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A near-infrared stellar spectral library: III. J-band spectra

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Abstract. This paper is the third in the series of papers published on near-infrared (NIR) stellar spectral library by Ranade et al. (2004 & 2007). The observations were carried out with 1.2 meter Gurushikhar Infrared Telescope (GIRT), at Mt. Abu, India using a NICMOS3 HgCdTe 256 × 256 NIR array based spectrometer. In paper I (Ranade et al. 2004), H-band spectra of 135 stars at a resolution of $\sim$ 16 Å & paper II (Ranade et al. 2007), K band spectra of 114 stars at a resolution of $\sim$ 22 Å were presented. The J-band library being released now consists of 126 stars covering spectral types O5–M8 and luminosity classes I–V. The spectra have a moderate resolution of $\sim$ 12.5 Å in the J band and have been continuum shape corrected to their respective effective temperatures. The complete set of library in near-infrared (NIR) will serve as a good database for researchers working in the field of stellar population synthesis. The complete library in J, H & K is available online at: http://vo.iucaa.ernet.in/~voi/NIR_Header.html

Keywords : astronomical databases : atlases – techniques : spectroscopic – instrumentation : spectrographs – methods : observational – infrared : stars

1. Introduction

The development in size and quantum efficiency of detectors has completely revolutionized the field of near infrared astronomy. Due to this several wide-field surveys like Two

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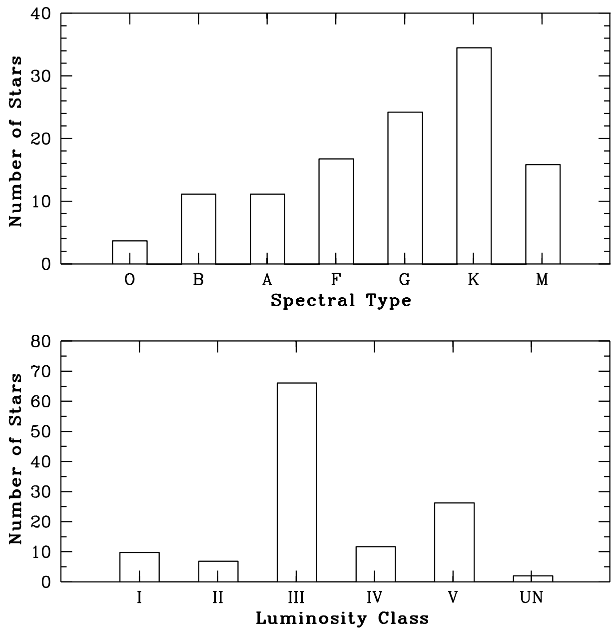

Figure 1. Distribution of stars in the database by spectral type and luminosity class.

Micron All Sky Survey (2MASS; Skrutskie et al. 1997) and Deep Near Infrared Southern Sky Survey (DENIS; Epchtein et al. 1997) were possible. Near infrared spectra are useful in many astrophysical applications including spectral classification, spectral definition of sub-dwarf objects, calibration of temperatures of late-type stars, definition of the end of main sequence etc. which are currently not well understood.

The characterization and analysis of stellar infrared spectra is an essential tool in understanding the physical and chemical processes taking place in stellar atmosphere (Heras et al. 2002). At the same time one needs to have accurate modeling of the NIR spectral range, which in turn must rely on NIR libraries of all types of stars. The first library of such stellar spectra was published in 1970 by Johnson & Meńdez; for 32 stars in 1 to 4 μ m region with the resolving power varying from 300 to 1000. A number of atlases at medium resolution in H and K band are provided by Kleinman & Hall (1986), Lançon & Rocca-Volmerange (1992), Origlia et al. (1993), Ali et al. (1995), Dallier et al. (1996), Ramirez et al. (1997). The more recent libraries including work of Meyer & Wallace et al. (1997 & 1998) for H and K libraries are summarized by Ivanov et al. (2004). The spectral library of late type stars by Ivanov et al. (2004) has 218 red stars spanning a range of [Fe/H] $\sim$ -2.2 to $\sim$ +0.3 but is not flux calibrated.

In contrast, J-band is the least explored region of near infrared spectroscopy. Since the hot stars up to A4 do not have many features in the J band region (Malkan et al. 2002) the atlases in J band region cover the cooler part of HR diagram. Some examples

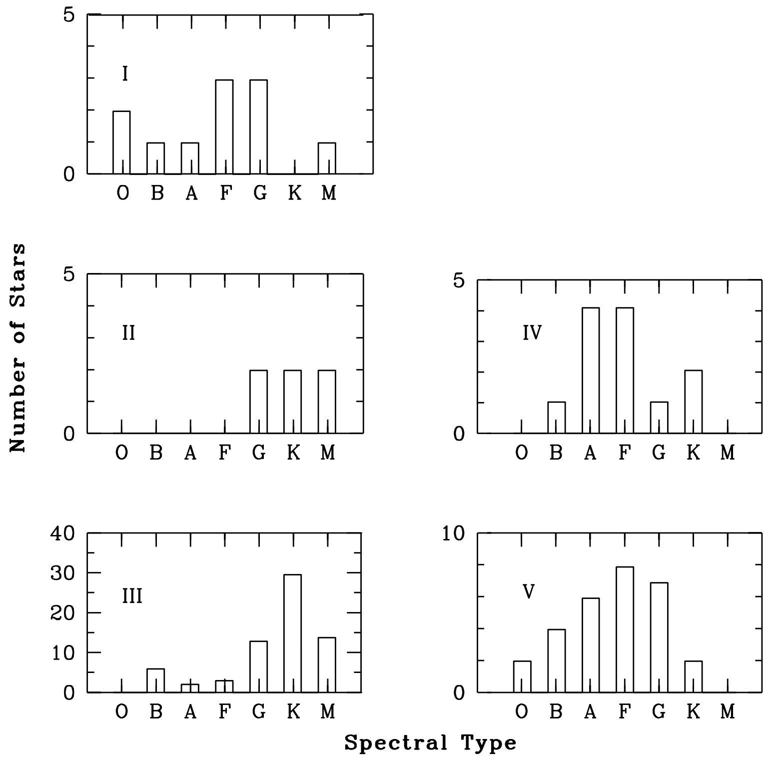

Figure 2. Distribution of stars in the database by spectral type per luminosity class.

of the existing J band spectral atlases with resolution varying from 1000 to 2500 are that of evolved stars of S, C & M types by Joyce et al. (1998), L & T dwarfs by McLean et al. (2000), M, L & T dwarfs by Cushing et al. (2005) and M2.5 to T6 dwarfs by McLean et al. (2003).

A library covering the samples over the HR diagram could be the reasonable way to get the relation of temperature and stellar features. There are very few libraries in J band which have the complete coverage of HR diagram in temperature, gravity and metallicity. The library of Wallace et al. (2000) with 88 sample covering O7 to M6 and I to V luminosity class with R $\sim$ 3000 and Malkan et al. (2002) with 105 stars from O9.5 to M7 and I-V luminosity which has R $\sim$ 400. Though stellar spectral classification is easiest to do with high resolution data, lower resolution is necessary for observations of substantial number of objects (Malkan et al. 2002). They have demonstrated that the low resolution data can be used for stellar classification, since several features depend on the effective temperature and gravity. In this paper, we present a spectral library of 126 star in J-band at moderate resolution of 12.5 Å covering larger range in T_{eff} and larger database as compared to Wallace et al. (2000) and Malkan et al. (2002). In this

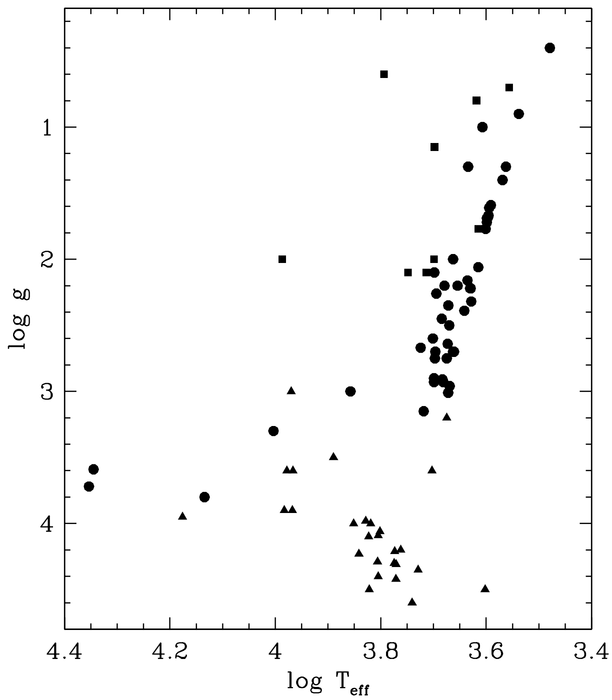

Figure 3. Surface gravity (*log g*) vs. effective temperature (T_{eff}) for supergiants (filled squares), giants (filled circles) and dwarfs (filled triangles).

paper, Section 2 describes the observations and related issues. In Section 3, we describe the basis of selection of the stars for this library and in Section 4 we describe the data reduction and calibration procedure. Lastly, in Section 5 we show examples of some J band spectra and their comparison with the existing database of Wallace et al. (2000).

