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Investigation of the empirical stellar library

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Abstract. During the large sample survey of LAMOST, mass spectrum of stars was obtained. The analysis of physical parameters, chemical composition and motion track can help us understand more about the structure and evolution of the Milky Way. Based on the investigation and research done on libraries of stellar spectra issued(such as in CDS), here I give an overview of the current status of empirical stellar libraries. I classify the valuable data according to specific criterion, such as spectral coverage/domain and resolution. After the integration of these spectrum, we will finally construct our own library of observed stellar spectra for LAMOST, which will serve as reference for the classification and automatic parameter analysis of stars, as well as for study of the galaxies evolution.

Keywords : survey: LAMOST – star: empirical stellar libraries

1. Introduction

An empirical stellar library is an homogeneous compilation of observed stellar spectra. It is not a simple task to assemble a library which has all the features of high S/N, wide wavelength coverage, high spectral resolution, good flux calibration and accurate stellar parameters. Major improvements have been made in the last years, with the publications of empirical libraries with improved spectral resolution and parameter coverage: e.g. ELODIE (Prugniel et al. 2007), STELIB, Indo-US (Valdes et al. 2004), MILES (Sánchez-Blázquez et al., 2006). A table is listed below, which covers comprehensive libraries currently available online.

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Table 1. Empirical stellar library for optical wavelength.

name	author	year	wavelength range	resolution	spectral type	luminosity class
Stellar Spectrophotometric Atlas 171 stars	Gunn, J.E.; Stryker, L.L.	1983	3130–10800Å	R=250	O-M	I-V
A Library of Stellar Spectra	Jacoby G.H., Hunter D.A., Christian C.A.	1984	3510–7427	4.5Å	O-M	V III
Spectrophotometry of bright F, G, K and M-type stars. 60 Southern and Equatorial stars	Kiehling R.	1987	3200–8600Å	10Å	F-M late type	I-V
Bruzual 77 stars	Bruzual.	1987	3200–8600Å	10Å	F-M	I III V
A New Library of Optical Spectra	Silva D.R., Cornell M.E.	1992	3510–8930	5Å	O-M	I-V
An Atlas of Low-Resolution NIR Spectra of 61 Normal Stars	Torres-Dodgen A. V., Weaver W. B.	1993	5750–8950	15.5Å	F-M	V, III, and Ib
An atlas of 126 southern MK standards	Bruzua	1994	5800–10200Å	4.3Å	F-M	I III V
Spectra and Photometry of 97 Nearby M-Giants	Steenman H.C.	1994	3800–9000Å	1.25;8.5Å	M	I III+ III V
Moderate-resolution Spectral Standards	Allen L.E., Strom K.M.	1995	5600–9000Å	1500	F-M	I-V
Spectra of 21 late-type stars from 4800–9000Å	Serote Roos M., Boisson C., Joly M.	1996	4800–8920Å 5000–9783Å	1.25A	late spectral types, G, K, M +F G K M	I III+III V
Jones CoudFeed Spectral Library	Leitherer, C.	1996	3820–4500Å; 4780–5460Å	1.8Å FWHM (~60 km/sec)	O M	V-I
A Stellar Spectral Flux Library	A. J. Pickles	1998	1150–25000Å	500	O-M	I-V
LL-ELODIE low-resolution ELODIE archive;LH-ELODIE high-resolution ELODIE archive	Prugniel Ph.; Soubiran C.	2001	3900–6800Å	10000; 42000	Teff:3000K to 60000 K, log g:-0.3 to 5.9 [Fe/H]:f -3.2 to +1.4	
Vertical distribution of Galactic disk stars. I. Kinematics and metallicity	Soubiran C.; Bienaym, O.; Siebert A.		3900–6800Å	420000	rv:-92 to 85km/s with a mean value of -13.5 km/s	

Table 1. Continued.

A Library of Medium Resolution Infrared Stellar Spectra Spectra of MK standard stars covering the J, H, K, and L bands	Wallace, Hinkle, Meyer, Edwards, and Strom.	1998 2000	Near infrared	3000	H-band O7-M5;J-band O7-M6	H-band:I-V;J-band:I-V
High resolution spectroscopy over lambda 8500–8750Å for GAIA	Munari U.	1999	8500–8750Å	0.25Å		
A Digital Spectral Classification Atlas On Line	R. O. Gray		3200–9500Å	3Å	O-M	I-V
Moderate-resolution near-infrared spectroscopy of cool stars: a new K-band library	Schreiber N.M.F.	2000	H and K band	830;2000	31 late-type giants and supergiants and two carbon stars	
1-1.4 Micron Spectral Atlas of Stars	M.A. Malkan, E. K. Hicks, H. I. Teplitz, I. M. McLean, H. Sugai, J. Guichard.	2002	J-band (1.08 μm to 1.35 μm)	400	O9.5-M7	I-V
S4N: A spectroscopic survey of stars in the solar neighborhood	Allende Prieto C.	2004	362–921 nm	50000		
CFLIB -The Indo-U.S. Library of Coud Feed Stellar Spectra	Valdes, et al.	2004	3460–9464Å	1Å		
High-dispersion spectra of nearby F-K stars	Takeda Y., et al.	2005	5000–6200Å 5800–7000Å and 7600–8800A	70000	160 F-K dwarfs and subgiants of the solar neighborhood	
MILES: A Medium resolution INT Library of Empirical Spectra			3525–7500Å	2.5Å		

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