

Spectroscopic portrait of the 2017-19 eclipse of the binary VV Cephei

GEMINI Ecole de photométrie
2023 June 24th

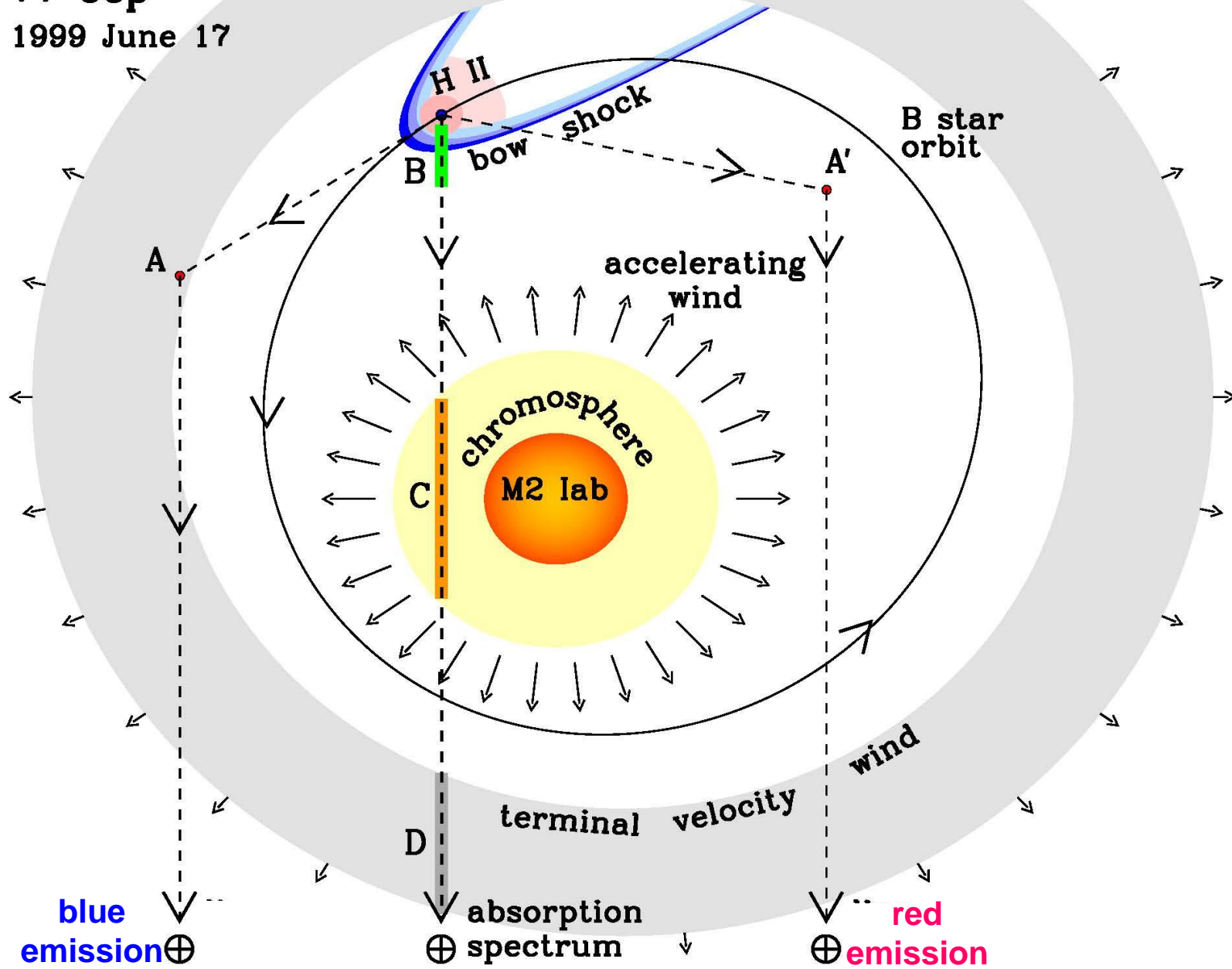
Ernst Pollmann