2. Observations

The database of 126 stars selected in this library were observed in six different runs from January–April 2003. The details of the log is shown in Table 1 in which first column gives observing dates and month, column 2 gives the total number of programme stars observed in each run and last column gives the total number of standard stars observed in each run. All the observations have been done from the 1.2 meter Gurushikhar Infrared Telescope (GIRT) of Mt.Abu Infrared Observatory, India ($24^0 39' \ 10.9''$N, $72^0 46' 45.9''$E at an altitude of 1680 meters). The J band long slit spectra were taken from the NIR Imager/Spectrometer equipped with a 256×256 HgCdTe NICMOS3 array. The slit width corresponds to 2 arc-seconds for the f/13 Cassegrain focus with the slit covering most of 240 arcsecs field of view and oriented along North-South direction in the sky. The

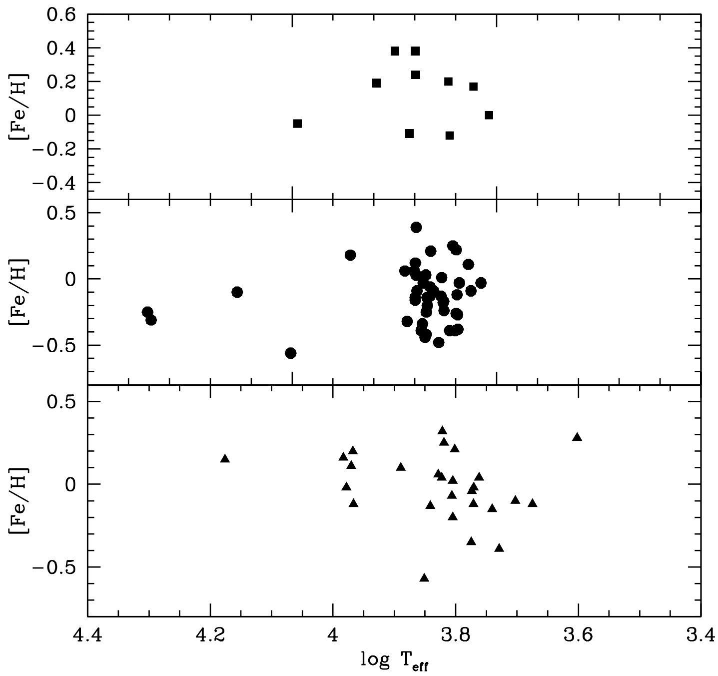

Figure 4. Metallicity [Fe/H] vs. effective temperature (T_{eff}) for supergiants (filled squares), giants (filled circles) and dwarfs (filled triangles) (*from top to bottom*).

Table 1. Observations Log at GIRT.

Dates of observations	Programme Stars	Standard Stars
20-24 Jan 03	18	1
07-12 Feb 03	40	3
02-04 Mar 03	13	2
17-20 Mar 03	28	1
04-07 Apr 03	26	9
27-30 Apr 03	20	18

reflection grating has 149 lines per mm and is blazed for H band center wavelength of 1.65 μm in the first order and combined with the slit width of 76 μm gives a moderate resolution of 1000. The exposure time for individual spectrum ranged from 1 sec to 120 sec depending on the J magnitude of the program star resulting in S/N ratio of 50 or better. Two sets of spectra were obtained at two dithered positions on the array, the typical separation was about 20 arc-sec. The details of procedure to acquire the data from the Mt. Abu observatory is discussed in paper I.

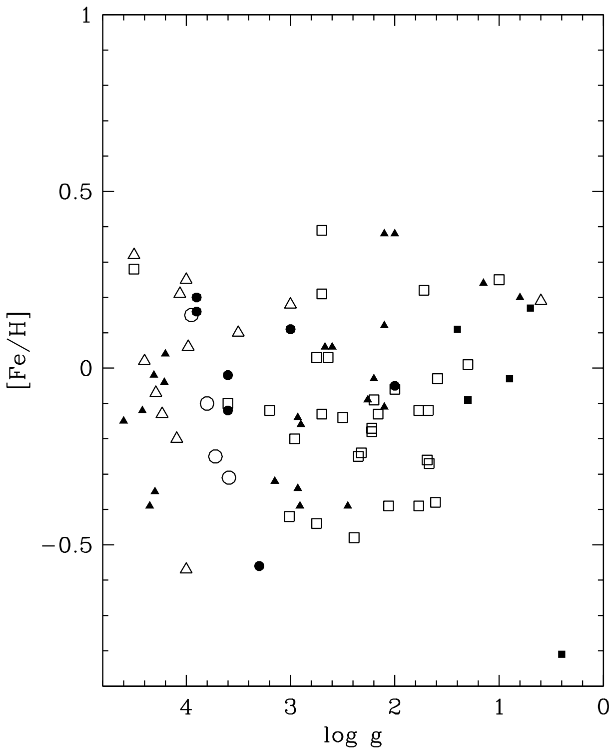

Figure 5. Metallicity [Fe/H] vs. surface gravity (*log g*) for spectral types B (open circles), A (filled circles) F (open triangles), G (filled triangles), K (open squares) and M (filled squares).

For a majority of the programme stars, we have observed a nearby main-sequence A type star at nearly same air-mass to minimize the effects of atmospheric extinction. To optimize the observing efficiency, a single standard star has been observed whenever some of the program stars happened to be in the nearby region of the sky. For the early February and late April 2003 observing runs, late B type standards have been observed. The list of standard stars that have been observed are given in Table 2. In this table the standard star identifier with HD number is given in column (1), HR number in column (2) and right ascension and declination for J2000.0 in column (3) and (4) respectively. Columns (5), (6) and (7) contain the spectro-luminosity class, observed V magnitude and T_{eff} respectively. The wavelength calibration has been performed using telluric absorption features.

3. Selection of stars

While building a spectral library, it is very important that one includes various spectral types so that we have a homogeneous and comprehensive coverage of all possible spectro-

Table 2. Standard star list with observational parameters*.

HD (1)	HR (2)	α(J2000.0) (3)	δ(J2000.0) (4)	Sp. Type (5)	V_{mag} (6)	T_{eff} (°K) (7)
HD028319	HR1412	04 28 39.74	+15 52 15.17	A7III	3.41	8150
HD047105	HR2421	06 37 42.70	+16 23 57.31	A0IV	1.90	9520
HD060179	HR2891	07 34 35.90	+31 53 18.00	A1V	1.58	9230
HD065456	HR3113	07 57 40.11	-30 20 04.46	A2Vvar	4.79	8970
HD071155	HR3314	08 25 39.63	-03 54 23.13	A0V	3.90	9520
HD079469	HR3665	09 14 21.86	+02 18 51.41	B9.5V	3.88	10010
HD082621	HR3799	09 34 49.43	+52 03 05.32	A2V	4.48	8970
HD085235	HR3894	09 52 06.36	+54 03 51.56	A3IV	4.56	8720
HD087737	HR3975	10 07 19.95	+16 45 45.59	A0Ib	3.51	9730
HD087901	HR3982	10 08 22.31	+11 58 01.95	B7V	1.35	13000
HD094601	HR4259	10 55 36.82	+24 44 59.30	A1V	4.50	9230
HD097633	HR4359	11 14 14.41	+15 25 46.45	A2V	3.32	8970
HD103287	HR4554	11 53 49.85	+53 41 41.14	A0Ve	2.43	9520
HD106591	HR4660	12 15 25.56	+57 01 57.42	A3V	3.30	8720
HD118098	HR5107	13 34 41.60	-00 35 44.95	A3V	3.40	8720
HD130109	HR5511	14 46 14.92	+01 53 34.39	A0V	3.72	9520
HD139006	HR5793	15 34 41.27	+26 42 52.90	A0V	2.21	9520
HD141003	HR5867	15 46 11.26	+15 25 18.57	A2IV	3.66	8970
HD153808	HR6324	17 00 17.37	+30 55 35.06	A0V	3.91	9520
HD155125	HR6378	17 10 22.69	-15 43 29.68	A2.5Va	2.43	8845

* (3)-(6) From SIMBAD database,(7) From Lang (1992)

luminosity classes. To optimize the observing efficiency stars up to a magnitude of V $\sim$ 7 were selected for the present programme. The histogram in Fig. 1 represents the total number of stars covered in terms of spectral types (top panel) and luminosity classes (bottom panel). The details of number of stars covered in terms of spectral types per luminosity class is illustrated by the histogram in Fig. 2. It may be noted that we have covered the HR diagram in effective temperature and luminosity parameters reasonably well, although we do not have enough stars for luminosity class II and main sequence spectral type O. The details of program stars along with the NIR magnitudes in J, H, K, L & M bands are listed in Table 3. In this table, the first column contains the program star ID, columns (2) to (6) list the J, H, K, L & M magnitudes respectively. The references from which they have been taken are listed in column 7.

