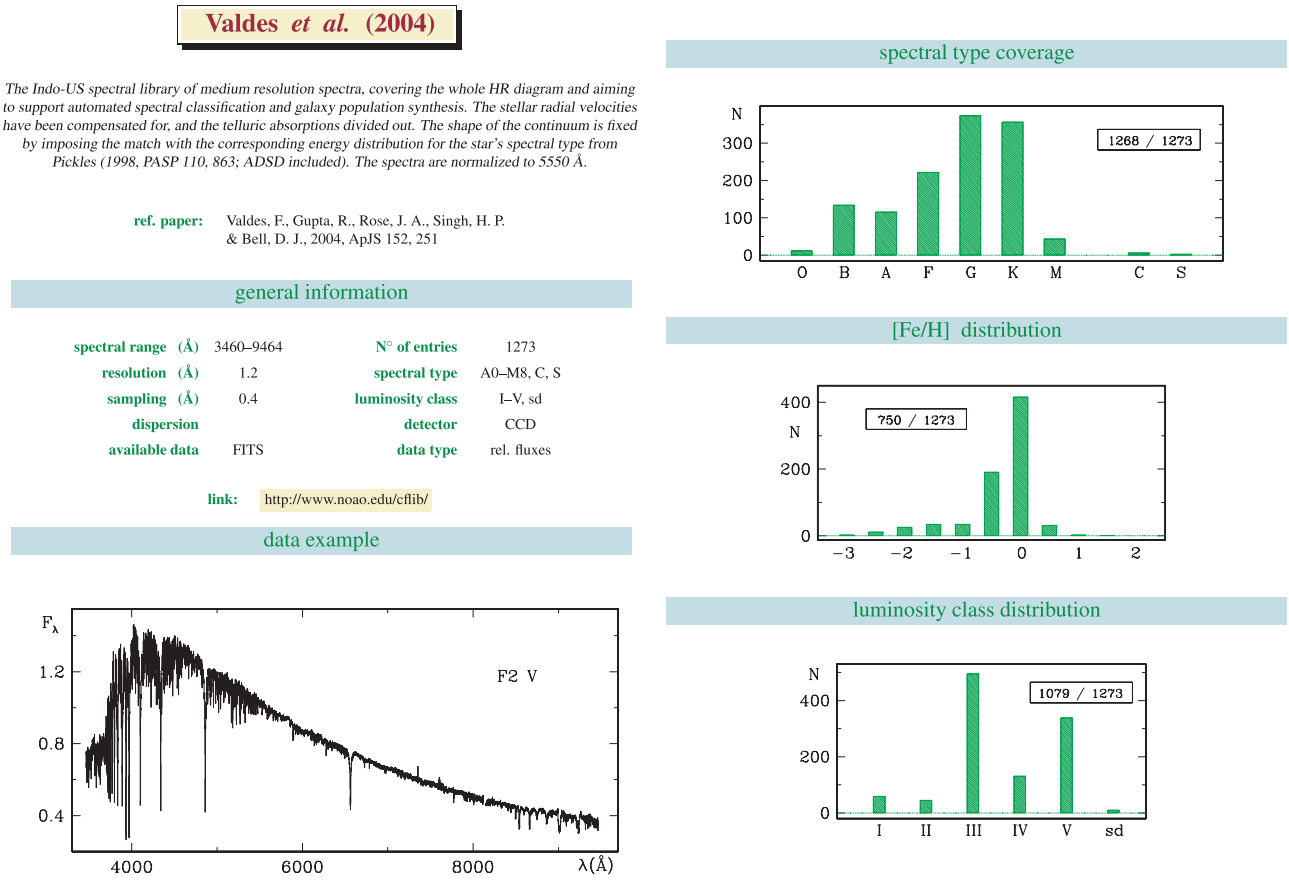

Fig. 1. An example of the card accompanying each individual database censused in ADSD, showing its front and rear sides. The front one describes the content of the library and presents an example of a spectrum. The rear one uses instead information retrieved from SIMBAD to illustrate the distribution in spectral type, luminosity class and metallicity of the stars contained in the database. A detailed description of the content of each entry and coding syntax is provided in the full book-size printable version of ADSD paper that can be downloaded from the project web site.

Future updates of the ADSD live edition are planned and will be made available via the web portal.

3. Census boundaries

The spectroscopic databases included in ADSD are divided into three broad categories: *electronic* are the libraries for which the spectra can be accessed and retrieved in electronic form, from an ftp or web address; *printed* are the libraries for which the spectra are available only in the form of printed tables with no known transfer to an electronic version; *graphical* are the libraries presenting their spectra only as figures, with no known transfer to a printed table or electronic version.

To be included in the ADSD a spectroscopic database (*i*) must be accompanied by a publicly available publication that documents the data (preferably in a refereed journal), (*ii*) the data must be directly accessible, thus excluding the datasets that need to be requested from and/or negotiated directly with the Authors, and (*iii*) the library must contain spectra of ∼10 stars minimum. Notable exceptions are the libraries devoted to specific types of objects (like brown dwarfs, Be stars in clusters, or WR stars in LMC., etc.), or very high resolution reference spectral atlases devoted to single stars (like Arcturus; ADSD however does not include atlases of the Sun), or compilation of spectral energy distributions of key reference spectrophotometric standards. There are a few exceptions to the above criteria, depending on our judgment of the relevance of a given atlas, driven not only by the number of stars and their peculiarity/rarity/specificity but also on the quality of the data, their wavelength extension, type of sampling and citation frequency in the literature.

ADSD does not include general repositories of unselected data collected by ground based telescopes or space missions (like HST). For example, the INES[1] archive of all spectra secured by the IUE satellite (maintained at Goddard, VILSPA and several national mirrors) is not included in ADSD, while the Jamar et al. (1976) atlas of *selected* TD-1 ultraviolet spectra of 1356 bright stars is included. The IRAS atlas of 5425 low-resolution spectra is included in ADSD because the spectra were all individually plotted and discussed in a monographic issue of A&AS and poor spectra have been removed. ADSD also does not include the unpublished sets of spectra about internal reference and calibration stars.