Internationale Arbeitsgemeinschaft **ASPA**

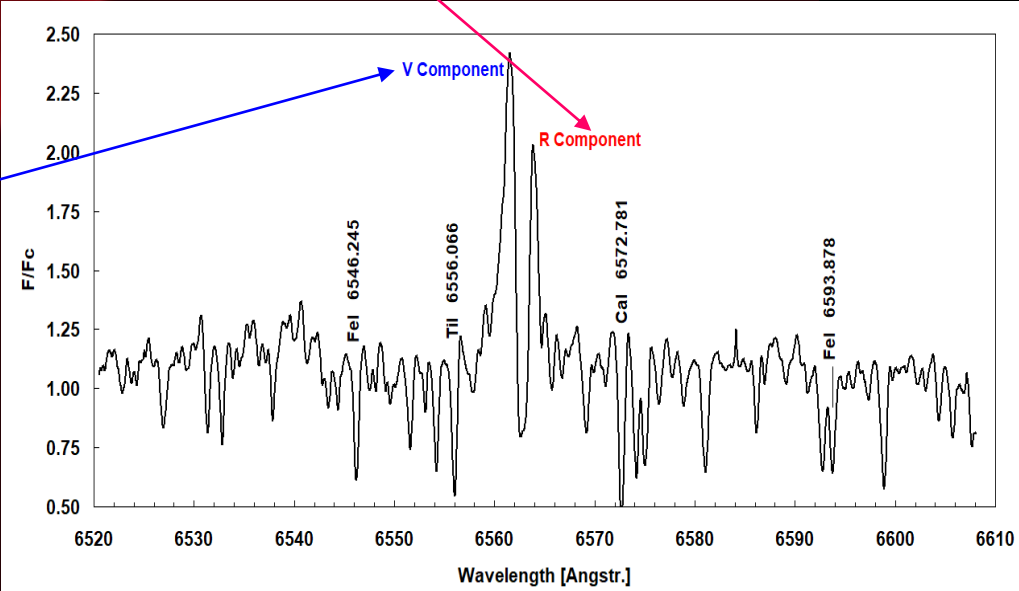
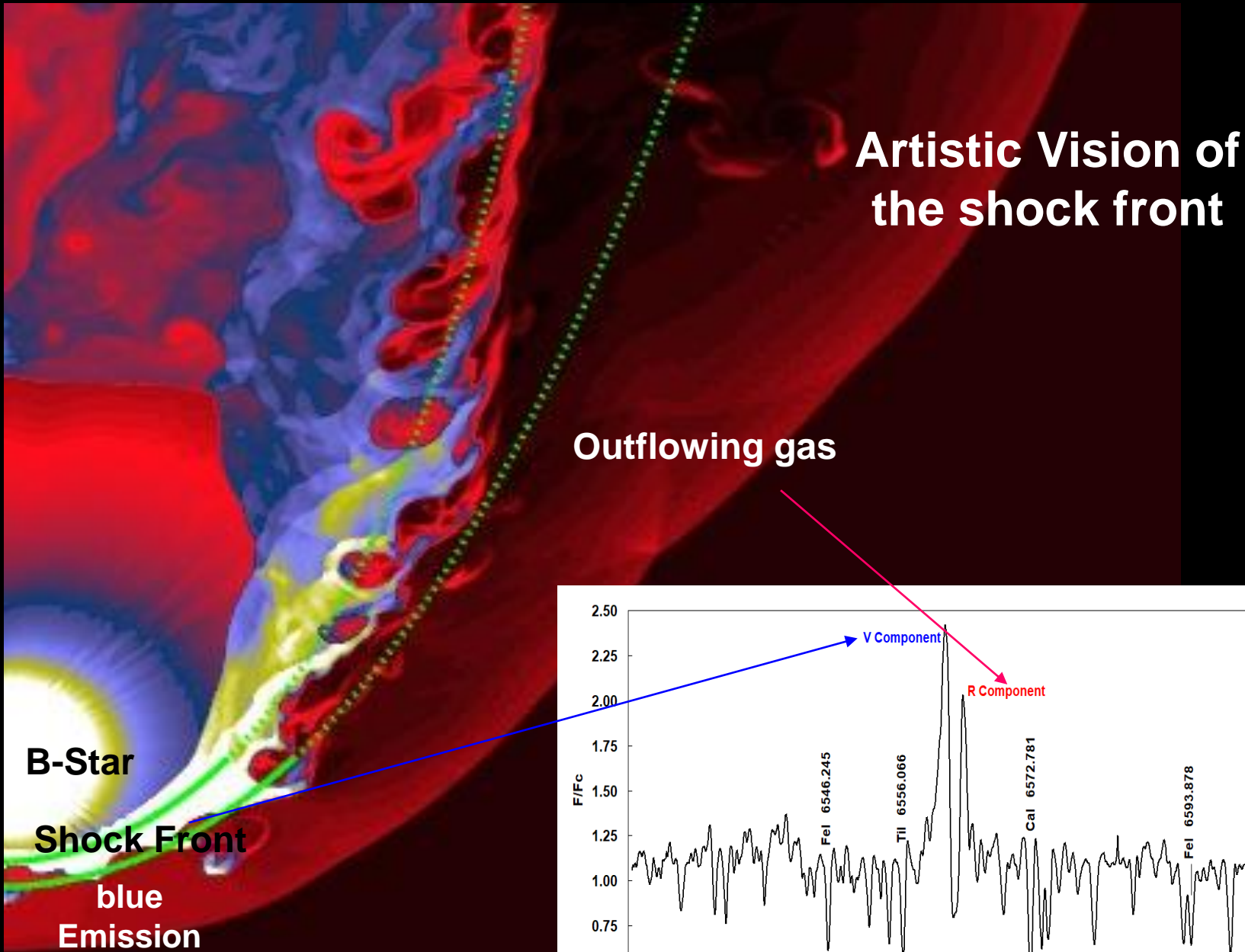
Aktive SPektroskopie in der Astronomie

