Observational laboratory, Assignment 8
Due date: Apr, 7

Cross-dispersion (echelle) spectroscopy is known for high and ultra-high resolution spectra. The resolving power, defined as $R = \lambda/\Delta\lambda$, is typically above 20,000, and can be as high as ∼500,000. We will learn how to do spectrum extraction using IRAF, and we will practice using the spectra of V505 Persei, an eclipsing binary with a ∼4.2-day period. The spectra were acquired at the Asiago Observatory in Italy, with an echelle spectrograph mounted on a 1.82-m Mt. Ekar telescope. All cosmetic reductions have been done, we can focus on aperture extraction, wavelength calibration and flux normalization. Then we will take a closer look at what spectral lines are doing.

1. Explain the operation of echelle spectrographs. Which diffraction orders are typically used to achieve such high resolving power? What problems might arise from using such orders?

2. Look up V505 Persei in the literature and write a section on it. What makes it interesting and worthy of study?

3. Extract all spectra. Explain in detail how you wavelength-calibrated and flux-normalized them. What is the resolving power of these spectra?

4. Identify at least 10 spectral lines and plot them for each spectrum. Comment on the temporal variability of these spectral lines.

5. Using splot and `[k]` and `[g]` keystrokes, extract approximate radial velocities for both components. Look up the ephemerides and plot a radial velocity curve through the data. Does it look convincing?

6. *Extra credit.* Instead of plotting the radial velocity curve, try fitting it to the data instead. Bear in mind that 4 exposures are not going to be enough to fully constraing the RV curve, so you might need to keep some parameters constant.