4. ADSD structure

4.1. ADSD cards and comparative tables

For each spectroscopic database providing data in either *electronic* or *printed* formats, there is an individual ADSD card describing its main characteristics and content. An example is presented in Fig. 1. Correspondence between card numbers and libraries is given in the first column of Tables 2 and 3. Spectroscopic databases presenting data only in graphical form do not have their own cards.

[1] `http://ines.laeff.esa.es/`

The cards aim to facilitate the inter-comparison between the different spectroscopic databases, by providing the same type of information, homogenized and accompanied by a sample spectrum representative of those included in the library. The content of the cards and their symbol syntax are described in detail in the printable book-size version of ADSD available from the project web site.

Tables 2−4 provide a summary of the 294 libraries currently contained in ADSD, allowing an easy comparison of their basic characteristics for an easier location of those of interest.

4.2. The web portal and interrogation tools

The ADSD web portal provides *interrogation tools* that allows one to search the list of censused databases for a number of possible applications. Two examples of a query illustrate the possibilities.

In the first type of interrogation, ADSD is searched for the spectral databases that meet certain parameters, e.g. ADSD could be searched for the libraries that satisfy all of the following criteria at the same time: (*a*) they must include the 4000−5000 Å range, (*b*) at a resolution between 1 and 10 Å, (*c*) with data calibrated into absolute fluxes, that are (*d*) accessible in electronic form, and (*e*) that contain G2 III spectra of individual stars, not mean spectra. In such a case, the web interrogation tool would answer that the only two catalogs matching the requirements are (*i*) Jacoby et al. (1984) presenting spectra of two G2 III stars HD 28099 and HD 66171, and (*ii*) Jones (1996, included in Leitherer 1996) providing spectra of the three G2 III stars HD 4307, HD 76151 and HD 98553.

In the second type of interrogation, ADSD is asked to list all libraries that contain spectra (in electronic or tabular form) of a given star. The star name must be introduced in a format accepted by SIMBAD (examples are given), that provides the list of other names recognized for this star and that are used to search all censused libraries. Asking for example for star HD 99028 (=HR 4399) would give in return Jones (1996, included in Leitherer 1996), Kharitonov et al. (1988), Heck et al. (1984), Breger (1976), Burnashev (1985) and Dickens & Penny (1971).

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References

Breger, M. 1976, ApJS, 32, 7
Burnashev, V. I. 1985, AbaOB, 59, 83
Dickens, R. F., & Penny, A. F. 1971, MNRAS, 153, 287
Heck, A., Egret, D., Jaschek, M., Jaschek, C., et al. 1984, A&AS, 57, 213
Jacoby, G. H., Hunter, D. A., & Christian, C. A. 1984, ApJS, 56, 257
Jamar, C., et al. 1976, ESA SR-27
Kharitonov, A. V., Tereshchenko, V. M., & Knjazeva, L. N. 1988, The spectrophotometric catalogue of stars of Alma-Ata Observatory (Nauka Pub)
Leitherer, C., Alloin, D., Fritze-v. Alvensleben, U., et al. 1996, PASP, 108, 996
Munari, U., & Sordo, R. 2005, in ATLAS12 and Related Codes, MemSAIt Suppl., 8, 170
Sordo, R., & Munari, U. 2003, in Gaia Spectroscopy, Science and Technology, ASPC Conf. Ser., 298, 221

Online Material

Table 2. The list of optical, ultraviolet, infrared and combined libraries that give access to the spectra in electronic form and that are included in ADSD. The first column lists the number of the figure on the ADSD web site that provide access to the card of the given library and that is included in the printable book-size full version of ADSD.