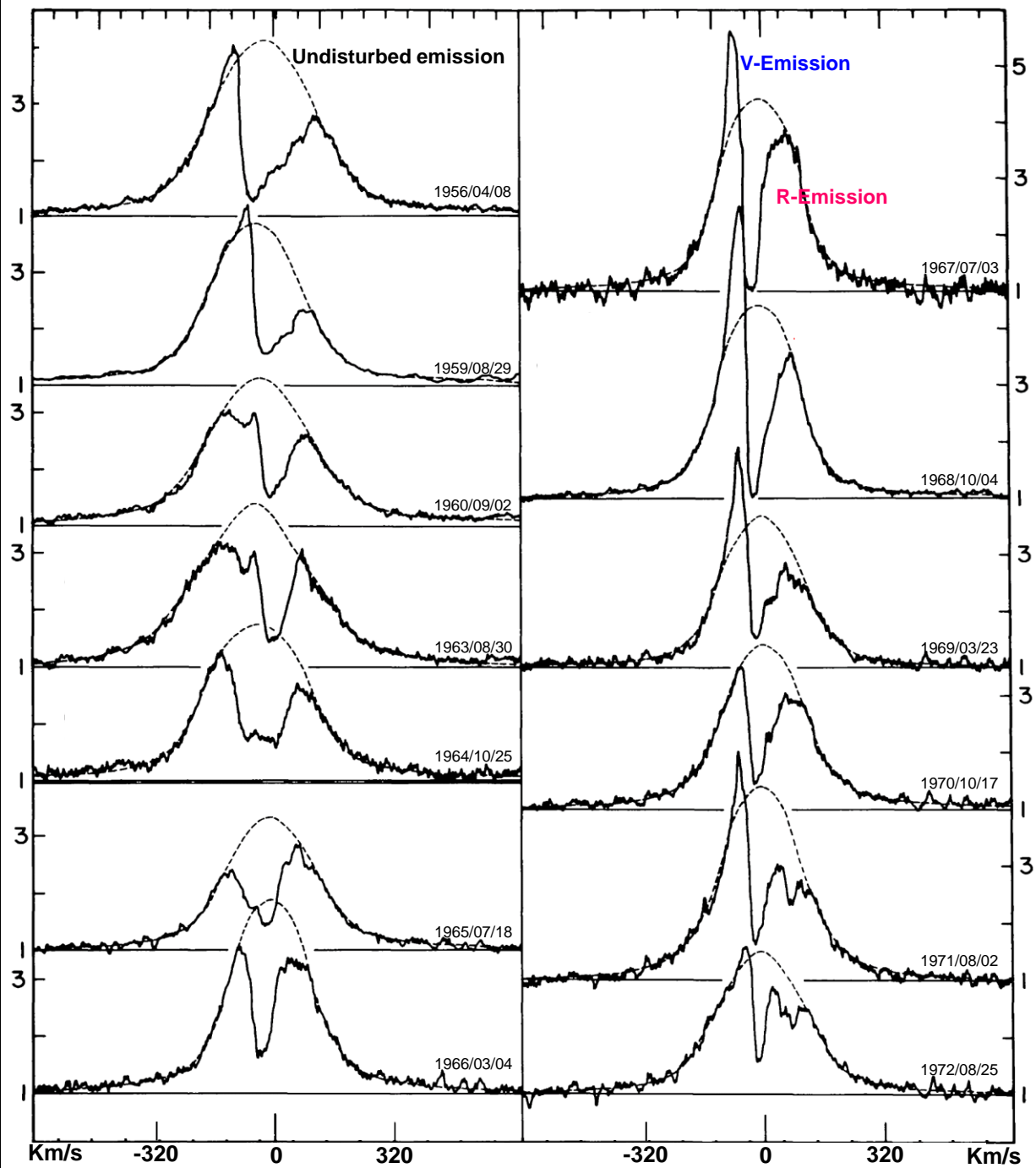
<http://www.astrospectroscopy.de>

VV Cep
1999 June 17



(aus: "Giants of Eclipse: The zeta Aur Stars and Other Binary Systems" Springer 2015, by Ph. Bennett & Wendy Hagen Bauer),