The detailed criteria for the selection of stars with their references are discussed in paper I. We have covered a reasonable region of parameter space in temperature, gravity and metallicity. Fig. 3 shows the plot of *log g* vs. T_{eff} for the GIRT stars. Figs 4 & 5 shows the plot of [Fe/H] vs. T_{eff} and *log g* respectively for the GIRT stars.

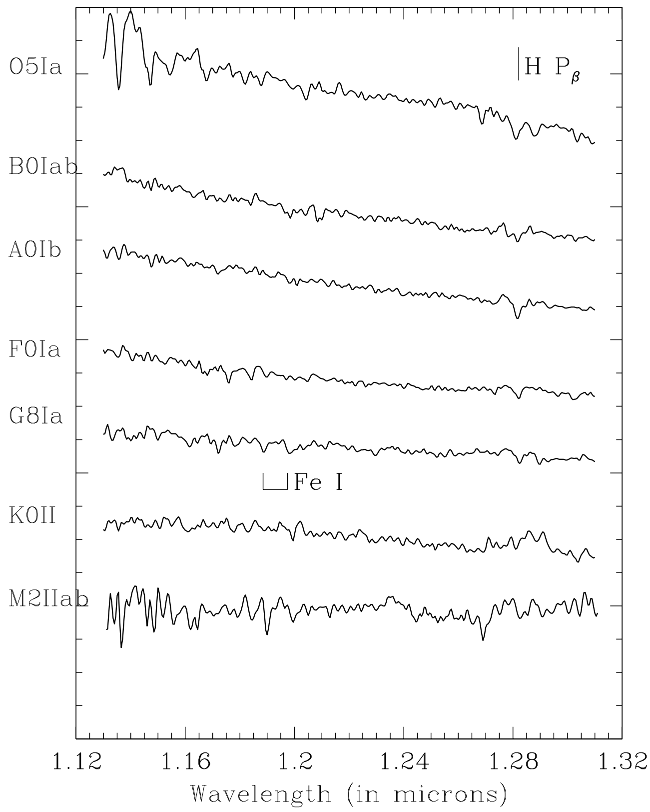

Figure 6. Spectra of seven supergiant stars, covering a large range of MK spectral type, are plotted to illustrate the basic dependence of spectral features on spectral type. The stars plotted are (bottom to top) HR1155, HR4255, HR2473, HR382, HR3975, HR1903 and HR3165. The spectral types are listed on the side.

4. Data reduction and calibration

The near infrared spectral data reduction is similar to that of optical data reduction with minor differences. The presence of strong telluric emission lines and varying atmospheric transmission due to changing water vapour content necessitates observation of standard star spectra at similar airmass soon after the programme star observation. The whole process of near infrared long slit spectra reduction can be separated into a few major steps, viz., (i) pre-processing (ii) spectrum extraction (iii) wavelength calibration (iv) atmospheric transmission and instrument response determination using standard star data (v) continuum fitting and (vi) radial velocity correction. We have used standard

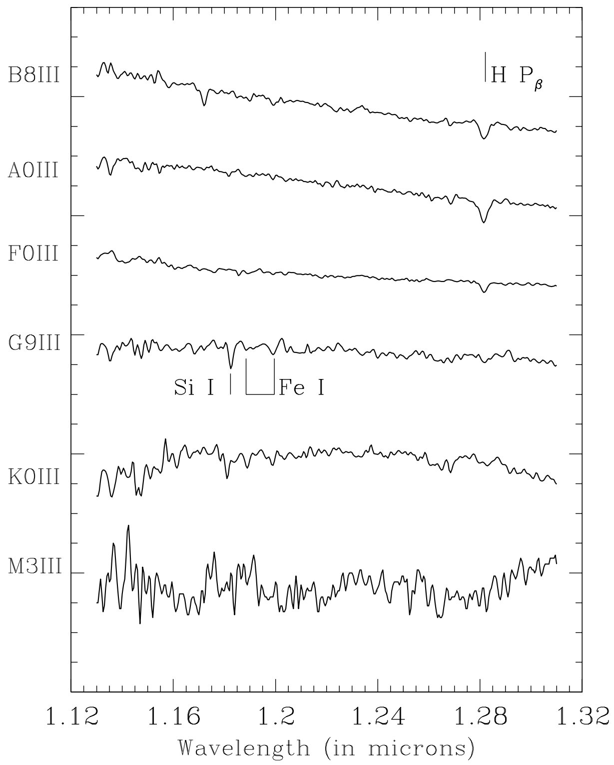

Figure 7. Spectra of six giant stars are plotted to illustrate the basic dependence of spectral features on spectral type. The stars are (bottom to top) HR4517, HR4232, HR2970, HR4031, HR5291 and HR4662. The spectral types are listed on the side.

tasks available in software package IRAF [1] for data reduction. As discussed in §2 we have two sets of frames at two different locations of the detector. The availability of these two sets of spectra is utilized to remove the dark counts and the large sky background at near infrared wavelengths. This is accomplished by taking the difference of spectra obtained at two different locations on the detector. As there is no autoguider on the telescope, the frames with maximum counts in two positions are selected for data reduction. We thus have two difference frames for extraction of the spectrum. The detail of the each task and its significance in the data reduction is discussed in paper I. The important aspect of the data reduction is to perform the wavelength calibration. The telluric absorption features at 11354 Å and 12684 Å in both programme and standard stars were used for wavelength calibration. The IRAF task *identify* is used for this purpose. The IRAF task *refspec* is

[1]IRAF is distributed by National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

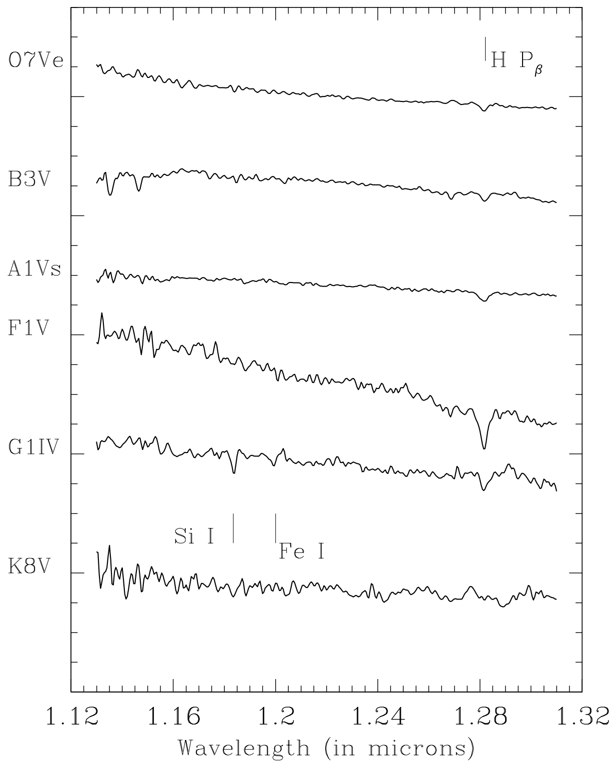

Figure 8. Spectra of six dwarf stars (bottom to top) HD88230, HR3176, HR2085, HR4963, HR5471 and HR2456. The spectral types are listed on the side.