Fig N.	Authors and year of publication		Spectral Range (Å)	D (Å/pix) (Å/*mm*)	R or R_P (Å)	Samplig (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
					Optical libraries with data in electronic form						
6	Adelman et al.	1989	3300–10800		4–50		207	O9–K4, pec	I–V	Sp.Sc.	rel
7	Alekseeva et al.	1997	3200–7350		50	25	602	O5–M4	I–V	Sp.Sc.	abs
			3200–10800		100	25	278	O5–M4	I–V	Sp.Sc.	abs
8	Allen & Strom	1995	5600–9600		6	1.97	102	F1–M4	V	CCD	counts
9	Allende Prieto et al.	2004	3620–10440		*50000*	0.01	91	A0–K3	II-V	CCD	norm
			3620–9210		*45000*	0.01	28	F2–M0	III–V	CCD	norm
10	Andrillat et al.	1995	8375–8770	*33*	1–1.5	0.8	76	O5–G0, pec	I–V	CCD	norm
11	Appelquist et al.	1983	5185–8700	*4.9*	0.195	0.04	1	γ Tau (K0)	III	plate	norm
12	Bagnulo et al.	2003	3040-10400		*80000*	0.012÷0.026	449	O–M, C	I–V,sd	CCD	rel
13	Barnbaum	1994	5080–7850	*2.84–4.35*	*47000*	0.043÷0.065	89	C		CCD	counts
14	Barnbaum et al.	1996	4000–7000	0.85–3.25	1.6–6.5	0.85÷3.25	72	C, Ba, CH		several	counts
15	Biryukov et al.	1998	3425–7525		50	50	82	B8–K1	III–V	Sp.Sc.	abs
16	Breger	1976	3200–12000		10–100	50–200	609	O5–K7	I–V	Sp.Sc.	rel
17	Burgasser et al.	2003a	6300–10100	1.86	7	1.86	13	T	V	CCD	abs
18	Burnashev	1985	3200–7350		25	25	1562	O5–M7,WR,C,S,pec	I–V		abs
19	Carquillat et al.	1997	8380–8780	*33*	2	0.8	54	A2–M4, C, S	I–V, sd	CCD	norm
20	Castelli & Hubrig	2004	3040–10000		*90000, 110000*	0.016÷0.026	1	HD 175640 (B9)	V	CCD	norm
21	Cenarro et al.	2001	8348–9020	0.79–0.85	1.5–2.13	0.85	706	O6–M8	I–V, sd	CCD	rel
22	Cincunegui & Mauas	2004	3890–6650	0.141÷0.249	*26400*	0.149	91	F6–M5.5	IV–V	CCD	abs
			3885–6975	3.41	*1050÷2070*	3.41	91	F6–M5.5	IV–V	CCD	abs
23	Clampitt & Burstein	1997	3500–7780		32–64	65–680	237	B–K0, pec	III–V	Sp.Sc.	rel
24	Danks & Dennefeld	1994	5800–10200	4.3		4	137	O5–M7, pec	I,III,V	Reticon	abs
25	Davies et al.	2005	5846–7030		1.1–2.1	0.447	13	B0–A6	Ia, Iae	CCD	norm
26	Fluks et al.	1994	3500–10000		*1300÷9000*	1	22 *ms*	M0–M10	III	CCD, IDS	abs
27	Friedrich et al.	2000	3200–9200	*100÷500*	5–40	2.4–7.6	40	WD		CCD	abs
28	Glushneva et al.	1992	3225–7675		50	50	238	O7–M4, pec	I–V	Sp.Sc.	abs
29	Glushneva et al.	1998a	5975–10825		50	50	223	O9–M5, pec	I–V	Sp.Sc.	abs
30	Glushneva et al.	1998b	3225–7625		50	50	862	O6–M6, pec	I–V	Sp.Sc.	abs
31	Gray et al.	2003	3800–4600		1.8, 3.6	1.11–1.14	3413	B3–M4, WR	I–V, sd	CCD	all
			3800–5500		1.8–3.6	0.77–1.79	215	O4–M7, pec	I–V	CCD	norm
32	Griffin & Griffin	1979	3140–7470			0.005	1	α CMi (F5)	IV–V	plate	norm
33	Gunn & Stryker	1983	3130–10800		20, 40	10, 20	175	O5–M8, pec	I–V	Sp.Sc.	rel
34	Hamann et al.	1995	3300–9000		*2000–3600*	1.12–3	62	WN		CCD	norm
35	Hamuy et al.	1992	3300–7550		10, 16	16, 50	29	B1–G0, WD, pec	III–V, sd	CCD	abs
36	Hamuy et al.	1994	6000–10500		11, 16	16, 50	30	B1–G0, WD, pec	III–V, sd	CCD	abs
37	Ivison et al.	1994	4500–6800	*79*		2.25	32	Symb.		IPCS	abs
38	Jacoby et al.	1984	3510–7427		4.5	1.4	161	O5–M7, pec	I–V	Reticon	abs
39	Johnson	1977	4000–10000		1.9÷3.85	3.855 cm^{-1}	16	O6–M9, C, S, pec	I–V	FTS	ps.norm
40	Johnson	1978a	4000–11000		1.9÷3.85	3.855 cm^{-1}	32	O9.5–M2, C, S, pec	I–V	FTS	ps.norm
41	Johnson	1980	4045–10220			50–150	16	O9–A3	III–V	FTS	abs
42	Jones	1996	3820 ··· 5460		1.8	0.6	684	O9–M7.5, C, pec	I–V, sd	CCD	abs
43	Kharitonov et al.	1988	3225–7575			50	1147	O6–M5, S, pec	I–V	Sp.Sc.	abs
44	Kiehling	1987	3200–8600		10	10	60	A9–M5	I–V	Sp.Sc.	rel
45	Kirkpatrick et al.	1999	6300–10100		9	1.865	25	L0–L8	V	CCD	rel
46	Kirkpatrick et al.	2000	6300–10100		9	1.9	67	L0–L8	V	CCD	rel
47	Knyazeva & Kharitonov	1996	3225–7575			50	41 *ms*	B5–M5	III–V	Sp.Sc.	rel
48	Le Borgne et al.	2003	3200–9500		3	1	253	O5–M6, WR, WD	I–V, sd	CCD	abs
49	Malyuto et al.	1997	4800–7700		10	5.7÷6.1	15	K0–M5	I–III	Digicon	rel
			4800–7700		10	5.7÷6.1	18	M1–M4.5	I	Digicon	abs
50	Marrese et al.	2003	8490–8740		*20000*	0.25	92	F2–M7	I–V	CCD	norm
51	Massey et al.	1988	3110–8380		7–14	1.6–2.7	25	O–A, DA, pec	I–V, sd	IRS, IIDS	abs
52	Meliani et al.	1995	4250–5400	*114*	5	1	40	K5–M	I	IDS	rel

Table 2. (*continued*)