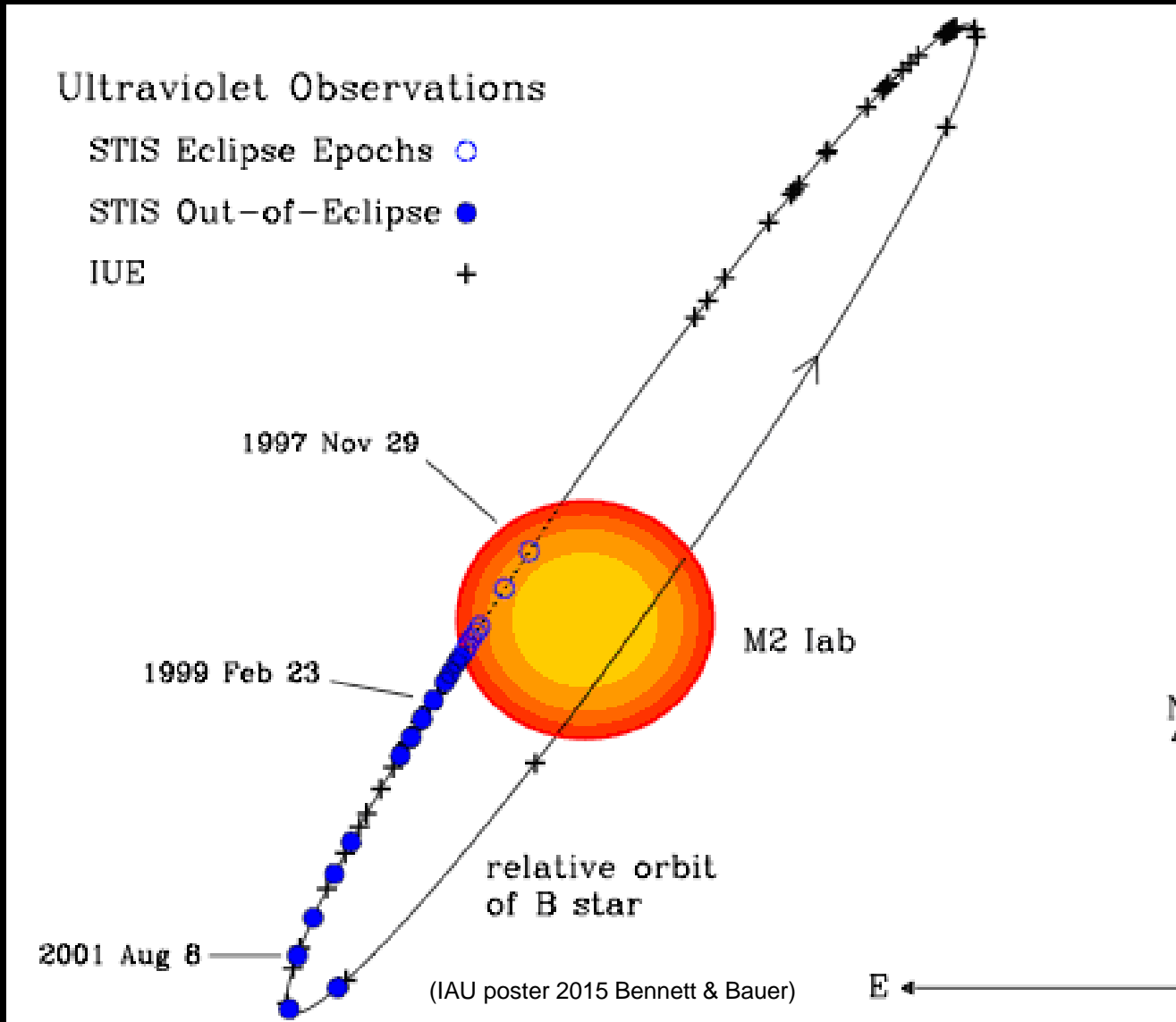


The H α emission profile of the shock front

