Astronomy 5830 – Observed Properties of Astronomical Systems

Autumn Semester 2017

Homework #1 – Due September 8, 2017

1. Stellar Scavenger Hunt: This problem is designed to acquaint you with how to look up basic information on stars. You can ask each other or me for hints on where to look, but otherwise you are on your own. For every quantity you find, please give a complete citation to the publication (catalog, journal article, etc.). If you find the information with a web-based source such as SIMBAD (http://simbad.u-strasbg.fr/sim-fid.pl), trace the information back to the original source, i.e., "HD172167 is classified A0V in Morgan & Keenan (), ApJ, …" is appropriate, whereas "google says so" is not.
    a. What is the right ascension and declination (epoch J2000), accurate to 1", of BD +18 4917? What does "BD" stand for?
    b. What is the proper motion of α Cen? Do you think Halley could have used it to discover proper motion? Why or why not?
    c. What is the *measured* effective temperature of Rasalgethi? Do not a reference that estimates T_{eff} from its spectral type or colors!
    d. Find an X-ray image of the Crab Nebula. What type of object is it?
    e. The star Wolf 359 is a popular battleground in science fiction. What type of star is it? What are its parallax and distance (with uncertainties)?
    f. Make a finding chart for the unusual variable star V4332 Sgr. Be sure to note the location of the object on your image.
    g. What is the angular separation and position angle on the sky between the two components of the visual binary Albireo?
    h. What are the IRAS flux densities at 12, 25, 60, and 100μm of Eta Carina? What is this object?
    i. Find a color-magnitude diagram of Omega Cen obtained with the Hubble Space Telescope. What is unusual about this globular cluster?
    j. You want to submit an observing proposal to MDM to study the Hyades. To obtain good observations, it should be above airmass 1.5 for at least six hours per night (after evening twilight and before morning twilight). What months are suitable?

2. Spectral Classification. The goal of this exercise is for you to classify the spectra of five stars. Please do this within the SciServer Compute framework to begin to gain some familiarity with this interface, even thought it is not really necessary for this particular exercise. I've created an ipython notebook that illustrates how to retrieve and plot the five stars that are available from the class website. To complete the homework:
    a. Retrieve and inspect each spectrum for any of the strong lines or features that are used for spectral classification. All of the stars fall within the range of MK types (there are no L and T dwarfs). The class notes have numerous example spectra. Another good resource is the MKK stellar atlas in the reading room (last seen on the bottom shelf),

which identifies key lines for the MK system on photographic plates. Note that the CCD spectra cover a wider range of wavelengths, especially to the red, compared to Morgan and Keenan's photographic plates.

b. Assign an MK spectral classification to each star. Full credit if you are within one spectral type. As a bonus, try to determine the luminosity class, although this is optional. Write a few sentences that describe how you determined the classification for each star. You should note the key spectral features you used.

c. Plot each spectrum and label the key features you used for the classification. I will take off for poorly constructed and unreadable plots. You are welcome to show me an example plot if you want feedback on a plot.