Fig N.	Authors and year of publication		Spectral Range (Å)	D (Å/pix) (Å/*mm*)	R or R_P (Å)	Samplig (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
53	Mennickent & Sterken	1997	6470–8780		5.4	2.4	8	Be		CCD	norm
54	Montes et al.	1997	3830 · · · 7643		0.2–3.1	0.1–0.3	115	F0–M9	II–V	CCD	norm
55	Montes & Martin	1998	4800 · · · 10600		*55000*	0.05÷0.09	48	F5–M8	III–V	CCD	counts
56	Montes et al.	1999	3900 · · · 9000	0.07–0.38	*12000*	0.15–0.35	132	F0–M8	I–V	CCD	counts
57	Munari et al.	1997	4020–7890		12	3.2÷4.0	14	CV		CCD	abs
			3480–7530		20	7.5–8	14	CV		CCD	abs
58	Munari	2003	8490–8740		*20000*	0.25	20	peculiar		CCD	norm
59	Munari & Tomasella	1999	8490–8750		*20000*	0.25	130	O4–M8	I–V	CCD	norm
60	Munari & Zwitter	1998	3300–9100		7	2.9	20	CV		CCD	abs
61	Munari & Zwitter	2002	3210–9190	2.5	5	2.77÷2.95	24	F0–M5, pec	II–III, sd	CCD	abs
			3150–7530	7.5	15	7.58÷7.70	16	F5–M5, pec	III	CCD	abs
62	O'Connell	1973	3300–10800		20, 30	14–760	49 *ms*	O5–M8	I–V, sd	Sp.Sc.	rel
63	Pickles	1985	3600–10000		10–17	3, 12	48 *ms*	O–M6	III–V	several	abs
64	Prugniel & Soubiran	2001	4100–6800		*42000*	0.05	708	O8–M2	II–V	CCD	norm
			4100–6800		*10000*	0.2	708	O8–M2	II–V	CCD	rel
65	Santos et al.	2001	7090–10200		3–20	3	72	B2–M5	I–V	several	rel
			3512–10226			3	22 *ms*	B8–M5	I–V	several	rel
66	Serote Roos et al.	1996	4800–8920	0.43	1.25	0.4	21	B3–M5	I–V	Reticon	rel
			5000–9780	3.3	8.5	3.3	7	F2–M1	III,V	CCD	rel
67	Silva & Cornell	1992	3510–8930			5	72 *ms*	O5–M6	I–V	CCD	rel
68	Soubiran et al.	1998	4400–6800		*42000*	0.05	211	A4–M2	II–V	CCD	counts
69	Spinrad & Taylor	1969	3880–7400		16, 32	27–1100	229	F8–M3	III-IV	Sp.Sc.	rel
			7980–10700		16, 32	DW	82			Sp.Sc.	rel
70	Stickland	1971	3350 · · · 7782		48, 64	50–700	29	O9–K7	V	Sp.Sc.	rel
71	Stone	1977	3200–8370		49, 98	50–450	16	O–G2, pec	III–V, sd	Sp.Sc.	abs
72	Stone	1996	4040–8800	5.5		5	107	O–M5, WD	III–V, sd	CCD	abs
73	Stritzinger et al.	2005	3050–11000	2.85, 5.34	8.6, 16.4	2.9	108			CCD	abs
74	Takeda et al.	2005	5000 · · · 8800		*70000*	0.02–0.04	161	F2–K2	III–V	CCD	norm
75	Taylor	1984a	3288–7000		32–100	32–100	12	G	V	Sp.Sc.	abs
76	Tereshchenko	1994	3100–7750		50	50	14	A0–F0	III, V	Sp.Sc.	abs
77	Tereshchenko	1996	3200–7600		50	50	27	M0–M8	I–III	Sp.Sc.	abs
78	Tereshchenko	1999	3200–7600		50	50	16	C, S		Sp.Sc.	abs
79	Tereshchenko	2001	3125–7575		50	50	24	B8.5–G5	IV–V	Sp.Sc.	abs
80	Tereshchenko	2002	3125–7575		50	50	41	B9.5–G6	IV–V	Sp.Sc.	abs
81	Tinney & Reid	1998	6400–9100	0.19÷0.27	*18750*	0.19	4	O9.5, M8, M9	V	CCD	rel
82	Torres-Dodgen & Weaver	1993	5800–8900	5.7÷6.8	15.5	5.7÷6.8	60	O4–M3	I,III,V	Reticon	abs
83	Torres-Dodgen & Massey	1988	3400–7300		10–15	2–3	173	WR		Vidicon	abs
84	Torres & Massey	1987	3100–7200	*125*	9	1.3–2.8	20	WR		Reticon	abs
85	Tur et al.	1995	3200–8000		50	100	7	Be		Sp.Sc.	rel
86	Valdes et al.	2004	3460–9464	0.4	1.2	0.4	1273	A0–M8, C, S	I–V, sd	CCD	rel
87	Walborn & Fitzpatrick	1990	3800–4900	0.5	1.5	0.4	78	O, B	I–V	2D-ph.c.	norm
88	Walborn & Fitzpatrick	2000	3800–4900	0.5	1.5	0.4	21	O, B, WR		2D-ph.c.	norm
89	Wallace & Hinkle	1996	8690–9300		*56000*	0.06÷0.07	1	α Boo (K1)	III	FTS	norm
90	Weaver et al.	1995	5750–8950	6.8	15.5	5.7÷6.9	43	A	I–V	Reticon	abs
91	Worthey & Ottaviani	1997	3900–6600		8÷10	1.25	460	B0.5–M8	I–V, sd	IDS	
92	Zwitter & Munari	1994	4600–9000	7.8	18	7.5÷7.8	41	CV		CCD	abs
93	Zwitter & Munari	1995	3300–9150		7	2.85÷3.0	25	CV		CCD	abs
94	Zwitter & Munari	1996	3270–9000		7	2.76÷2.95	38	CV		CCD	abs

Ultraviolet libraries with data in electronic form

95	Ayres	2003	1150–3000		*30000, 110000*	0.012	52	F0–M5.5, T Tau	I–V, sd	STIS	abs
96	Brandt et al.	1995	1979–3300		*20000–35000*	0.021÷0.025	1	α Ori (M2)	Iab	GHRS	abs
97	Brandt et al.	1998	1180–1777		*17000–21000*	0.017÷0.018	1	10 Lac (O9)	V	GHRS	abs
98	Brandt et al.	1999	1249 · · · 2688		*75000–93000*	0.003÷0.007	1	χ Lupi (B9.5p+A2Vm)		GHRS	abs

Table 2. (*continued*)