(aus: Wright, 1977)

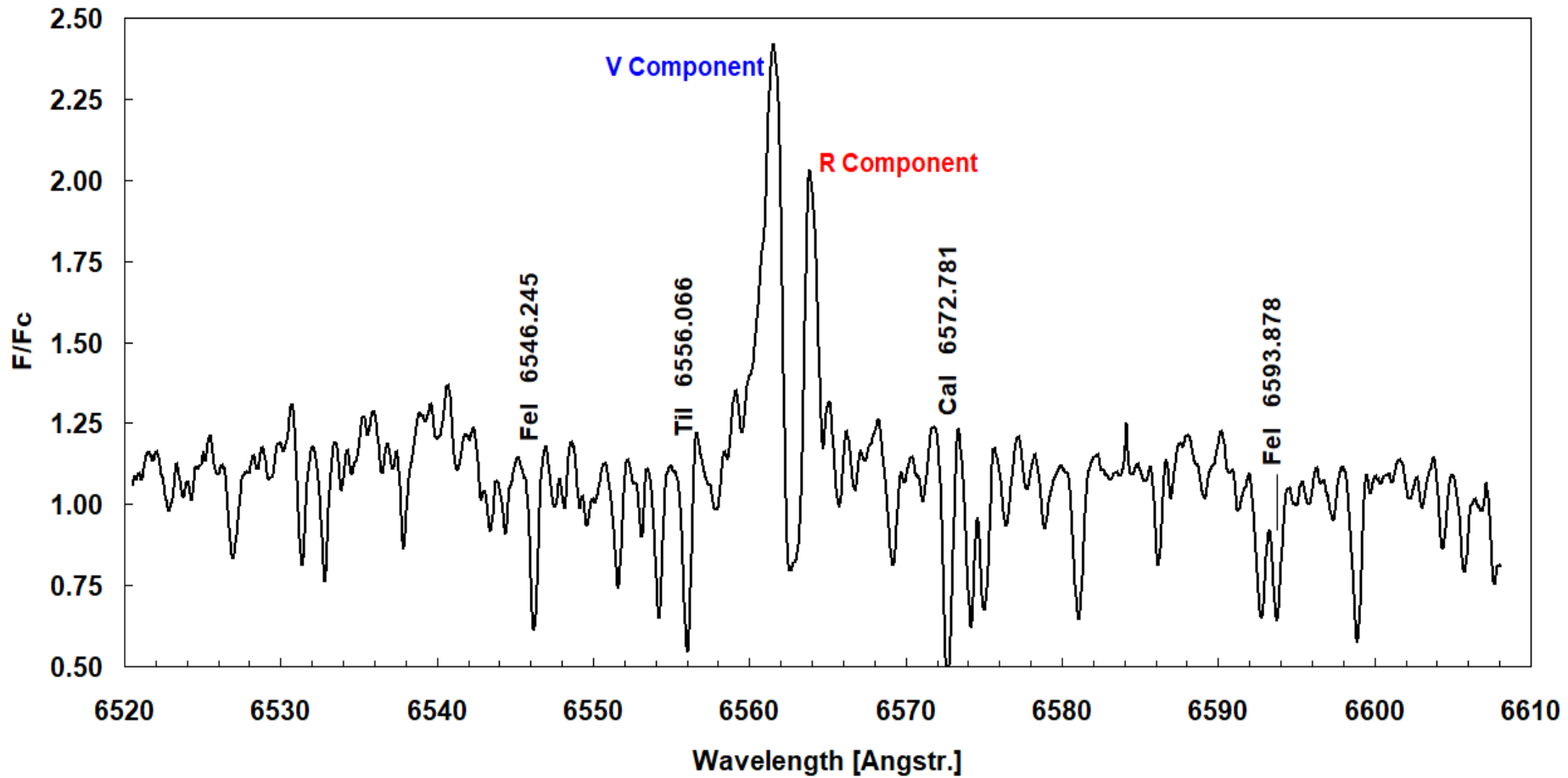
The orbit of VV Cephei as seen on the sky