used to specify the appropriate wavelength calibrated spectrum for the stellar spectra extracted through *apall* task. The IRAF task *dispcor* was used to set the wavelength calibration for the stellar spectra. The effects like atmospheric transmission effects and the instrument effects (filter transmission and wavelength dependence of detector quantum efficiency) can be removed by taking the ratio of the program star spectrum with that of a standard star spectrum observed under similar conditions. We have selected bright A and late B type with $T_{eff} \approx 10000$ K because at this temperature only neutral hydrogen lines will be present and no metallic lines will present in the NIR spectral region. Table 2 lists standard stars used for the purpose of taking ratios. The stellar absorption feature due to hydrogen namely the Paschen β line was removed before taking the ratio. The program star flux is divided by the corresponding standard star flux and in this process the modulation due to telluric features, atmospheric extinction and instrumental effects cancels out. The resultant spectrum from this division is multiplied with a corresponding blackbody flux distribution at the temperature corresponding to the standard star. It may be noted that unlike many of the spectral libraries published earlier, the spectra presented here have been continuum shape corrected to their respective effective temperatures. The

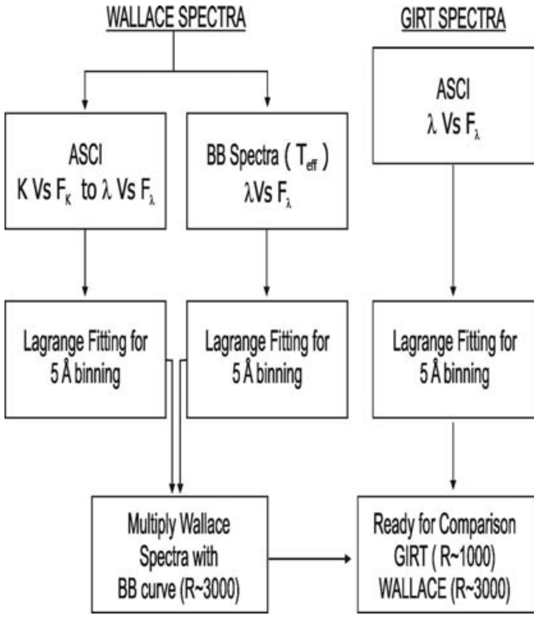

Figure 9. Block diagram illustrating the steps involved in comparison of GIRT and Wallace et al. (2000) libraries

list of 126 programme stars selected in this library is shown in table 4. In this, the first and second column contain the star ID, columns (3) and (4) contain the right ascension (J2000.0) and declination (J2000.0) respectively and column (5) gives the apparent V magnitude. The column (6) gives the corresponding standard star ID used for data reduction.

5. Spectral library

The NIR J band spectral library of 126 stars is available in the format of reduced ASCII tables with wavelength versus flux at a spectral resolution of 1000 at 5 Å binning. The main goal of this paper is to make this library available for variety of investigators working in the NIR region. Thus, the complete library can be downloaded from the website:

http://vo.iucaa.ernet.in/∼voi/NIR_Header.html

The essential information of each star in the database is summarized in Tables 3 and 4 as observational parameters and in Table 5 as physical parameters. The contents of Table 3 has been mentioned in section Section 3 and content of Table 4 has been mentioned in section Section 4. Table 5 contains the star ID in the first column. Columns (2), (3) and (4) give spectral type, luminosity class and effective temperature respectively. Columns

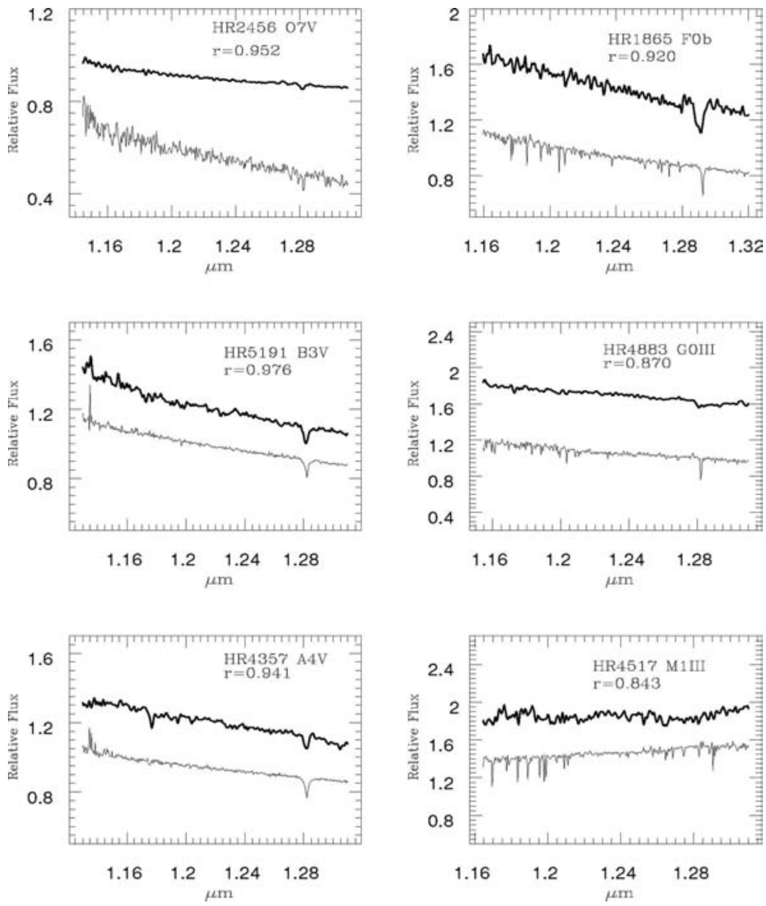

Figure 10. A selection of common spectra from Wallace et al. 2000 (*thin* lines) and GIRT (*thick* lines) libraries. Please note that the two spectra in each panel have been offset purposely for sake of clarity and the flux values are relative.

(5) and (6) give the $\log_{10} g$ and [Fe/H] values respectively. The last column gives the references from which the physical parameters have been obtained.

Fig. 6, shows spectra of seven supergiant stars, covering a large range of MK spectral type, and thus illustrates the basic dependence of spectral features on spectral types. Fig. 7 shows spectra of six giant stars again covering different spectral types. Similarly Fig. 8 shows a series of six dwarf stars. All of these plots illustrate the change in basic features with the temperature, gravity and metallicity. We also attempt to show the quality of spectra by comparing some selected spectra with the already published J band library by Wallace et al. (2000).

Table 3. NIR magnitudes of programme stars.

