AY257 Winter 2019

Homework #5: Spectral Reductions: Stars

There is a set of arc lamp, flat-field lamp and program object files at:

http://www.ucolick.org/~bolte/AY257/HMWK5_2015

The frames are overscan subtracted and trimmed. The program is to identify white dwarfs in young open clusters with the goals of identifying the critical main-sequence mass above which stars explode as core-collapse supernova and below which they become white dwarfs, and mapping the initial-mass final-mass relation for WDs.

WD candidates have been identified in the field the open cluster NGC 2168 through UBV photometry. Spectra were obtained with LRIS-B of the candidates. These are the files n2168 WB1.fits n2168 WB2.fits etc.. There are also two frames with spectra of the faintest WD candidate members of Praesepe (read Claver et al. 2001, ApJ, 563, 987). Additional frames were obtained of bright field WDs with known effective temperature and surface gravity (WD...,EGGRxx,PG0048+202) and a spectrophotometric standard (hz14). There is also a quartz-flat spectrum and line lamp spectrum obtained in the afternoon.

1. Extract the spectra [for IRAF/PYRAF: *noao.twod.apextract, apall*].

2. Extract the line lamp spectrum (ARC.fits) using one of the bright WD spectra for a reference aperture. The lines are from three lamps: Hg, Cd and Zn. Use the extracted arc to create a pixel-to-wavelength solution. [In IRAF/PYRAF: *noao.oned.identify* to fit the lamp spectrum, *refspec* to associate a wavelength solution to an extracted spectrum, and *dispcor* to create linear dispersion solution for each extracted spectrum.]

3. Use hz14 to determine the flux calibration and apply it to the program spectra. [in IRAF/PYRAF tasks *standard*, *sensfunc* and *calibrate*

4. Identify each of the objects (g-star, white dwarf etc.).

5. For the white dwarfs in the sample, measure the equivalent width and FWHM [in IRAF/PYRAF *splot* and Lorentzian: 'k', 'l') for the H_γ line and use the diagram in the directory called wd.ps to estimate t_{eff} and log(g) for each of the WDs including the WD "standards". Note the handy *splot* feature 's' to smooth noisy spectra.

6. Estimate the radial velocity of each WD, first correcting the individual spectra in wavelength based on the night-sky emission lines, then measuring the centers of the Balmer lines. Determine the heliocentric correction and apply it. [IRAF/PYRAF: *noao.rv rvcorrect]*