

Variable Stars

Name	α	δ	Epoch	VMag	Type	Per
BM Ori	05:35:16.1	-05:23:07.0	2000.0	7.9-8.6	E	6.47 dy
VV Ori	05:33:31.5	-01:09:21.9	2000.0	5.3-5.7	E	1.485 dy
Z CMa	07:03:43.2	-11:33:06.2	2000.0	8.4-12	FU Ori	Irreg
R CMa	07:19:28.2	-16:23:42.9	2000.0	5.7-6.3	E	1.1359 dy
ι Boo	14:16:09.9	+51:22:02.0	2000.0	4.75 ± 0.01	δ Sct	40 min
44,i Boo	15:03:47.3	+47:39:14.6	2000.0	5.8-6.4	WUMa	0.27 dy
ρ Oph	16:25:35.1	-23:26:49.8	2000.0	4.6	I	Irreg
V703 Sco	17:42:16.8	-32:31:23.6	2000.0	7.8-8.5	RR Lyr	0.115 dy
VV Ser	18:28:49.0	+00:08:39	2000.0	11.1-13.3	Herbig	Irreg
WW Vul	19:24:57.0	+21:12:48.0	2000.0	10.9-12.6	I (RCrB?)	Irreg

- **Z Canis Majoris** – Irregularly variable between 9 and 11 magnitude (V). This is a FU Orionis type variable, that is, a young T Tauri star that is undergoing a massive accretion event lasting perhaps one hundred years. Its disk heats up and releases many hundred times the luminosity of the star, so in reality we only see the hot disk now (the star would be about 16 magnitude).
- **The Orion Trapezium** – These are OB stars probably less than 300,000 yr old still enveloped in nebulosity. Two of the stars in the Trapezium are eclipsing, BM Ori has a period of 6.47 days and varies between 7.9 and 8.6, which is clearly visible when comparing to the other Trapezium stars. The other has a two month long period, so is rarely seen in eclipse.
- **VV Ori** – Eclipsing binary system only 8×10^6 yrs old which contains 3 stars. This is a β Lyr type eclipsing binary, with 2 main sequence stars of spectral type B (Arai, 1994).
- **Z CMa** – T Tauri type variable. This is a young binary system embedded within a circumstellar disk with bipolar winds (Millan-Gabet & Monnier, 2002). This is a luminous and irregularly variable young stellar object, which outburst in 1987. The irregular variability is the result of active accretion.
- **R CMa** – Eclipsing Binary of Algol Type which is a triple star system with a primary period of 1.1359 days. The mass of the primary star is $1.07 \pm 0.2 M_{\odot}$, and the secondary $M = 0.17 \pm 0.02 M_{\odot}$ and the third body $M = 0.34 \pm 0.02 M_{\odot}$. The variability in this system was discovered in 1887, but only recent work has determined the period and orbital parameters of the 3rd component (92.8 yr; Ribas *et al.*, 2002).
- **ι Boo** – Suspected δ Sct variable since the 1980s, and recent work has shown that indeed it does pulsate on rapid timescales with a period of about 40 min. The pulsation is low amplitude, so accurate differential photometry is needed. See

<http://www.konkoly.hu/cgi-bin/IBVS?4698>

- **44,i Boo** – W UMa type Eclipsing Binary star. This is a triple star system, with a light curve characterized by active and quiet intervals with a variable period.

- **ρ Ophiuchi** – This is a bright ($V = 4.6$) early B star surrounded by nebulosity. The Ophiuchus clouds are located close to Antares at relatively high latitude, and may represent a cloud that has been hit by one or more supernova explosions, leading to a cometary structure and intense star formation.
- **The North America Nebula** – 2000: 20:58:47 +44:19.8. A large nearby (about 500 pc, same as Orion) HII region illuminated by OB stars that are still deeply embedded and obscured. This might show up nicely on a red CCD exposure.
- **V703 Sco** – This star is spectral type A9V and is an RR Lyr type (pulsating) variable star. These are pulsating stars just evolving off the Main Sequence, and they obey the period-luminosity relation, so can be used as distance indicators (Halprin and Moon, 1982).
- **VV Serpentis** – This is a variable Herbig Ae/Be star, which is sometimes occulted by large dust clouds, so it fades from its normal magnitude of $V \sim 11.6$ by several magnitudes.
- **WW Vulpeculae** – It is postulated that this is a young stellar system with a circumstellar dust disk which is not homogeneously distributed, but confined to clumpy clouds around the object. There may be infalling bodies evaporating and mixing with the normal gas accretion on the disk.

References

- Arai, K. (1994). “Photoelectric Observations of VV Ori in R and I”, *IBVS* **4085**
- Chambliss, C. R. and B. M. Davan (1987). “An Analysis of Light Curves of the Eclipsing Binary System VV Orinis Observed at the Wavelength of H- α ”, *AJ* **93**, 950-958.
- Halprin, L. and T. T. Moon (1982). “Revised List of Pulsating Stars with Ultra-Short Periods”, *Astrophys. Space Sci.* **91**, 43-51.
- Millan-Gabet, R., and J. D. Monnier (2002). “Discovery of a Near- Infrared Jetlike Feature in the Z Canis Majoris System”, *AJ* **580**, L167-170.
- Oprea, G., A. Dumitrescu, P. Rovithis, H. Rovithis-Livaniou (1996). “New Times of Minima of the Eclipsing Binaries 44i Bootis and WV Cephei”, *IBVS* **4307**.
- Ribas, I., F. Arenou, and E. F. Guinan (2002). “Astrometric and Light- Travel Time Orbits to Detect Low-Mass Companions: A Case Study of the Eclipsing System R Canis Majoris”, *AJ* **123**, 2033-2041.
- Szatmary, J. G. and J. Vinko (1994). “Photometric Period of the Suspected Delta Scuti-Type Star Iota Bootis”, *IBVS* **4071**.