HD (1)	J_{mag} (2)	H_{mag} (3)	K_{mag} (4)	L_{mag} (5)	M_{mag} (6)	Reference (7)
HD007927	3.75	3.54	3.19			2003yCat2246... (Cutri)
HD008538		2.30				1998ApJ....508...397 (Meyer)
HD010307	4.0	3.70	3.58			2003yCat2246... (Cutri)
HD011353	1.92	1.36	1.22	1.60		1983A&AS....51...489 (Koornneef)
HD023475	0.57	-0.42	-0.65			2003yCat2246... (Cutri)
HD025204	3.66	3.67	3.66	3.65	3.71	1983A&AS....51...489 (Koornneef)
HD026846	2.97	2.39	2.27	2.19		1983A&AS....51...489 (Koornneef)
HD030652	2.37	2.15	2.08	2.09		1983A&AS....51...489 (Koornneef)
HD030836	4.03	4.10	4.15	4.20		1990MNRAS...242...1 (Carter)
HD035468	2.17	2.28	2.32	2.34	2.36	1983A&AS....51...489 (Koornneef)
HD035497	1.96	2.02	2.02	2.03	2.11	1983A&AS....51...489 (Koornneef)
HD036673	2.05	1.92	1.86	1.81		1983A&AS....51...489 (Koornneef)
HD037128	2.19	2.40	2.27			2003yCat2246... (Cutri)
HD037742	2.21	2.27	2.32	2.31		1983A&AS....51...489 (Koornneef)
HD038393	2.70	2.47	2.41	2.38	2.42	1983A&AS....51...489 (Koornneef)
HD038858	4.82	4.50	4.44			1991A&AS....91...409 (Bouchet)
HD040136	3.10	2.94	2.90	2.87		1983A&AS....51...489 (Koornneef)
HD043232	1.84	1.19	1.02	0.94		1983A&AS....51...489 (Koornneef)
HD047105	1.87	1.86	1.86	1.84	1.83	1991A&AS...91...409 (Bouchet)
HD047839	5.2	5.32	5.34			2003yCat2246... (Cutri)
HD048329	0.89	0.23	0.13			2003yCat2246... (Cutri)
HD049331	1.63	0.86	0.56			2003yCat2246... (Cutri)
HD054605	0.77	0.51	0.41	0.32	0.28	1983A&AS....51...489 (Koornneef)
HD054810	3.18	2.64	2.53	2.47	2.58	1983A&AS....51...489 (Koornneef)
HD056537	3.54	3.50	3.54			2003yCat2246... (Cutri)
HD058715	1.83	1.07	0.90	0.77	2.94	1983A&AS....51...489 (Koornneef)
HD060414	1.25	0.38	0.09	-0.09	0.17	1983A&AS....51...489 (Koornneef)
HD061421	-0.39	-0.59	-0.63	-0.70	-0.70	1991A&AS...91...409 (Bouchet)
HD061935	2.28	1.77	1.62	1.57	1.70	1983A&AS....51...489 (Koornneef)
HD062345	2.05	1.64	1.52			2003yCat2246... (Cutri)
HD062576	1.74	0.96	0.75	0.63	0.88	1983A&AS....51...489 (Koornneef)
HD062721	2.07	2.27	1.24			2003yCat2246... (Cutri)
HD063700	1.52	1.03	0.89	0.81		1983A&AS....51...489 (Koornneef)
HD066811	2.79	2.96	2.97			2003yCat2246... (Cutri)
HD067228	4.13	3.91	3.83	3.79	3.92	1983A&AS....51...489 (Koornneef)
HD068312	3.79	3.23	3.15			2003yCat2246... (Cutri)
HD070272	1.26	0.45	0.38			2003yCat2246... (Cutri)
HD071369						1997ApJ....111...445 (Wallace)
HD072094	2.45	1.64	1.43	1.26	1.57	1994A&AS....105...311 (Fluks)
HD074918	2.80	2.33	2.23	2.17		1983A&AS....51...489 (Koornneef)
HD076943						2004ApJS...152..251 (INDO-US)
HD077912	2.84	2.46	2.4			2003yCat2246... (Cutri)

Table 3. Continued.

HD (1)	J_{mag} (2)	H_{mag} (3)	K_{mag} (4)	L_{mag} (5)	M_{mag} (6)	Reference (7)
HD080874	1.69	0.84	0.60	0.38	0.67	1991A&AS...91...409 (Bouchet)
HD081797	-0.36	-1.04	-1.21	-1.33	-1.6	1983A&AS...51...489 (Koornneef)
HD082328						2004ApJS...152..251 (INDO-US)
HD084748	-0-.72	-1.75				2003yCat2246... (Cutri)
HD085444	2.59	2.13	2.02	1.97	2.06	1983A&AS....51...489 (Koornneef)
HD085951	2.01	1.22	1.01	0.85	1.18	1994A&AS....105...311 (Fluks)
HD086663	1.54	0.72	0.50	0.34	0.66	1994A&AS....105...311 (Fluks)
HD087737	3.50	3.50	3.30			2003yCat2246... (Cutri)
HD088230	3.89	3.30	2.96			2003yCat2246... (Cutri)
HD088284	1.99	1.51	1.40	1.34	1.48	1983A&AS....51...489 (Koornneef)
HD089025	2.7	2.62	2.63			2003yCat2246... (Cutri)
HD089021	3.44	3.46	3.42			2003yCat2246... (Cutri)
HD089449	4.04	3.94	4.02			2003yCat2246... (Cutri)
HD089490	4.86	4.45	4.32			2003yCat2246... (Cutri)
HD089758	-0.11	-0.91	-1.01			2003yCat2246... (Cutri)
HD090254	2.45	1.59	1.36	1.20	1.48	1994A&AS....105...311 (Fluks)
HD090432	1.31	0.56	0.38	0.26		1983A&AS....51...489 (Koornneef)
HD090610	1.81	1.07	0.91	0.77	1.00	1994A&AS....105...311 (Fluks)
HD092125	3.30	2.93	2.83			2003yCat2246... (Cutri)
HD092588	4.69	4.54	4.15			2003yCat2246... (Cutri)
HD093813	1.07	0.42	0.27	0.17		1983A&AS....51...489 (Koornneef)
HD094264	2.05	1.43	1.55			2003yCat2246... (Cutri)
HD094481	4.24	3.76	3.75			2003yCat2246... (Cutri)
HD095418	2.27	2.36	2.29			2003yCat2246... (Cutri)
HD097603	2.32	2.27	2.27	2.29		1983A&AS....51...489 (Koornneef)
HD097778	1.01	0.16	-0.07			2003yCat2246... (Cutri)
HD098231						2004ApJS...152..251 (INDO-US)
HD099028						2004ApJS...152..251 (INDO-US)
HD099167	1.93	1.19	1.01			2003yCat2246... (Cutri)
HD100920	2.78	2.27	2.18			2003yCat2246... (Cutri)
HD101501	3.99	3.65	3.59			2003yCat2246... (Cutri)
HD102212	1.08	0.23	0.03	-0.09		1991A&AS...409...424 (Bouchet)
HD105707	0.94	0.31	0.14	0.03	0.19	1983A&AS....51...489 (Koornneef)
HD106625	2.79	2.83	2.82	2.76	2.80	1983A&AS....51...489 (Koornneef)
HD107259	3.81	3.78	3.77	3.76		1990MNRAS....242...1 (Carter)
HD107328	2.95	2.32	2.19	2.09	2.30	1983A&AS....51...489 (Koornneef)
HD109358	3.21	2.90	2.85			2003yCat2246... (Cutri)
HD109379	1.24	0.81	0.70	0.64	0.72	1983A&AS....51...489 (Koornneef)
HD110379	2.07	1.90	1.86	1.84	1.92	1983A&AS....51...489 (Koornneef)
HD111812	3.73	3.46	3.36	3.29	3.34	1983A&AS....51...489 (Koornneef)

Table 3. Continued.

HD (1)	J$_{mag}$ (2)	H$_{mag}$ (3)	K$_{mag}$ (4)	L$_{mag}$ (5)	M$_{mag}$ (6)	Reference (7)
HD112142	1.27	0.40	0.17			2003yCat2246... (Cutri)
HD112300	-0.11	-1.01	-1.19			2003yCat2246... (Cutri)
HD113139	4.32	4.16	3.95			2003yCat2246... (Cutri)
HD113226	1.25	0.73	0.66			2003yCat2246... (Cutri)
HD113847	3.76	3.15	2.90			2003yCat2246... (Cutri)
HD113996	2.37	1.63	1.49			2003yCat2246... (Cutri)
HD114330						1997ApJ....111...445 (Wallace)
HD114961	-0.36	-1.61				2004ApJS...152..251 (INDO-US)
HD115604	4.06	4.02	4.01			2003yCat2246... (Cutri)
HD115659	1.48	1.03	0.94	0.89		1991A&AS...409...424 (Bouchet)
HD115892	2.73	2.74	2.73	2.70		1983A&AS....51...489 (Koornneef)
HD116656						1997ApJ....111...445 (Wallace)
HD116658	1.53	1.64	1.68	1.72	1.76	1983A&AS....51...489 (Koornneef)
HD116870	2.62	1.81	1.61	1.47	1.73	1994A&AS....105...311 (Fluks)
HD120052	1.88	1.02	0.73			2003yCat2246... (Cutri)
HD120315	2.23	2.41	2.27			2003yCat2246... (Cutri)
HD121299	3.66	2.98	2.86			2003yCat2246... (Cutri)
HD123123	1.42	0.84	0.72	0.62		1983A&AS...51...489 (Koornneef)
HD123139	0.42	-0.09	-0.21	-0.31	-0.2 1	1983A&AS....51...489 (Koornneef)
HD123299	3.43	3.63	3.64			2003yCat2246... (Cutri)
HD123657	1.01	-0.01	-0.23			2003yCat2246... (Cutri)
HD123934	1.65	0.81	-0.60			2003yCat2246... (Cutri)
HD124294	1.89	1.18	1.03	0.94		1983A&AS....51...489 (Koornneef)
HD126661	5.16	4.94	4.87			2003yCat2246... (Cutri)
HD127665	1.50	0.76	0.76			2003yCat2246... (Cutri)
HD129116	4.38	4.46	4.52	4.56		1990MNRAS....242...1 (Carter)
HD129502	3.12	2.94	2.89	2.83		1983A&AS....51...489 (Koornneef)
HD130841	2.52	2.45	2.42	2.40	2.42	1983A&AS....51...489 (Koornneef)
HD130952	3.50	2.90	2.80			2003yCat2246... (Cutri)
HD131156						2004ApJS...152..251 (INDO-US)
HD131918	3.01	2.28	2.09			2003yCat2246... (Cutri)
HD134083	4.25	4.01	3.86			2003yCat2246... (Cutri)
HD135722	1.66	0.99	1.22			2003yCat2246... (Cutri)
HD136512	3.65	3.17	2.93			2003yCat2246... (Cutri)
HD138716	2.86	2.34	2.24			2003yCat2246... (Cutri)
HD138905	2.24	1.67	1.55	1.47		1991A&AS...409...424 (Bouchet)
HD141004	3.36	3.05	2.99			1991A&AS....91...409 (Bouchet)
HD141714	3.21	2.80	2.67			2003yCat2246... (Cutri)
HD141850	2.05	1.23	0.69	-0.08	-0.10	1994A&AS....105...311 (Fluks)
HD145328	2.99	2.50	2.34			2003yCat2246... (Cutri)
HD147165	2.49	2.44	2.42	2.42	2.43	1983A&AS....51...489 (Koornneef)
HD147394						2004ApJS...152..251 (INDO-US)
HD148513	2.95	2.16	2.04	1.92		1990MNRAS....242...1 (Carter)
HD149752	8.65	8.55	8.55			2003yCat2246... (Cutri)