Fig N.	Authors and year of publication		Spectral Range (Å)	D (Å/pix) (Å/*mm*)	R or R_P (Å)	Samplig (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
99	Cacciari	1985	1900–3200			2.66	36	popII	III–V	IUE	abs
			1200–1900			1.67	19	popII	III–V	IUE	abs
100	Code & Meade	1979	1160–3600		12, 22	20	164	O5–M2, WR	I–V	Sp.Sc.	abs
101	Craig et al.	1997	70–760		0.5–2	0.05–2	96	B2–M5, WD, CV	I–V	EUVE	abs
102	Fanelli et al.	1992	1205–3185		6	1–2	56 *ms*	O3–M4	I–V	IUE	rel
103	Heck et al.	1984	1150–3200		7	2	229	O3–G5	I–V	IUE	abs
104	Henize et al.	1979	1300–4200			2–20	494			plate	abs
105	Holberg et al.	1998	1150–1950		*10000*	0.03	55	WD		IUE	abs
106	Holberg et al.	2003	1150–3200		6	1.67, 2.66	336	WD		IUE	abs
107	Jamar et al.	1976	1360–2540	*36*		20	1356	O4–K0, WR	I–V	Sp.Sc.	abs
108	Macau-Hercot et al.	1978	1360–2540	*36*		10	435	O–M	I–V	Sp.Sc.	abs
109	Meier et al.	1994	1150–1980		6	1.68	32	Symb. stars		IUE	abs
110	Pellerin et al.	2002	912–1185		*20000*	0.006, 0.007	45	O2–B3	I–V	FUSE	norm
111	Robert et al.	1993	1205–1850			0.75	51 *ms*	O, WR	I–V	IUE	norm
112	Rogerson	1985	970–1501		0.05, 0.1	0.020–0.053	1	γ Peg (B2)	IV	Sp.Sc.	counts
113	Rogerson	1987	1649–3170		0.1	0.038–0.054	1	α CMa(A1)	V	Sp.Sc.	counts
114	Rogerson	1989	2000–3187		0.1	0.038–0.048	1	α Lyr (A0)	V	Sp.Sc.	counts
115	Rogerson & Upson	1977	949–1560		0.05, 0.1	0.020–0.053	1	τ Sco (B0)	V	Sp.Sc.	counts
116	Rogerson & Upson	1982	949–1561		0.05, 0.1	0.020–0.053	1	β Ori (B8)	Ia	Sp.Sc.	counts
117	Snow & Jenkins	1977	1000–1450		0.2	0.2	60	O4–A1	I–V	Sp.Sc.	abs
118	Upson & Rogerson	1980	999–1467		0.05, 0.1	0.020–0.053	1	ι Her (B3)	IV	Sp.Sc.	counts
119	Valenti et al.	2000	1150–1980		6	1.67	142	T Tau, Ae/Be		IUE	abs
120	Valenti et al.	2003	1850–3200		6	2.66	191	T Tau, Ae/Be		IUE	abs
121	Walborn et al.	1985	1150–1950		0.25	0.25	98	O3–B1, WR	I–V, sd	IUE	norm
122	Walborn et al.	1995	1150–1950		0.25	0.25	86	O9–B8	I–V	IUE	norm
123	Walborn et al.	2002	905–1187		*20000*	0.25	47	O2–B1.5	I–V	FUSE	abs
124	Willis et al.	2004	905–1187		*20000*	0.094÷0.109	21	WN, WC		FUSE	abs
125	Wood et al.	1996	1205$\cdots$2806		*17000÷21000*	0.006–0.02	1	α CMi (F5)	IV–V		abs
126	Wu et al.	1996	1150–3200		6	1.67, 2.66	476	O3–M7	I–V	IUE	abs
			1150–3200		6	1.67, 2.66	38	O–B, WD	sd		abs

Infrared libraries with data in electronic form

127	Arnaud et al.	1989	2.0–2.45		200	80	73	F3–M8	II–V	rel	
128	Burgasser et al.	2002	1.0–2.5	49, 59	*60–120*	49, 59	16	T	V	abs	
			1.2–2.35	4.4÷8.8	*1200*	4.4÷8.8	14	T	V	abs	
129	Burgasser et al.	2003b	1.2–2.35	4.4÷8.8	*1200*	4.4÷8.8	6	T0–T8	V	abs	
130	Cohen et al.	1995	1.2–35		*30*	200–1000	5	K0–M2	III	abs	
131	Cohen et al.	1996a	3–35		*30*	200–3100	3	K2–G2	III,V	abs	
132	Cohen et al.	1996b	1.2–35			30–3100	5	K1–M3	III	abs	
133	Dallier et al.	1996	1.57–1.64		*1500–2000*	3	37	O7–M2	I,III,V	rel	
134	Förster Schreiber	2000	2.18–2.45		*2000*	5	17	K0–M4.5, C	I–III	rel	
			1.9–2.4		*830*	10	16	G8.5–M4	I–III	rel	
135	Hanson et al.	1996	2.0–2.2		*800–3000*	8	180	O3–M3, pec	I–V	norm	
136	Hinkle et al.	1995	0.9–5.3		*100000*	0.03÷0.3	1	α Boo (K1)	III	norm	
137	IRAS	1986	7.7–22.6		*20÷60*	1000–2000	5425			abs	
138	Johnson & Mendez	1970	1–4		8 cm^{-1}	60÷100	30	A0–M8, pec, C	I–V	counts	
139	Kleinmann & Hall	1986	2.02–2.4		1.6 cm^{-1}	0.9	26	F8–M7	I,III,V	rel	
140	Lançon et al.	1992	1.43–2.5		*500*	4–12	56	O6–M8	I–V	rel	
141	Lucas et al.	2001	1.43–2.5		*330–440*	25÷50	23	brown dwarfs		counts	
142	Malkan et al.	2002	1.08–1.35		*400*	11.5	105	O9.5–M7	I–V	rel	
143	McLean et al.	2003	0.94–2.31		*2000*	2–4	16	M6–T8		abs	
			1.13–2.31		*2000*	2–4	37	M6–T8		abs	
144	Meyer et al.	1998	1.51–1.78		*3000*	3	85	O7–M5	I–V	norm	
145	Testi et al.	2001	0.85–2.45		*100*	30÷110	26	L	V	rel	

Table 2. (*continued*)

