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An Extended Empirical Library for Metal-Poor Stars Recognition and Parameterization

We present an extended empirical stellar spectra library created using spectra from the Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) DR5 and the Sloan Digital Sky Survey's extended Baryon Oscillation Spectroscopic Survey (eBOSS). Using more spectra of Metal-poor stars observed by both LAMOST and SDSS, we generated denser low-metallicity templates to fill in data missing from the pre-constructed empirical spectral library using only LAMOST spectra (Bing Du, et al. 2019, ApJS, 240, 10). The extended library covers the parameter space, temperatures of 3750 K through 8500 K, metallicity from −2.5 dex to +1.0 dex, and log g from 0 dex to 5.0 dex, with grid steps of $\sim$ 150 K, 0.15dex, and 0.25 dex for $T_{\rm eff}$, [Fe/H], and log g, respectively. The spectra in the library have resolutions R $\sim$1800, with well−calibrated fluxes and rest-framed wavelengths. we confirmed that the density of the library and the quality of the associated stellar parameters enable the stellar parameter measurements from this library to achieve precisions of about 125 K in $T_{\rm eff}$, 0.1 dex in [Fe/H] and 0.20 dex in log g. For metal-poor stars, owing to the limited number and the limited S/Ns of the observational spectra, the co-added templates are very limited in this parameter space. More spectra of metal-poor stars should be assembled to create more complete empirical templates with spectra of higher quality.

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