Table 4. Observational parameters (from SIMBAD) of programme stars.

HD (1)	HR (2)	α(J2000.0) (3)	δ(J2000.0) (4)	V_{mag} (5)	Standard Star (6)
HD007927	HR382	01 20 04.91	+58 13 53.79	5.01	HR3314
HD008538	HR403	01 25 48.95	+60 14 07.01	2.68	HR3314
HD010307	HR483	01 41 47.14	+42 36 48.12	4.90	HR3314
HD011353	HR539	01 51 27.63	-10 20 06.13	3.73	HR3314
HD023475	HR1155	03 49 31.28	+65 31 33.50	4.47	HR2421
HD025204	HR1239	04 00 40.81	+12 29 25.24	3.40	HR2421
HD026846	HR1318	04 14 23.68	-10 15 22.61	4.90	HR2421
HD030652	HR1543	04 49 50.41	+06 57 40.59	3.19	HR3314
HD030836	HR1552	04 51 12.36	+05 36 18.37	4.47	HR2421
HD035468	HR1790	05 25 07.86	+06 20 58.92	1.62	HR3314
HD03549-	HR1791	05 26 17.51	+28 36 26.82	1.68	HR3314
HD036673	HR1865	05 32 43.81	-17 49 20.23	2.59	HR2421
HD037128	HR1903	05 36 12.81	-01 12 06.91	1.70	HR3314
HD037742	HR1948	05 40 45.53	-01 56 33.50	1.70	HR3314
HD038393	HR1983	05 44 27.79	-22 26 54.17	3.60	HR2421
HD038858	HR2007	05 48 34.94	-04 05 40.73	5.97	HR2421
HD040136	HR2085	05 56 24.29	-14 10 03.72	3.71	HR1412
HD043232	HR2227	06 14 51.33	-06 14 29.19	3.98	HR3314
HD047105	HR2421	06 37 42.70	+16 23 57.30	1.90	HR3314
HD047839	HR2456	06 40 58.66	+09 53 44.71	4.66	HR3314
HD048329	HR2473	06 43 55.92	+25 07 52.04	3.01	HR2421
HD049331	HR2508	06 47 37.22	-08 59 54.60	5.10	HR3982
HD054605	HR2693	07 08 23.48	-26 23 35.51	1.84	HR5793
HD054810	HR2701	07 10 13.68	-04 14 13.58	4.92	HR3314
HD056537	HR2763	07 18 05.57	+16 32 25.37	3.58	HR2421
HD058715	HR2845	07 27 09.04	+08 17 21.53	2.88	HR2421
HD060414	HR2902	07 33 47.96	-14 31 26.01	4.97	HR1412
HD061421	HR2943	07 39 18.11	+05 13 29.97	0.34	HR3982
HD061935	HR2970	07 41 14.83	-09 33 04.07	3.93	HR2421
HD062345	HR2985	07 44 26.85	+24 23 52.77	3.57	HR2421
HD062576	HR2993	07 43 32.38	-28 24 39.18	4.62	HR2891
HD062721	HR3003	07 46 07.44	+18 30 36.15	4.88	HR2421
HD063700	HR3045	07 49 17.65	-24 51 35.22	3.33	HR3113
HD066811	HR3165	08 03 35.04	-40 00 11.33	2.21	HR2421
HD067228	HR3176	08 07 45.85	+21 34 54.53	5.30	HR2421
HD068312	HR3212	08 11 33.00	-07 46 21.14	5.35	HR5793
HD070272	HR3275	08 22 50.10	+43 11 17.27	4.25	HR3982
HD071369	HR3323	08 30 15.87	+60 43 05.40	3.37	HR2421
HD072094	HR3357	08 31 35.70	+18 05 40.00	5.33	HR5793
HD074918	HR3484	08 46 22.53	-13 32 51.79	4.32	HR3314
HD076943	HR3579	09 00 38.40	+41 46 58.00	3.90	HR2891
HD077912	HR3612	09 06 31.80	+38 27 08.00	4.50	HR3894
HD080874	HR3718	09 21 29.59	-25 57 55.58	4.72	HR2421
HD081797	HR3748	09 27 35.24	-08 39 30.96	2.00	HR2421
HD082328	HR3775	09 32 51.43	+51 40 38.28	3.20	HR3975
HD084748	HR3882	09 47 33.49	+11 25 43.64	6.02	HR5793
HD085444	HR3903	09 51 28.69	-14 50 47.77	4.11	HR2421
HD085951	HR3923	09 54 52.20	-19 00 34.00	4.93	HR5793

Table 4. Continued.

HD (1)	HR (2)	α(J2000.0) (3)	δ(J2000.0) (4)	V_{mag} (5)	Standard Star (6)
HD086663	HR3950	10 00 12.80	+08 02 39.00	4.64	HR3799
HD087737	HR3975	10 07 19.95	+16 45 45.59	3.51	HR3314
HD088230		10 11 22.14	+49 27 15.25	6.61	HR3665
HD088284	HR3994	10 10 35.27	-12 21 14.69	3.61	HR5793
HD089025	HR4031	10 16 41.41	+23 25 02.31	3.44	HR2421
HD089021	HR4033	10 17 05.79	+42 54 51.71	3.44	HR2421
HD089449	HR4054	10 19 44.10	+19 28 15.00	4.70	HR4259
HD089490	HR4059	10 19 32.20	-05 06 21.00	6.30	HR4359
HD089758	HR4069	10 22 19.74	+41 29 58.25	3.06	HR2421
HD090254	HR4088	10 25 15.20	+08 47 25.00	5.59	HR3799
HD090432	HR4094	10 26 05.42	-16 50 10.64	3.83	HR1412
HD090610	HR4104	10 27 09.10	-31 04 04.00	4.27	HR4660
HD092125	HR4166	10 38 43.21	+31 58 34.45	4.68	HR5793
HD092588	HR4182	10 41 24.62	-01 44 23.50	6.26	HR4359
HD093813	HR4232	10 49 37.48	-16 11 37.13	3.11	HR5793
HD094264	HR4247	10 53 18.33	+34 13 07.30	3.03	HR4554
HD094481	HR4255	10 54 17.77	-13 45 28.92	5.66	HR5793
HD095418	HR4295	11 01 50.47	+56 22 56.73	2.34	HR5793
HD097603	HR4357	11 14 06.50	+20 31 25.38	2.56	HR5793
HD097778	HR4362	11 15 12.22	+23 05 43.80	4.58	HR2421
HD098231	HR4375	11 18 10.90	+31 31 44.90	4.41	HR1412
HD099028	HR4399	11 23 55.50	+10 31 45.00	3.90	HR4259
HD099167	HR4402	11 24 36.62	-10 51 34.90	4.83	HR4357
HD100920	HR4471	11 36 57.02	-00 49 26.00	4.30	HR4554
HD101501	HR4496	11 41 03.01	+34 12 05.88	5.32	HR2421
HD102212	HR4517	11 45 51.55	+06 31 45.75	4.05	HR2421
HD105707	HR4630	12 10 07.48	-22 37 11.15	3.01	HR5793
HD106625	HR4662	12 15 48.37	-17 32 30.94	2.59	HR2421
HD107259	HR4689	12 19 54.35	-00 40 00.49	3.89	HR5793
HD107328	HR4695	12 20 20.98	+03 18 45.26	2.06	HR2421
HD109358	HR4785	12 33 47.64	+41 21 12.00	4.26	HR4660
HD109379	HR4786	12 34 23.23	-23 23 48.33	2.65	HR5793
HD110379	HR4825	12 41 39.60	-01 26 57.90	3.65	HR3314
HD111812	HR4883	12 51 41.92	+27 32 26.56	4.93	HR3982
HD112142	HR4902	12 54 21.16	-09 32 20.38	4.80	HR5793
HD112300	HR4910	12 55 36.20	+03 23 50.89	3.38	HR5867
HD113139	HR4931	13 00 43.59	+56 21 58.81	4.93	HR2421
HD113226	HR4932	13 02 10.59	+10 57 32.94	2.83	HR3982
HD113847	HR4945	13 05 52.30	+45 16 07.00	5.60	HR4660
HD113996	HR4954	13 07 10.70	+27 37 29.00	4.80	HR5867
HD114330	HR4963	13 09 56.99	-05 32 20.43	4.38	HR5793
HD114961		13 14 04.45	-02 48 24.70	7.02	HR5867
HD115604	HR5017	13 17 32.54	+40 34 21.38	4.72	HR3314
HD115659	HR5020	13 18 55.29	-23 10 17.44	3.00	HR2421
HD115892	HR5028	13 20 35.81	-36 42 44.26	2.70	HR2421
HD116656	HR5054	13 23 55.54	+54 55 31.30	2.70	HR2421
HD116658	HR5056	13 25 11.57	-11 09 40.75	1.04	HR2421
HD116870	HR5064	13 26 43.16	-12 42 27.59	5.27	HR5793
HD120052	HR5181	13 47 25.39	-17 51 35.42	5.44	HR5793