Fig N.	Authors and year of publication		Spectral Range (Å)	D (Å/pix) (Å/*mm*)	R or R_P (Å)	Samplig (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
146	Wallace et al.	2000	1.05–1.34		*3000*	1÷2	88	O7–M6	I–V	rel	
147	Wallace & Hinkle	1997	2–2.4		*3000*	2÷3	119	O4–M8, pec	I–V	rel	
	Combined libraries with data in electronic form										
148	Bohlin et al.	2001	1140–10250			0.5–4.9	32	O, B, A, WD		abs	
149	Pickles	1998	1150–25000		*500*	5	131 *ms*	O5–M10	I–V	rel	
150	Sviderskiene	1988	1200–10500			50	98 *ms*	O–M	I–V	rel	
151	Knapp et al.	2004	8400–25000		20–50	6, 13	55	L, T		abs	
152	Lançon & Wood	2000	10000–25000		*1100*	5	57	K0–M9, C		counts	
			5000–10000	9.7	30÷40	5	71	K0–M9, C		counts	
153	Lançon & Mouhcine	2002	5100–24900			5	17 *ms*	AGB		rel	

Table 3. The list of optical, ultraviolet and infrared libraries that give access to the spectra in printed tabular form and that are included in ADSD. The first column lists the number of the figure on the ADSD web site that provide access to the card of the given library and that is included in the printable book-size full version of ADSD.

Fig N.	Authors and year of publication		Spectral Range (Å)	D (Å/pix) (Å/*mm*)	R or R_P (Å)	Samplig (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
				Optical libraries with data in printed form							
154	Bahner	1963	3200–6400		54	100–430	25	O9–F5	I–V	Sp.Sc.	rel
155	Baldwin & Stone	1984	6056–10400		80	90–1125	18	A-G, WD		several	abs
156	Beavers & Cook	1980	3500–4400		10	DW	116	O9–G1	IV–V	Sp.Sc.	rel
157	Böhm-Vitense & Johnson	1977	3500–8080		40	60–400	43	A4–F5	IV–V	Sp.Sc.	abs
158	Christensen	1978	3450–10800		20, 30	DW	65			Sp.Sc.	abs
159	Cochran	1981	4650–10000		42	20	16	B0–A3	I–V	Reticon	abs
160	Danziger & Dickens	1967	3400–10800		50	60–1200	9	A2–F4, pec	II–V	Sp.Sc.	abs
161	Davis & Webb	1974	3300–8080		50	60–430	33	O5–F8	I–V	Sp.Sc.	rel
162	Dickens & Penny	1971	3500–8000		40, 80	60–530	31	A3–F7	II–V	Sp.Sc.	abs
163	Fawley	1977	4000–11000		48, 32	DW	16	G8–M9	I	several	abs
164	Faÿ et al.	1974	3300–7000		30	50–400	25	G0–M5	I,III,V	Sp.Sc.	rel
165	Goraya	1984	3500–7500		50	100	7	B1e–B8e	III–V	Sp.Sc.	rel
166	Goraya	1986	3200–8000		50	100	26	B0e–B9e	III–V	Sp.Sc.	rel
167	Goraya & Gurm	1987	3200–8000		50	100	8	B2e–B4e	III–V	Sp.Sc.	rel
168	Goraya & Tur	1988	3200–8000		50	100	9	B1e–B3e	III–V	Sp.Sc.	rel
169	Gutiérrez-Moreno et al.	1988	3200–8370		40, 80	50–400	15	B0–G8	IV–V	Sp.Sc.	abs
170	Hamuy et al.	1992	3350–7550		40–98	DW	19	B–G, WD, C		CCD	abs
171	Hamuy et al.	1994	6050–10400		80, 98	DW	20	B–F, WD, pec		CCD	abs
172	Hayes	1970	3200–10870		30, 45	50–1125	12	B0–A1	I, III–V	Sp.Sc.	rel
173	Hayes & Philip	1983	3410–6840		40	160–360	20	A		Sp.Sc.	rel
174	Hickson & Mulrooney	1998	3500–9200		15	50	21			CCD	abs
175	Hua et al.	1983	3200–8100	*2.5, 5*		50–450	6	WR		Sp.Sc.	abs
176	Jeffers & Weller	1985	3800–7000		7, 15	10	10	WN, WC		Vidicon	rel
177	Kaiser	1987	3200–8500		50	50	26	Be	III–V	Sp.Sc.	abs
178	Kharitonov et al.	1997	3125–7175			50	60	O6–A3, pec	I–V	Sp.Sc.	abs
179	Knyazeva & Kharitonov	2000	3225–7575			50	16 *ms*	O9.5–G2	I–IV	Sp.Sc.	rel
180	Kuhi	1966	3200–11000		40, 50	35–840	21	WN, WC		Sp.Sc.	rel
181	Kuhi	1974	3320–7500		48, 64		25	T Tau var.		Sp.Sc.	abs
182	Lane & Lester	1980	3400–8090		40,80	50–450	13	Am		Sp.Sc.	rel
183	Lockwood	1973	9711–10834		32	DW	21	M2–M10		Sp.Sc.	abs
184	Massey & Gronwall	1990	7350÷10200		50	50	11	O–A, DA	V, sd	CCD	abs
185	Oke	1964	3390–10800		50	60–900	13	O9.5–A1	I–V	Sp.Sc.	abs
186	Oke	1990	3200–9200		40	5–390	25	O–G, WD	IV–V, sd	CCD	abs
187	Oke, Gunn	1983	3080–12000		40	20–860	4	F	sd	Sp.Sc.	abs
188	Panek	1977	3600–4200		10	5	7	A0–A5	III–V	Sp.Sc.	abs
189	Philip & Hayes	1983	3450–6790		40, 80	50–380	25	B5–F6		Sp.Sc.	rel
190	Schild et al.	1971	3300–6050		50, 100	60–330	54	O9.5–A7	I–V	Sp.Sc.	abs
191	Schild	1978	3200–8572		50	50–450	61	Be		Sp.Sc.	abs
192	Schild & Chaffee	1971	3200–5556		50	50–295	19	B	III–V	Sp.Sc.	rel
193	Schmidt-Kaler & Oestreicher	1999	3260–7770		10	10	6	B2–A0		Rubikon	abs
194	Spinrad & Taylor	1971	3300–10700		16, 32	DW	120	O9–M9, C, WD	III–V	Sp.Sc.	rel
			3300–10700		16, 32	DW	34 *ms*	O–M, C, WD	III–V	Sp.Sc.	rel
195	Stone & Baldwin	1983	3200–8280		40, 80	50–310	18	A–G, WD		several	abs
196	Taylor	1970	4037–8800		16, 32	DW	280	G2–K7	V	Sp.Sc.	rel
197	Taylor et al.	1972	3880–7400		16, 32	DW	34	G5–M0	II–V	Sp.Sc.	rel
198	Taylor	1979	5840–11000		32–96	150–1120	24			Sp.Sc.	abs
199	Taylor	1982	4040–6180		9.6–32	DW	14			Sp.Sc.	abs
			6110–10700		32	DW	32			Sp.Sc.	abs
200	Taylor	1984b	3300–10800		50	60–1120	22	B–A		Sp.Sc.	abs
201	Tüg	1980	3200–8800		1.5–20	50–350	14	O5–F0	I–V	Sp.Sc.	abs

