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The SDSS DR4 White Dwarf Catalog

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Abstract. Following up on the Kleinman et al. (2001) white dwarf catalog from the Sloan Digital Sky Survey Data Release One, Eisenstein et al. (2006) have an updated version from Data Release Four. Here we report on what the catalog contains and highlight some differences between this and the earlier effort.

1. Introduction

Since the 2551 spectroscopically-confirmed white dwarf stars from the Sloan Digital Sky Survey (SDSS) Data Release 1 (DR1) were reported in Kleinman et al. (2004), we have continued to search SDSS data for white dwarf spectra and here report on the resulting Data Release 4 (DR4) catalog of Eisenstein et al. (2006). This new catalog contains 9316 spectroscopically confirmed white dwarf stars, approximately 6000 of which are new discoveries — once again roughly doubling the McCook & Sion catalog post SDSS–DR1.

There are 8000 DAs, 713 DBs, 289 DCs, 133 DZs, 104 DQs, 31 DOs, 27 white dwarfs of unknown type, 10 PG 1159, and 9 DHs in the new catalog. In addition are 928 subdwarfs and 774 duplicate white dwarf spectra. As in the DR1 catalog, we provide SDSS photometric and spectroscopic information for all objects and fit T_{eff} and $\log g$ for the DA and DB spectra using models from Koester (Finley, Koester, & Basri 1997). The catalog can be found online either via the ApJ, or the SDSS web site at www.sdss.org/drX → data products → value-added catalogs → DR4 WD catalog (where X is any valid data release number greater than 3), or das.sdss.org/wdcat/dr4. Full details of the catalog can be found in Eisenstein et al. (2006). We only outline here some of the unique features of this catalog compared to the DR1 effort.

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2. Identifications

In the Kleinman et al. (2004) DR1 catalog, we personally inspected every candidate spectrum before determining its status as a white dwarf star. The sheer abundance of data released in DR4 made this approach impractical. Whereas the DR1 catalog necessitated human inspection of approximately 10,000 spectra, the DR4 effort would have needed roughly 40,000 inspections. Instead, through color and other cuts, we created a set of 14,000 potential white dwarf spectra, of which approximately 3000 were human inspected. The rest were reliably fit or rejected by our fitting code.

SDSS white dwarf catalogs are invariably incomplete on the sky since white dwarf stars are not targeted for spectroscopy with any particular uniformity. However, in order to make our computer-sorted candidate list easier to handle, we specifically avoided selecting candidate white dwarf stars with $T_{\text{eff}} \lesssim 8000\text{K}$, which fall close to the A–F main sequence star locus. Many white dwarf/main sequence binaries were found, but our catalog is not nearly as complete here as in that of Silvestri et al. (2006). More obscure white dwarf stars, like the DH, DC, DQ, and DZ stars are less completely recovered than is the main DA and DB sample.

In addition to fitting DA and DB models as before, our code now flags objects with HeII, C₂, and some metal lines, making it easier to identify DO, DQ, and DZ stars.

The online catalog has a link to the CAS Explorer page for each object (<http://cas.sdss.org/dr5/en/tools/explore/obj.asp>). This page makes it easy to get a finder chart, spectra, and other information about each star. There is also a link to the plot of the spectral fit. We highly recommend that both the SDSS image and the fit plot be examined before making any strong conclusions on any particular object.

One of us (SJK) maintains a web site with (hopefully) helpful hints on accessing SDSS data. You can find it at: www.naoj.org/staff/sjnk/public_sdss/.