Table 4. Continued.

HD (1)	HR (2)	α(J2000.0) (3)	δ(J2000.0) (4)	V_{mag} (5)	Standard Star (6)
HD120315	HR5191	13 47 32.43	+49 18 47.75	1.86	HR2421
HD121299	HR5232	13 54 42.14	-01 30 11.24	5.16	HR5867
HD123123	HR5287	14 06 22.29	-26 40 56.50	3.26	HR3314
HD123139	HR5288	14 06 40.94	-36 22 11.83	2.06	HR5893
HD123299	HR5291	14 04 23.34	+64 22 33.06	3.65	HR2421
HD123657	HR5299	14 07 55.65	+43 51 17.30	5.27	HR5511
HD123934	HR5301	14 10 50.50	-16 18 07.00	4.90	HR4259
HD124294	HR5315	14 12 53.74	-10 16 25.32	4.19	HR2421
HD126661	HR5405	14 26 27.36	+19 13 36.83	5.39	HR3314
HD127665	HR5429	14 31 50.13	+30 22 11.00	3.58	HR6324
HD129116	HR5471	14 41 57.59	-37 47 36.59	3.98	HR5793
HD129502	HR5487	14 43 03.62	-05 39 29.54	3.90	HR5793
HD130841	HR5531	14 50 52.71	-16 02 30.40	2.75	HR5793
HD130952	HR5535	14 51 01.07	-02 17 56.94	4.93	HR5867
HD131156	HR5544	14 51 23.30	+19 06 04.00	4.50	HR6324
HD131918	HR5564	14 56 46.11	-11 24 34.92	5.47	HR5867
HD134083	HR5634	15 07 17.34	+24 52 17.00	4.93	HR5867
HD135722	HR5681	15 15 29.77	+33 18 58.70	3.47	HR6324
HD136512	HR5709	15 20 08.94	+29 37 00.00	5.51	HR5511
HD138716	HR5777	15 34 10.70	-10 03 52.30	4.61	HR5867
HD138905	HR5787	15 35 31.57	-14 47 22.33	3.92	HR2421
HD141004	HR5868	15 46 26.61	+07 21 11.06	4.43	HR6378
HD141714	HR5889	15 49 35.88	+26 04 09.00	4.63	HR5511
HD141850	HR5894	15 50 41.70	+15 08 01.00	7.10	HR6324
HD145328	HR6018	16 08 58.45	+36 29 10.30	4.76	HR5107
HD147165	HR6084	16 21 11.31	-25 35 34.06	2.91	HR6324
HD147394	HR6092	16 19 44.43	+46 18 48.11	3.89	HR5867
HD148513	HR6136	16 28 33.98	+00 39 54.00	5.90	HR6378
HD149757	HR6175	16 37 09.53	-10 34 01.52	2.57	HR5867

Following paragraphs describe the procedure that we have followed for comparing the GIRT and Wallace data.

The block diagram in Fig. 9 depicts the steps carried out on both libraries. There are two steps performed on the library by Wallace et al. (2000).

(i) conversion of wavenumber vs. relative flux to wavelength vs. relative flux.

(ii) fitting a continuum to respective T_{eff} of each star and lagrange fitting for binning at 5 Å steps.

These steps were performed by writing a common algorithm which could run uniformly on the Wallace et al. (2000) library. The T_{eff} values were taken from 'Astronomical Hand Book' by K. R. Lang and the black body spectra were generated by IRAF *mk1dspec* task for J band region.

Table 5. Physical parameters of programme stars.

HD (1)	Spectral type (2)	Luminosity class (3)	T_{eff} (°K) (4)	$\log_{10}$ (g) (5)	(Fe/H) (6)	Reference (7)
HD007927	F0	Ia				
HD008538	A5	III	8090			1995A&AS...110..553 (Sokolov)
HD010307	G1.5	V	5898	4.31	-0.02	1993A&A....275..101 (Edvardsson)
HD011353	K0	III	4600	2.70	-0.13	1990ApJS....1075..1128 (McWilliam)
HD023475	M2.5	II				
HD025204	B3	V				
HD026846	K3	III	4582	2.70	0.21	1997A&AS...124..299C (Cayrel)
HD030652	F6	V	6380	4.40	0.02	2004ApJS...152..251 (INDO-US)
HD030836	B2	III	22120	3.59	-0.31	1997A&AS...124..299C (Cayrel)
HD035468	B2	III	22570	3.72	-0.25	2004ApJS...152..251 (INDO-US)
HD035497	B7	III	13622	3.80	-0.10	2004ApJS...152..251 (INDO-US)
HD036673	F0	Ib	7400	1.10	0.04	2004ApJS...152..251 (INDO-US)
HD037128	B0	Iab				
HD037742	O9	Iab				
HD038393	F7	V	6398	4.29	-0.07	1997A&AS...124..299C (Cayrel)
HD038858	G4	V				
HD040136	F1	V	6939	4.23	-0.13	2004ApJS...152..251 (INDO-US)
HD043232	K1.5	III	4270	2.22	-0.18	2004ApJS...152..251 (INDO-US)
HD047105	A0	IV	9260	3.60	-0.12	1994PASP...1239..1247 (Adelman)
HD047839	O7	Ve				
HD048329	G8	Ib	4150	0.80	0.20	2004ApJS...152..251 (INDO-US)
HD049331	M1	Iab	3600	0.70	0.17	1997A&AS...124..299C (Cayrel)
HD054605	F8	Iab	6222	0.60	0.19	1981ApJ...1018..1034 (Luck)
HD054810	K0	III	4697	2.35	-0.25	2004ApJS...151..387 (Ivanov)
HD056537	A3	V				
HD058715	B8	Ve	11710			1995A&AS...110..553 (Sokolov)
HD060414	A4	Ia				
HD061421	F5	IV	6650	4.10	0.04	1995PASP...219..224 (Andrievsky)
HD061935	G9	III	4776	2.20	-0.03	2004ApJS...151..387 (Ivanov)
HD062345	G8	IIIa	5000	2.90	-0.16	1990pJS....1075..1128 (McWilliam)
HD062576	K3	III	4308	1.30	0.01	1997A&AS...124..299C (Cayrel)
HD062721	K4	III	3940	1.67	-0.27	1997A&AS...124..299C (Cayrel)
HD063700	G6	Ia	4990	1.15	0.24	1997A&AS...124..299C (Cayrel)
HD066811	O5	Ia				
HD067228	G1	IV	5779	4.20	0.04	2004ApJS...152..251 (INDO-US)
HD068312	G6	III				
HD070272	K4.5	III	3900	1.59	-0.03	1997A&AS...124..299C (Cayrel)
HD071369	G5	III	5300	2.67	0.06	2004ApJS...152..251 (INDO-US)
HD072094	K5	III				
HD074918	G8	III	4950	2.26	-0.09	1997A&AS...124..299C (Cayrel)
HD076943	F3	V	6590	4.00	0.25	2004ApJS...152..251 (INDO-US)
HD077912	G7	Ib-II	5000	2.00	0.38	2004ApJS...152..251 (INDO-US)
HD080874	M0	III				
HD081797	K3	II	4120	1.77	-0.12	1990ApJS....1075..1128 (McWilliam)
HD082328	F6	IV	6380	4.09	-0.20	1993A&A...101..152 (Edvardsson)
HD084748	M8	IIIe				
HD085444	G6	III	5000	2.93	-0.14	2004ApJS...152..251 (INDO-US)

Table 5. Continued.