Table 3. (*continued*)

Fig N.	Authors and year of publication		Spectral Range (Å)	D (Å/pix) (Å/*mm*)	R or R_P (Å)	Samplig (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
				Ultraviolet libraries with data in printed form							
202	Bohlin	1986	1155–3195			5	5	O–B3, pec	IV, V	IUE	abs
203	Brune et al.	1979	912–3100		15	10	5	O4–B3, WR	I–V	Sp.Sc.	abs
204	Fanelli et al.	1987	1230–1930		20	10–100	15 *ms*	O3–A7	I,III,V	IUE	rel
205	Lamers et al.	1981	2060 ··· 2880		1.7–2.3	0.4	220	O4–G2, pec	I–V	Sp.Sc.	abs
206	Meade & Code	1980	1160–1850		12	10	132	O7–A3	I–V	Sp.Sc.	abs
			1800–3600		22	20	34	O5–K0	I–V	Sp.Sc.	abs
207	Papaj et al.	1990	1380–2540			20	12 *ms*	O9.5–B5	III, V	Sp.Sc.	rel
208	Parsons & Ake	1993	1300–3000		100	100	13 *ms*	B0–F0	V	IUE	abs
			2500–3000		100	100	35 *ms*	G5–M6	I–III	IUE	abs
209	Smith & Willis	1983	1150–3080		6–9	5, 10	9	WN, WC		IUE	abs
210	Wegner & Swanson	1991	1160–3200		7	20	182	WD		IUE	abs
211	Willis & Wilson	1978	1350–2550		35	10	9	WN, WC		Sp.Sc.	abs
212	Woods et al.	1985	912–1600		10	10	6	O4–A1, WR	I,III,V	Sp.Sc.	abs
				Infrared libraries with data in printed form							
213	Lazaro et al.	1994	1–4.2		*500*	100	15	CN		abs	

Table 4. The list of optical, ultraviolet and infrared libraries that present the spectra in graphical form and that are included in ADSD.

Authors & year of publication		Spectral Range (Å)	D (Å/pix) (Å/mm)	R o R_P (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
Optical libraries with data in graphical form									
Allen	1984	3400–7500		3–10	100	Symb. stars		IPCS,IDS	norm
Andrillat et al.	1988	7500–8800	*50*		51	Be		Reticon	counts
Andrillat et al.	1994	3800 ⋯ 10950	*33–260*	1.2–13.3	1	PU Vul (Symb. nova)		CCD	rel
Bessell	1991	5000–10200		5, 15	58	M4–M10	V	IDS, CCD	rel
Brewer et al.	1996	5500–6800	1.55	3.1	87	C, S, M	III	CCD	rel
Bruch	1989	3900–7400	3.25–13	24, 31	12	CV	V	CCD,Reticon	rel
Bruch, Schimpke	1992	3800–7200	3.5	7.6÷14.4	25	CV	V	CCD	abs
Chan	1993	4670 ⋯ 6350	*15, 30*		11	C		CCD	counts
Chen et al.	2001	3800–5000	*100*	4	12	CV		Reticon	norm
Dawson et al.	2000	4500–10000		*900*	10	K–M5.2	V, sd	CCD	rel
Dopita, Hua	1997	4620 ⋯ 7180	0.5	0.7	6	PN		CCD	abs
Echevarría et al.	1989	3300–5600	*96*	9	15	CV		Sp.Sc.	abs
Fan et al.	2000	5800–9800	6.2, 7.1	13, 14	8	M7–L8	V	DIS	rel
Faÿ et al.	1974	5000–7000		*300*	37	C		Sp.Sc.	counts
Groppi, Hanson	1986	6250–7150		1.3	9	O4-O9 pec	V	CCD	norm
Huenemoerder et al.	1984	3600–5800		8, 10	10	FHB		Reticon	rel
Jüttner et al.	1989	3900–4900		*20000, 25000*	5	B	V	CCD	norm
Kaiser	1987	3200–8500		10	26	Be	III–V	Sp.Sc.	rel
Kilian et al.	1991	4060–5060		0.2	3	B0–B2	III, V		norm
Kirkpatrick et al.	1991	6300–9000		18	77	K5–M9	V	CCD	rel
Kolev, Tomov	1993	3610–4930		0.35	1	MWC 560		plate	norm
Lennon et al.	1992	3950–4950	0.4	0.8	46	O9–B9	I	CCD	norm
Liu et al.	1999a	3700–8500	4.9	7–23	27	CV		CCD	abs
Liu et al.	1999b	3800–8500	4.9	12–33	30	CV		CCD	abs
Liu, Hu	2000	3800–8500	4.9	12–20	32	CV		CCD	abs
Lündstrom, Stenholm	1984	4400–5900	*43*	2.5	14	WC, WN		plate	counts
Markova	1994	3555–4800	*9*	0.18	1	P Cyg (B1-1.5)	Ia	plate	norm
Markova, Zamanov	1995	4840–6760	*18*	0.36	1	P Cyg (B1-1.5)	Ia	plate	norm
Martin et al.	1996	6400–8800		5.8	11	M	V	CCD	rel
Matheson et al.	2001	3100–10500		3–15	28	SN	Ib-c	CCD	rel
Moehler et al.	1990	4000–5000	*60*	2.5	92	O–A	sd	CCD	rel
Oudmaijer	1998	3850–10000		*30000*	1	IRC+10420 (F8)	Ia	CCD	norm
Parker et al.	2001	3910–4740	1.3	2.7	9	O	I, II, V	CCD	norm
Parthasarathy et al.	2000	4350 ÷8820		0.3	1	SAO 85766 (B1pe)	I	CCD	norm
Pereira et al.	2001	3100–7500		1.9, 4.6	25	Be, T Tau		CCD	rel
Pritchet, van den Bergh	1977	3800–6800		12÷45	96	O7–M9	III–V	FTS	abs
Schild et al.	1990	4000–8000		7, 14	12	WR		CCD	rel
Stahl et al.	1985	4600–4900	*20*		24	A–B, pec		plate	norm
Stahl et al.	1993	4050–9050		*12000*	1	P Cyg		CCD	norm
Steele et al.	1999	3670–5070	0.5	0.67÷0.93	20	Be	III–V	CCD	norm
Thévenin, Jasniewicz	1992	4000–4700	1.9	4.7	19	A3–G0	I	CCD	norm
Torres-Dodgen	1990	5800–8500		7	12	O3–B3, pec	I, III	Reticon	norm
Tull, Vogt	1977	3900–6000	*4.4*	0.28	1	HD 88230 (M0)	V	Digicon	counts
Vreux	1983	5750–10350	*228*	7.6	28	WR		Reticon	rel
Vreux et al.	1989	6150–10350	*228*	7.6	12	WR		Reticon	rel
Xu	1991	8160–8700	*33*	2	18	G0–M5	III, V	CCD	norm
		4000–7850		12	14			CCD	abs

