Abstract

We present the results of our long-term photometric monitoring effort of VV Serpentis, a Herbig Ae star related to the Serpens Cloud.

VV Serpentis

- A nearby (~260 pc) Herbig Ae star related to the Serpens Cloud.
- VV Ser is a UX Ori star, a subgroup of young stars that are variable as a result of dust occultations. Particularly strong occultations (~1.5–2 magnitudes in V) are general accompanied by a “bluing effect” as a result of scattered light from the disk accounting for a larger fraction of the observed flux.
- SED modeling (Postobitanuk et al. 2007) confirms that VV Ser has a nearly edge-on (i~70°), self-shadowed dusty disk that is dominated by its puffed-up inner rim.
- Host star mass estimated to be ~3M☉ with spectral type of B9 from SED modeling.
- Photometrically and spectroscopically variable on time scales of minutes to years.

Data of VV Ser from ANDICAM on the CTIO 1.3m in Chile. (Artmenko, Grankin, and Petrov 2010). The green data is from the Crimean The red data is from the ROTOR program at the Maidanak Observatory that of two other groups to obtain a massive 23 season, 1834 night light curve. We combined our data from the CTIO telescope in Chile (shown in blue) with SED modeling (Postobitanuk et al. 2007) confirms that VV Ser has a nearly edge-on (~70°), self-shadowed dusty disk that is dominated by its puffed-up inner rim. Host star mass estimated to be ~3M☉ with spectral type of B9 from SED modeling. Photometrically and spectroscopically variable on time scales of minutes to years.

Keplerian Periodicity in the Photometric Variability of VV Serpentis

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References

Beck, S., Grit, M. H., Böker, R. 1998, Computer & Geosciences, 758, 105
Postobitanuk, M., Grankin, K. N., and Petrov, P. P. 2010, Astronomy Reports, 45, 67

Interpretations

• A 35 day period around a 3 solar mass star corresponds to a Herbigian orbital radius of 0.3 AU
• This is consistent with Eisner et al 2004, which measured an inner rim radius of 0.3-0.4 using Keck interferometry
• In our Toy model, a 2 day extinction event at this orbital radius corresponds to a “clump” diameter of ~0.1 AU
• For a 0.6 magnitude extinction event and assuming ISM grains, we calculate a column density of ~1.1 x 1020 [H/cm^2]
• This corresponds to a mass of ~3x10^13, which is roughly the mass of an asteroid.