HD (1)	Spectral type (2)	Luminosity class (3)	T_{eff} (°K) (4)	$\log_{10}$ (g) (5)	(Fe/H) (6)	Reference (7)
HD085951	k5	III				
HD086663	M2	III				
HD087737	A0	Ib	9700	2.00	-0.05	1995ApJS...659..692 (Venn)
HD088230	K8	V	4000	4.50	0.28	1997A&AS...124..299C (Cayrel)
HD088284	K0	III	4971	2.70	0.39	2004ApJS...151..387 (Ivanov)
HD089025	F0	III				
HD089021	A2	IV	9280	3.90	0.20	1995A&A...536..546 (Hill)
HD089449	F6	IV	6333	4.06	0.21	2004ApJS...152..251 (INDO-US)
HD089490	K0					
HD089758	M0	III				
HD090254	M3	III	3706	1.40	0.11	1997A&AS...124..299C (Cayrel)
HD090432	K4	III	3950	1.68	-0.12	1997A&AS...124..299C (Cayrel)
HD090610	K4	III	3990	1.77	-0.39	1997A&AS...124..299C (Cayrel)
HD092125	G2.5	IIa	5600	2.10	0.38	2004ApJS...152..251 (INDO-US)
HD092588	K1	IV	5044	3.60	-0.10	2004ApJS...152..251 (INDO-US)
HD093813	K0	III	4250	2.32	-0.24	2004ApJS...152..251 (INDO-US)
HD094264	K0	III	4670	2.96	-0.20	2004ApJS...152..251 (INDO-US)
HD094481	K0	II+..				
HD095418	A1	V	9620	3.90	0.16	2004ApJS...152..251 (INDO-US)
HD097603	A4	V	8080			1995A&AS...110..553 (Sokolov)
HD097778	M3	IIb	3300		0.00	2004ApJS...151..387 (Ivanov)
HD098231	G0	V	5950	4.30	-0.35	1994A&A...505..516 (Cayrel)
HD099028	F1	IV	6739	3.98	0.06	2004ApJS...152..251 (INDO-US)
HD099167	K5	III	3930	1.61	-0.38	2004ApJS...152..251 (INDO-US)
HD100920	G8.5	III	4800	2.93	-0.34	2004ApJS...152..251 (INDO-US)
HD101501	G8	V	5360	4.35	-0.39	2004ApJS...151..387 (Ivanov)
HD102212	M1	III				
HD105707	K2	III	4320	2.16	-0.13	1997A&AS...124..299C (Cayrel)
HD106625	B8	III				
HD107259	A2	IV	9333	3.00	0.11	2004ApJS...152..251 (INDO-US)
HD107328	K0	IIIb	4380	2.39	-0.48	2004ApJS...152..251 (INDO-US)
HD109358	G0	V	5903	4.42	-0.12	2004ApJS...151..387 (Ivanov)
HD109379	G5	II	5170	2.10	-0.11	1997A&AS...124..299C (Cayrel)
HD110379	F0	V	7099	4.00	-0.57	1997A&AS...124..299C (Cayrel)
HD111812	G0	IIIp			0.01	2004ApJS...152..251 (INDO-US)
HD112142	M3	III				
HD112300	M3	III	3652	1.3	-0.09	1985ApJ...326..338 (Smith)
HD113139	F2	V				
HD113226	G8	III	4994	2.10	0.12	2004ApJS...151..387 (Ivanov)
HD113847	K1	III	4510	2.20	-0.09	2004ApJS...152..251 (INDO-US)
HD113996	K5	III	3970	1.69	-0.26	2004ApJS...151..387 (Ivanov)
HD114330	A1	Vs+..	9509	3.60	-0.02	2004ApJS...152..251 (INDO-US)
HD114961	M7	III	3014	0.40	-0.81	2004ApJS...152..251 (INDO-US)
HD115604	F3	III	7200	3.00	0.18	2004ApJS...152..251 (INDO-US)
HD115659	G8	III	5025	2.60	0.06	1995AJ...2968..3009 (Luck)
HD115892	A2	V	9030			1995A&AS...110..553 (Sokolov)
HD116656	A2	V	5793			2004ApJS...152..251 (INDO-US)
HD116658	B1	III				
HD116870	K5	III				

Table 5. Continued.

HD (1)	Spectral type (2)	Luminosity class (3)	T_{eff} (°K) (4)	$\log_{10}$ (g) (5)	(Fe/H) (6)	Reference (7)
HD120052	M2	III				
HD120315	B3	V	17200			1995A&AS...110..553 (Sokolov)
HD121299	K2	III	4710	2.64	0.03	1990ApJS...1075..1128 (McWilliam)
HD123123	K2	III	4600	2.00	-0.06	1991ApJS....579.. (Luck)
HD123139	K0	IIIb	4980	2.75	0.03	1997A&AS...124..299C (Cayrel)
HD123299	A0	III	10080	3.30	-0.56	2004ApJS...152..251 (INDO-US)
HD123657	M4.5	III	3452	0.90	-0.03	2004ApJS...152..251 (INDO-US)
HD123934	M2	IIIa				
HD124294	K2.5	IIIb	4120	2.06	-0.39	1997A&AS...124..299C (Cayrel)
HD126661	F0m		7754	3.50	0.10	2004ApJS...152..251 (INDO-US)
HD127665	K3	III	4260	2.22	-0.17	2004ApJS...152..251 (INDO-US)
HD129116	B3	V				
HD129502	F2	III	6820			1995A&AS...110..553 (Sokolov)
HD130841	A3	IV				
HD130952	G8	III	4820	2.91	-0.39	1990ApJS...1075..1128 (McWilliam)
HD131156	G7	Ve	5500	4.60	-0.15	2004ApJS...152..251 (INDO-US)
HD131918	K4	III	3970	1.72	0.22	1990ApJS...1075..1128 (McWilliam)
HD134083	F5	V	6632	4.50	0.32	2004ApJS...152..251 (INDO-US)
HD135722	G8	III	4834	2.45	-0.39	2004ApJS...151..387 (Ivanov)
HD136512	K0	III	4730	2.75	-0.44	2004ApJS...152..251 (INDO-US)
HD138716	K1	IV	4730	3.20	-0.12	1990ApJS...1075..1128 (McWilliam)
HD138905	K0	III	4700	3.01	-0.42	1990ApJS...1075..1128 (McWilliam)
HD141004	G6	V	5937	4.21	-0.04	2004ApJS...152..251 (INDO-US)
HD141714	G5	III	5230	3.15	-0.32	2004ApJS...152..251 (INDO-US)
HD141850	M7	III				
HD145328	K1	III	4678	2.50	-0.14	2004ApJS...151..387 (Ivanov)
HD147165	B1	III				
HD147394	B5	IV	15000	3.95	0.15	1993A&A...335..355 (Smith)
HD148513	K4	III	4046	1.00	0.25	2004ApJS...151..387 (Ivanov)
HD149757	O9	V				

Fig. 10 shows a sample of some of the common stars in GIRT and Wallace et al. library with good matching of the spectral features as evident from the correlation coefficient r values. This plot covers most of the main spectral types. It may be noted that the resolution of both the spectra is not same viz. GIRT $\sim$ 1000 and Wallace $\sim$ 3000.

In conclusion, we may mention that this library of 126 stellar spectra in the NIR J band has been carefully checked for its consistency with earlier published libraries and provides a larger database with extended spectro-luminosity coverage for usage in stellar population synthesis work and other applications as well as complimenting large optical libraries.

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