Table 4. (*continued*)

Authors & year of publication		Spectral Range (Å)	D (Å/pix) (Å/mm)	R o R_P (Å)	N. Stars	Spectrum	Lum. Class	detector/ instr.	data
Ultraviolet libraries with data in graphical form									
Altamore et al.	1992	1190–3200		0.1–8	1	KQ Pup (VV Cep)		IUE	abs
		3180–6500	*12–15*		1	KQ Pup (VV Cep)		plate	abs
Artu et al.	1989	1250–1986		??	2	B7, B9.5	V	IUE	counts
Bohlin et al.	1990	1200–3200		5–6	37	O–G5, WD	III–V	IUE	abs
Carpenter et al.	1988	1200–3230			1	γ Cru (M3.4)	III	IUE	abs
de Mello et al.	2000	1200–1850			10 *ms*	B0–B8	I,III,V	IUE	norm
Johnson	1978b	920–3190		0.2, 0.4	3	WR		Sp.Sc.	abs
Rountree, Sonneborn	1991	1200–1900		0.25	14	B	III–V	IUE	norm
Walborn, Bohlin	1996	1000–1200		0.2	27	OB		Sp.Sc.	counts
Walborn, Panek	1984	1220 $\cdots$ 1760		0.25	12	O3–B1, pec	V	IUE	norm
Wing et al.	1983	2500–3200		*10000*	13	G2–M3	I–V	IUE	abs
Infrared libraries with data in graphical form									
Ali et al.	1995	2.15–2.36		*1380*	34	F3–M6	V		norm
Clark, Steele	2000	2.05–2.22		4.8÷5.2	66	Be	III–V		norm
Conti, Howarth	1999	0.98–1.1		*3400, 5600*	70	O3–A5, pec	I, III, V		norm
Dhillon et al.	2000	1.8–2.4		21–28	25	K2–M6, CV	V		rel
Eenens et al.	1991	1–3.4		*300–600*	8	WC5–9			rel
Figer et al.	1997	2–2.4		*525*	38	WR			rel
Forbes et al.	1970	1.35–4.1		*100*	26	G8–M10, pec	I–III		counts
Genzel et al.	2000	2.02–2.2		*2000*	18	pec			rel
Hanson et al.	1998	1.66–1.72	3.5	8.7	34	O7–B9, pec	I, V		norm
Howarth, Schmutz	1992	0.97–1.12	1.6	3–4	24	WR			norm
Ishii et al.	2001	2–2.33		*500*	32	YSO			abs
Johnson et al.	1973	1.49 ÷2.5		0.5 cm^{-1}	1	χ Cyg (S)			counts
Leggett et al.	2000	0.75–2.5		18–62	3	T	V		rel
Leggett et al.	2001	1–2.55		*600*	7	M6–L7	V		rel
Littlefair et al.	2000	1.02–1.34		10÷13	7	CV			rel
Morris et al.	1996	2.03–2.37		*550*	26	O–B, WN, pec	I, V		norm
Origlia et al.	1993	1.51–1.72		*1500*	22	A0–M5	I,III,V		norm
Ramirez et al.	1997	2.19–2.34		*1380*	28	K0–M6	III		norm
Reid et al.	2001	1–2.5		18–82	19	M7–L8	V		rel
Ridgway et al.	1984	3.6–4.1			5	K,M,C,S			norm
Rinehart et al.	2002	7.5–14		*600*	15	PN			abs
Smith, Houck	2001	8–13		*600*	29	WN, WC			abs
Smith, Hummer	1988	1.4–2.55		*100*	17	WC			counts
Smith et al.	2000	8–13		*40–150*	13	YSO			abs
Steele, Clark	2001	1.53–1.69		5	57	Be	III–V		norm
Tamblyn et al.	1996	2.04–2.22		*2500*	31	O6–B2, WN			norm
Thompson et al.	1973	1.4–2.5		0.5, 1 cm^{-1}	2	C			counts
Volk et al.	2000	2–43		*400*	5	C			abs
Combined libraries with data in graphical form									
Dessart et al.	2000	0.1 $\cdots$ 3.6			3	WC			abs