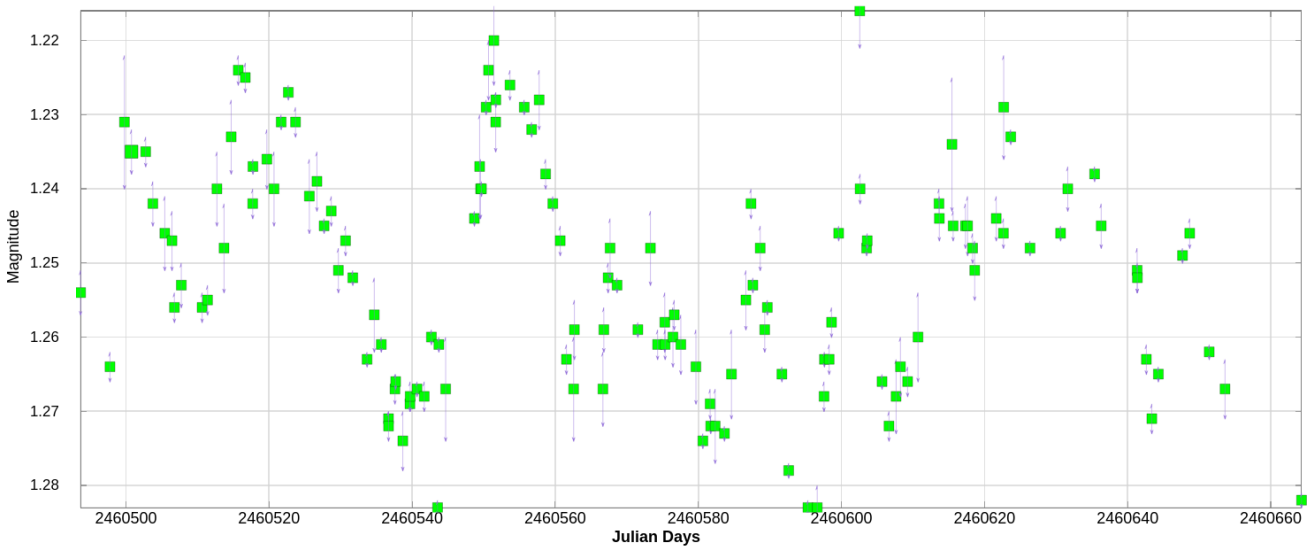
# PEP Campaign on α Cygni Variables

## 20 May 2025

At this time, α Cygni stars are the most important targets for the PEP observing group. They are supergiants of spectral classes B and A that pulsate, yielding photometric variation. Deneb is the prototype of this class, hence the name. These are evolved stars that have exhausted hydrogen in the core and swollen to massive size. We see them as bluish or whitish in color. They may be in the process of becoming red supergiants, moving left to right across the Hertzsprung-Russell diagram, or they may be post-red-supergiants that have swung back to the left after shedding a cool exterior. We don't know which. The pulsation is presumed to be driven primarily by the "kappa" mechanism, otherwise known as the Eddington Valve, in which a layer of partially ionized gas is able to alternately trap and release energy, causing the star to swell and shrink. This motion is detectable in the Doppler shifts seen in the stellar spectra. Cepheid variables pulsate in this way and do so in a very regular manner, but α Cygnis are subject to erratic pulsation that is unexplained. And it's unclear exactly how the photometric variation (also erratic) is linked with pulsation. All this makes the stars an interesting research subject.

So why PEP? First off, the range of photometric variation is less than 0.1 magnitude in V band. This calls for the precision that PEP can supply much more readily than CCDs. And as a group PEP observers experience much higher internal consistency, leading to better combined light curves. Finally, there are many very bright examples of the α Cygni class. The Variable Star Index lists at least twenty-one that are brighter than magnitude V=5 and at least six brighter than V=3. This is where PEP excels.




PEP light curve of Deneb, July-November 2024

Our challenge with these stars is to get dense coverage—one data point per night would be ideal. This calls for many observers with considerable geographic scatter (so as to avoid widespread clouds, smoke, etc.). The color variation of α Cygnis is small, so we can work exclusively in V band and get good results. For the very brightest stars an 8" Cassegrain or 5" short-focus refractor telescope will suffice, and we have a small supply of loaner photometers available.

**Come Join Us!**