The positions of the companion at the times of 21 satellite observations are marked

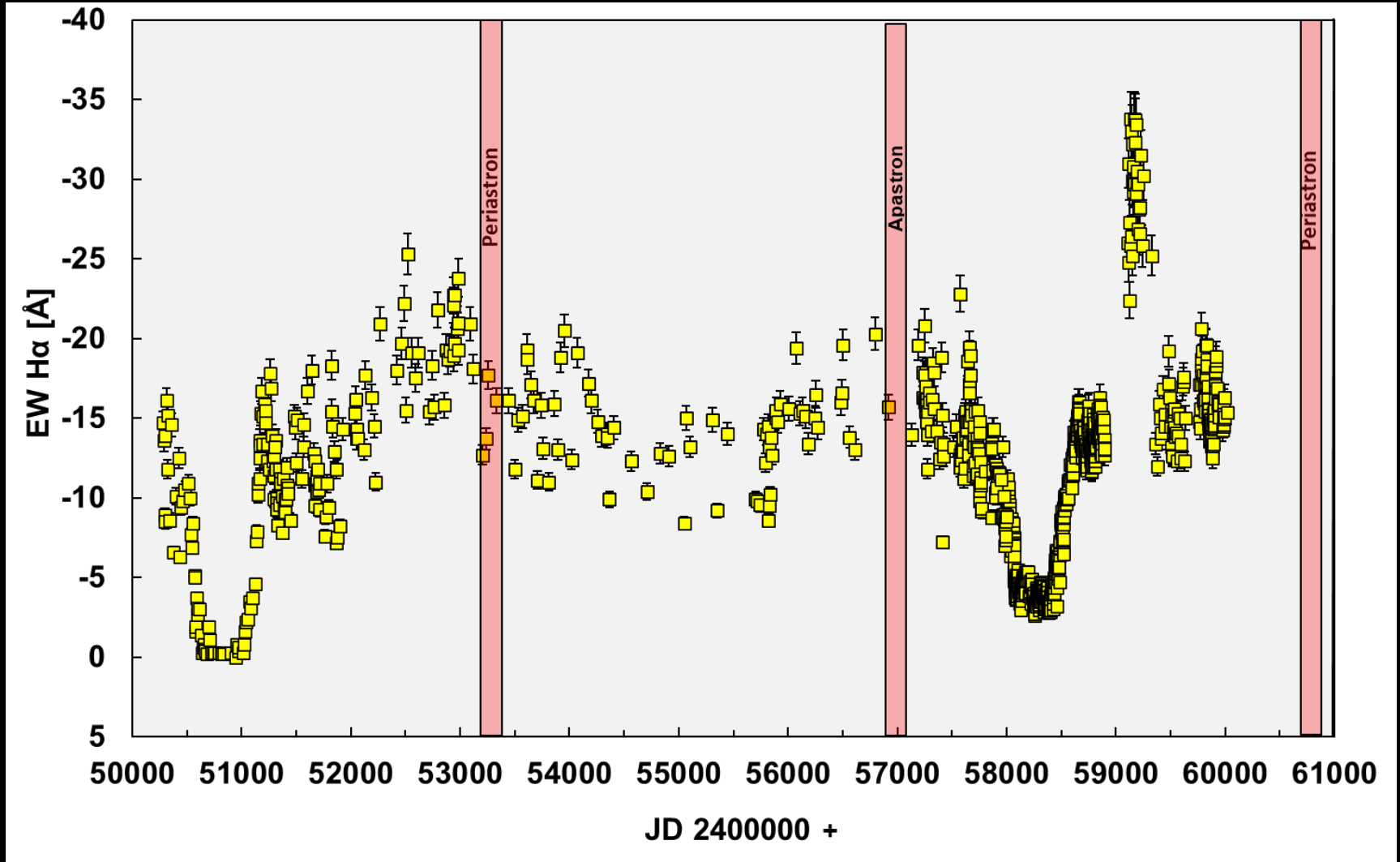


Double peak profile of the H α Emission

