Section III -Spectroscopy

Procedure

In Labs 9 thru 12 we explore two techniques for taking and processing stellar spectra, including a spectrograph, and a diffraction grating filter mounted in the CCD camera. http://en.wikipedia.org/wiki/Astronomical_spectroscopy This spectroscopic data reveals specific information about a star, including its chemical composition, and Doppler shift: relative motion of the star, either toward us (blue shifted) or away from us (red shifted). http://en.wikipedia.org/wiki/Doppler_effect#Astronomy

Stellar Spectroscopy

Stars are divided into spectral types, the result of varying atomic-level activity on the star. In spectroscopy, we measure this activity via a spectrograph or diffraction grating / CCD combination, attached to a telescope.
http://www.atnf.csiro.au/outreach/education/senior/astrophysics/spectrographs.html
The resultant data are converted to graphical format for further analysis.

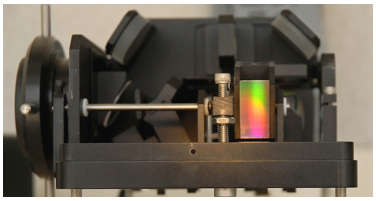
The main spectral types are characterized by the letters O,B,A,F,G,K, & M. Stars of O type are the hottest, and rarest. Stars of M type are the coolest, and most abundant.

Class Spectral Lines

O -Weak neutral and ionized Helium, weak Hydrogen, very few absorption lines.
B -Weak neutral Helium, stronger Hydrogen, an otherwise relatively smooth continuum.
A -No Helium, very strong Hydrogen, weak CaII, the continuum is less smooth.
F -Strong Hydrogen, strong CaII, weak NaI, continuum is rougher, ionized metal lines.
G -Weaker Hydrogen, strong CaII, stronger NaI, many ionized and neutral metals.
K -Very weak Hydrogen, strong CaII, strong NaI and many metals G-band is present .
M -Strongest NaI, weak Hydrogen absorption (Note: Hydrogen may be *emission* lines.)

There are 2 setups for taking spectra in the observatory.

The SGS Spectrograph is attached to a Meade 8" Schmidt Cassegrain telescope @ f/6.3, and ST-7XME-S CCD camera. The SGS dispersion is 1.06 ang/pixel, with a resolution of ~2.2 Å This setup is used mostly for brighter stars.


SGS Spectrograph

We also use a 100 or 200 line/mm diffraction grating filter installed in an ST-10XME CCD camera, mounted on a TEC140 *f*/7 refractor. This setup yields a dispersion of 16.15 ang/pixel. This is lower resolution, and allows spectra of fainter stars, quasars, and some Type Ia supernovae.