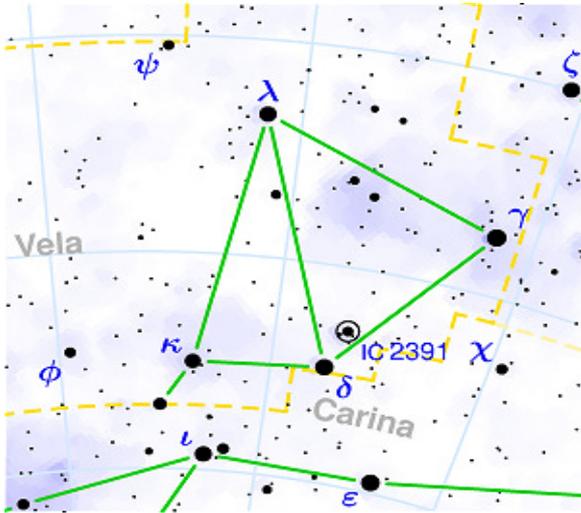


## The nearby eclipsing stellar system $\delta$ Velorum

*Delta Velorum ( $\delta$  Vel) is the second brightest star ( $m_v = 1.96$ ) in the southern constellation Vela, near the border with Carina. The system is known due to its multiplicity and includes at least three identified components. Delta Velorum is among our closest stellar neighbors.*

The multiple stellar system  $\delta$  Vel (HD 74956, HIP 41913, GJ 321.3, GJ 9278) contains one of the nearest and brightest eclipsing binaries. The binarity of  $\delta$  Vel was discovered by S. I. Bailey in 1894 from Arequipa, Peru (and independently by Innes 1895). It has already been known as a quadruple system for many years as IDS 08419-5420 (Jeffers et al., 1963) The system contains two pairs which are located apart at an angular separation of 69 arcsec. The bright close pair AB is separated by 2". The distant satellite binary system CD has its components of 11m and 13m splitted by 6".

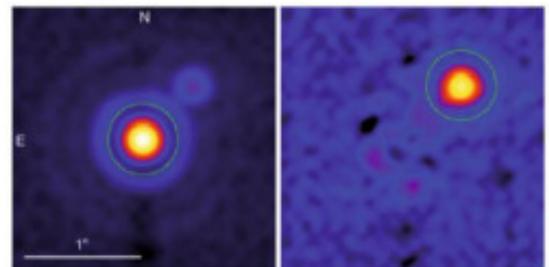


In 1978 the primary component A was reported to be a spectroscopic binary (sep. 0".6) in the Proceeding of the Australian Astronomical observatory (Tango et al., 1979), making the whole system quintuple. This was later confirmed by the Hipparcos satellite (0".736, Perryman et al., 1997). Being composed of two A-type in rapid rotation and one F-type main sequence stars,  $\delta$  Vel AB is particularly interesting to astrophysicists, because of its close distance to the Sun.

With a revised Hipparcos parallax of  $40.49 \pm 0.39$ mas (van Leeuwen, 2007), it is just 80.6 light-years away. The outward components A and B have a wide orbit with a 142 year orbital period at an average distance of 49 AU. The primary component A has an apparent magnitude of 1.97, while the secondary component B is magnitude 5.55. Delta Vel C and D, two probable class M red dwarfs of magnitudes 11 and 13.5 at least 150 AU apart and orbit over a period of at least two thousand years.

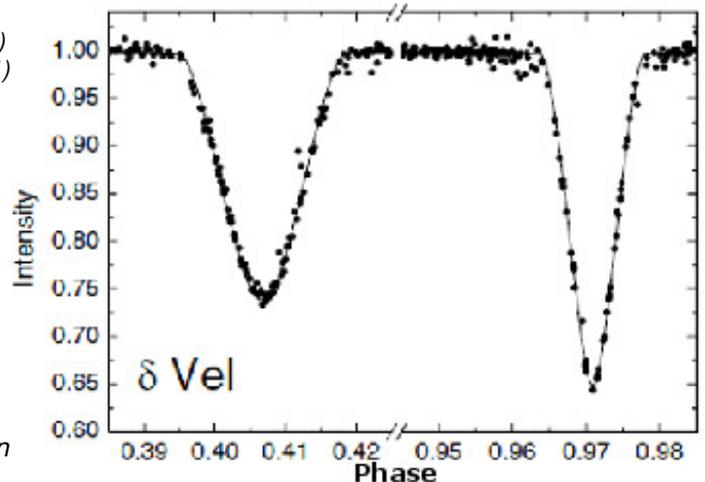
In 2000 it was announced that the components Aa and Ab form an eclipsing binary (Otero et al., 2000), having an orbital period of 45.150 days ( $a \sim 0.5$  AU) and an eccentricity of 0.230 (Ammler-von Eiff, M., 2011). The system probably contains two early A-type stars (Otero et al., 2000). Surprisingly enough, Delta Velorum became one of the brightest known eclipsing binaries in the sky, one of the very few observable with the unaided eye. Although Algol has a deeper minimum and is much easier to observe visually.

Orbital period of 45 days seems to be remarkably long for most known eclipsing binaries. The  $\delta$  Vel system is also noticeable for another reason. Because of precession (the 26,000-year wobble of the Earth's axis),  $\delta$  Vel will be a South Pole star around 9000 AD. Being close to our Solar system, Delta Velorum therefore presents a unique opportunity to determine independently the physical properties of the three components of the system. The components Aa and Ab are bright fast rotating stars, with masses of  $2.53M_{\odot}$  and  $2.37 M_{\odot}$  ( $\approx 4\%$  accuracy) respectively, and the mass of  $\delta$ Vel B is estimated to be  $\approx 1.5 M_{\odot}$ .



*Delta Vel A (left) and B (right). By Kervella, P.; Thévenin, F.; Petr-Gotzens, M. G. (2009)*

*Right: Detrended and filtered (removing obvious outliers) SMEI LC of Delta Velorum (Pribulla et al., 2011)*



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### References for further reading:

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