3. Future Work

As in our DR1 catalog, we continue to find apparent systematic differences in our fit values at large T_{eff} when compared to previously published values. The difference, though, is that we now think we have an explanation. When we fit the independent Bok telescope spectra of SDSS objects from Liebert et al. (2005), the resultant fits showed no more disagreement with previously-published values. This result led us to further suspect the SDSS spectra themselves and not our fitting code. A plot (Figure 1) of the differences between the Bok and SDSS spectra for one sample object shows significant discrepancies (~ 2 – 3%) near the H_γ and H_δ lines. Independent work by other SDSS members revealed problems in the spectrophotometry precisely in this region. We now believe these differences are due to the way the F-star templates are used in the pipeline spectrophotometric calibrations. Efforts are underway project-wide to correct this situation, but it is also possible to use SDSS data on other objects to make an empirically-determined correction array which can then be applied to the data before our fit. We have not yet attempted this (although we have

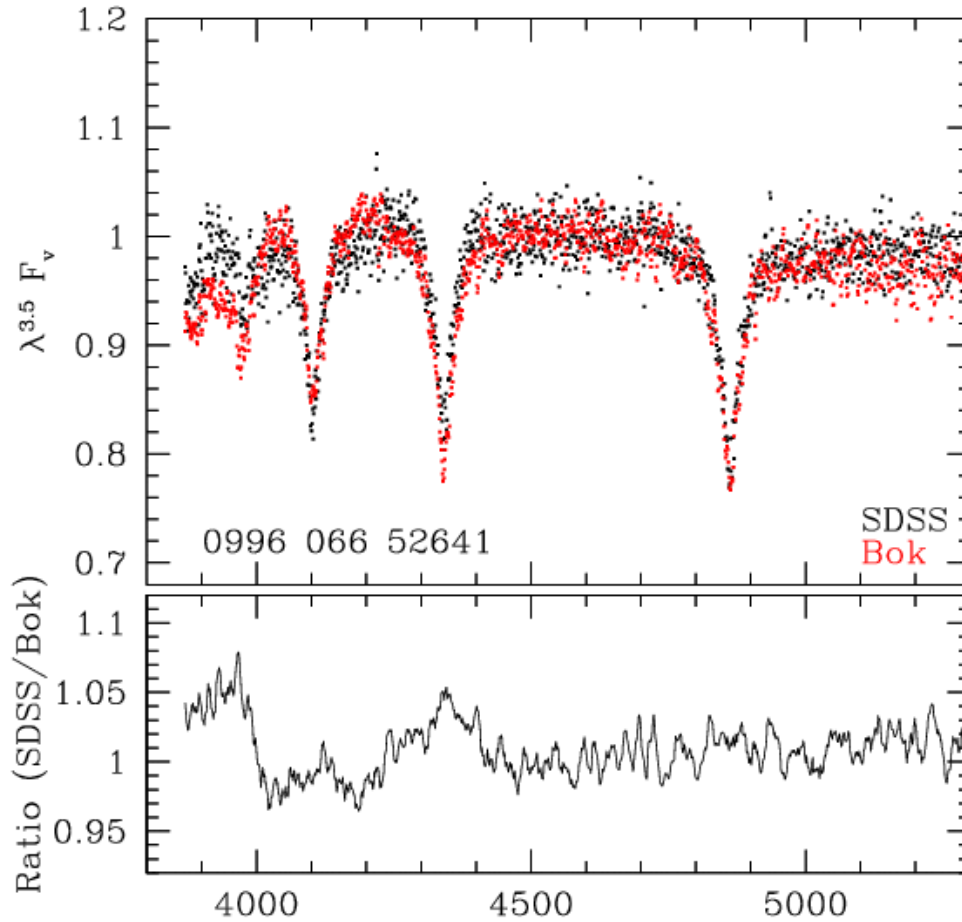


Figure 1. A sample SDSS and Bok (Liebert et al. 2005) spectrum of a SDSS DA. The top panel shows the SDSS spectrum in red and the Bok spectrum in black. The bottom panel shows the ratio of the SDSS to Bok spectra.

the suspected correction array), but we believe the result will be to alleviate our literature disagreement substantially. The SDSS pipeline will also implement better spectrophotometry in future data releases, but as of DR5, this problem has not yet been addressed.

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