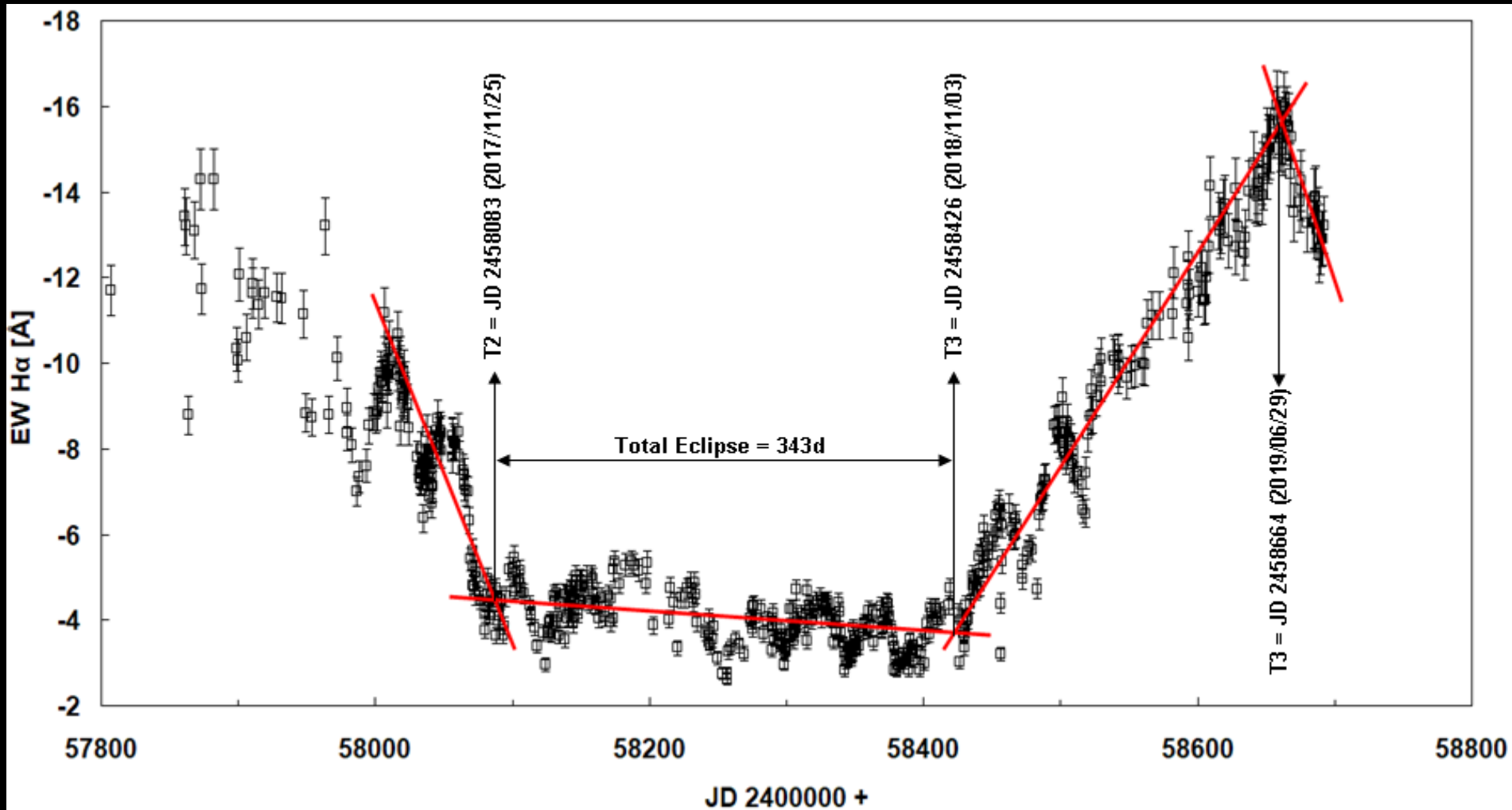
V & R components have different origins

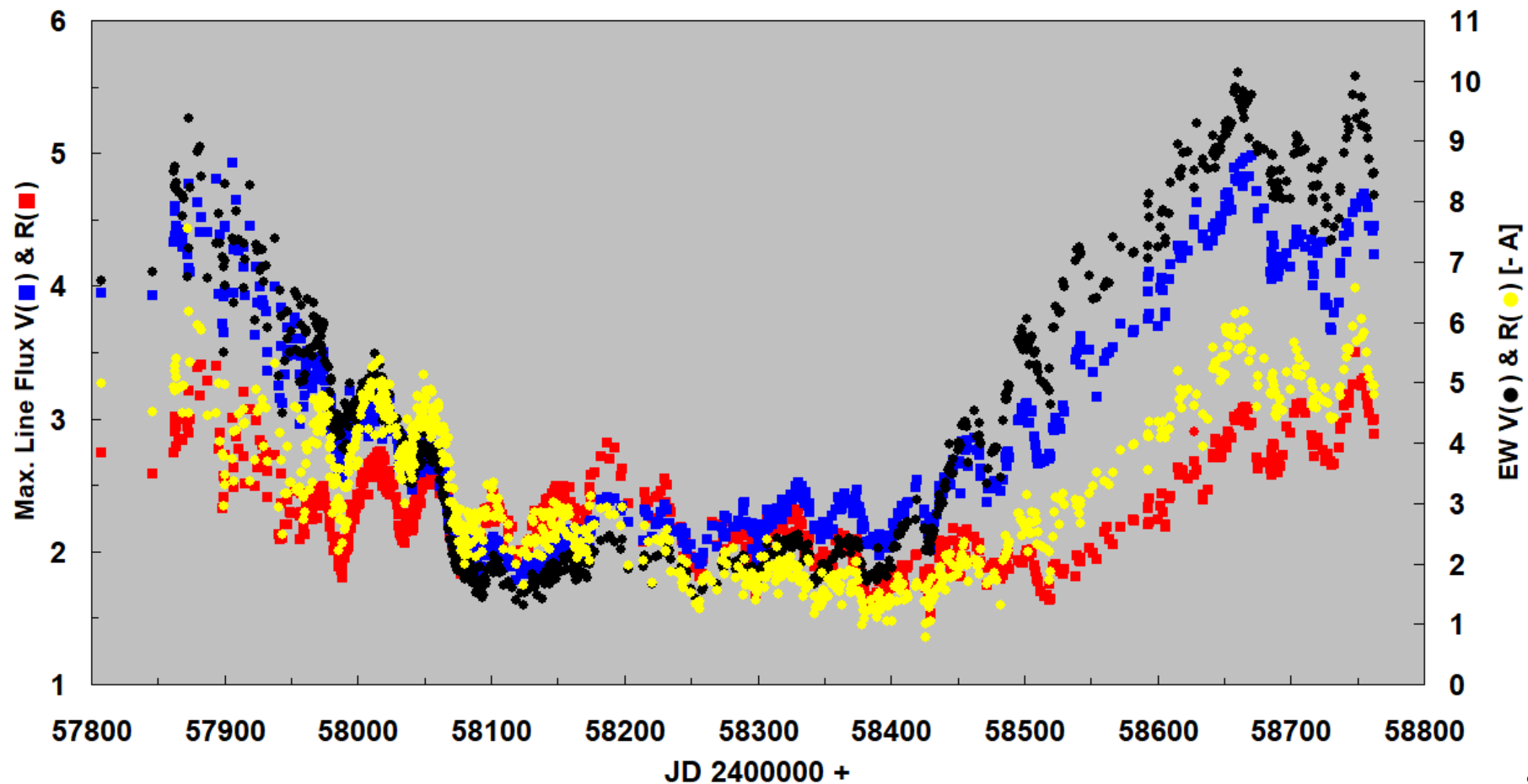
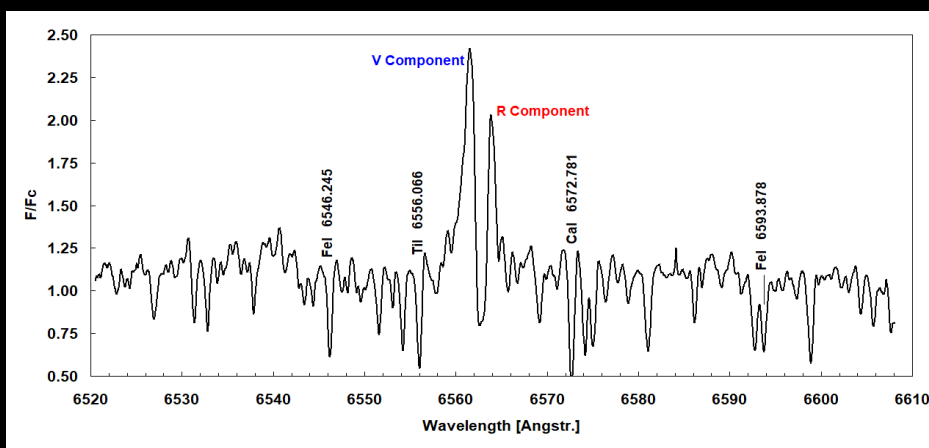


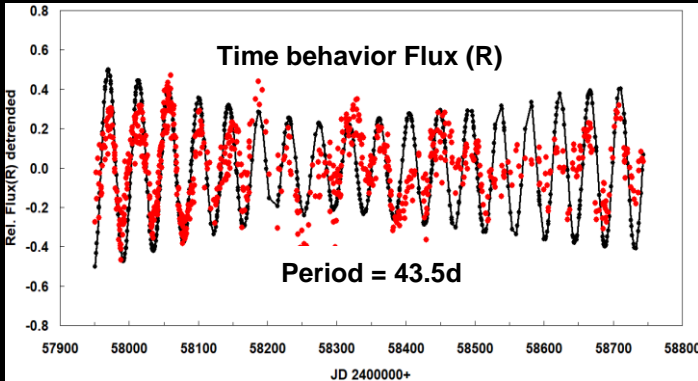
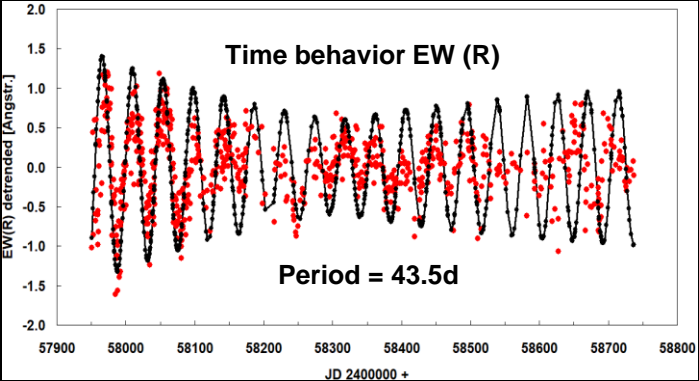
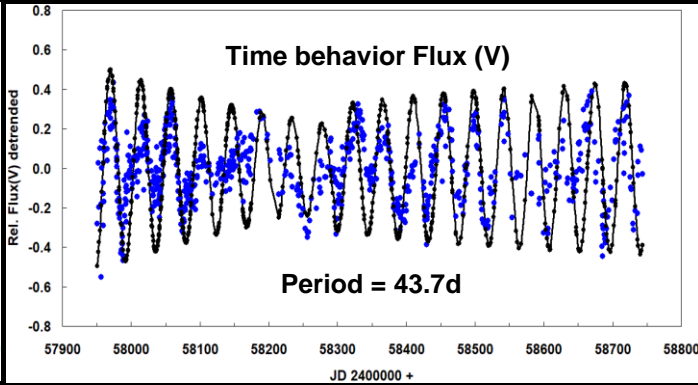
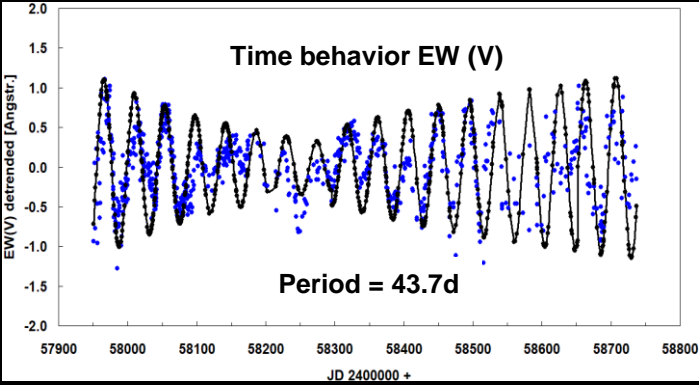
Monitoring H α EW since 1996 to January 2023



Cyclic short-term variability of the H α emission during total eclipse

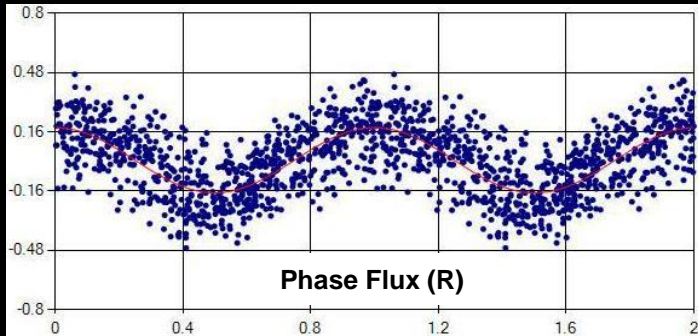
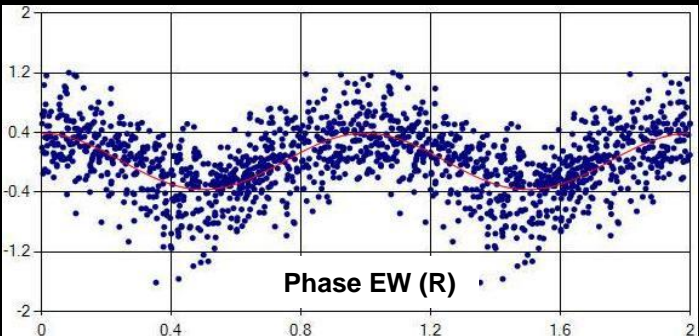
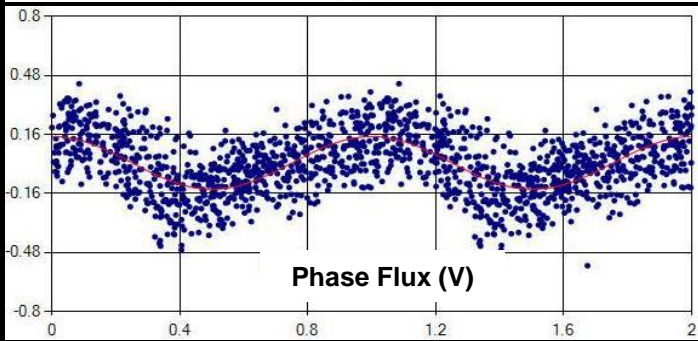
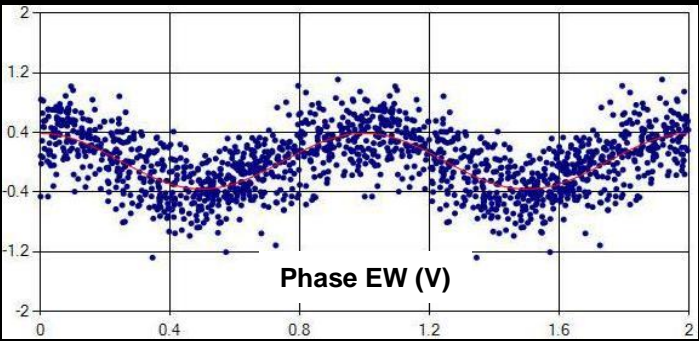




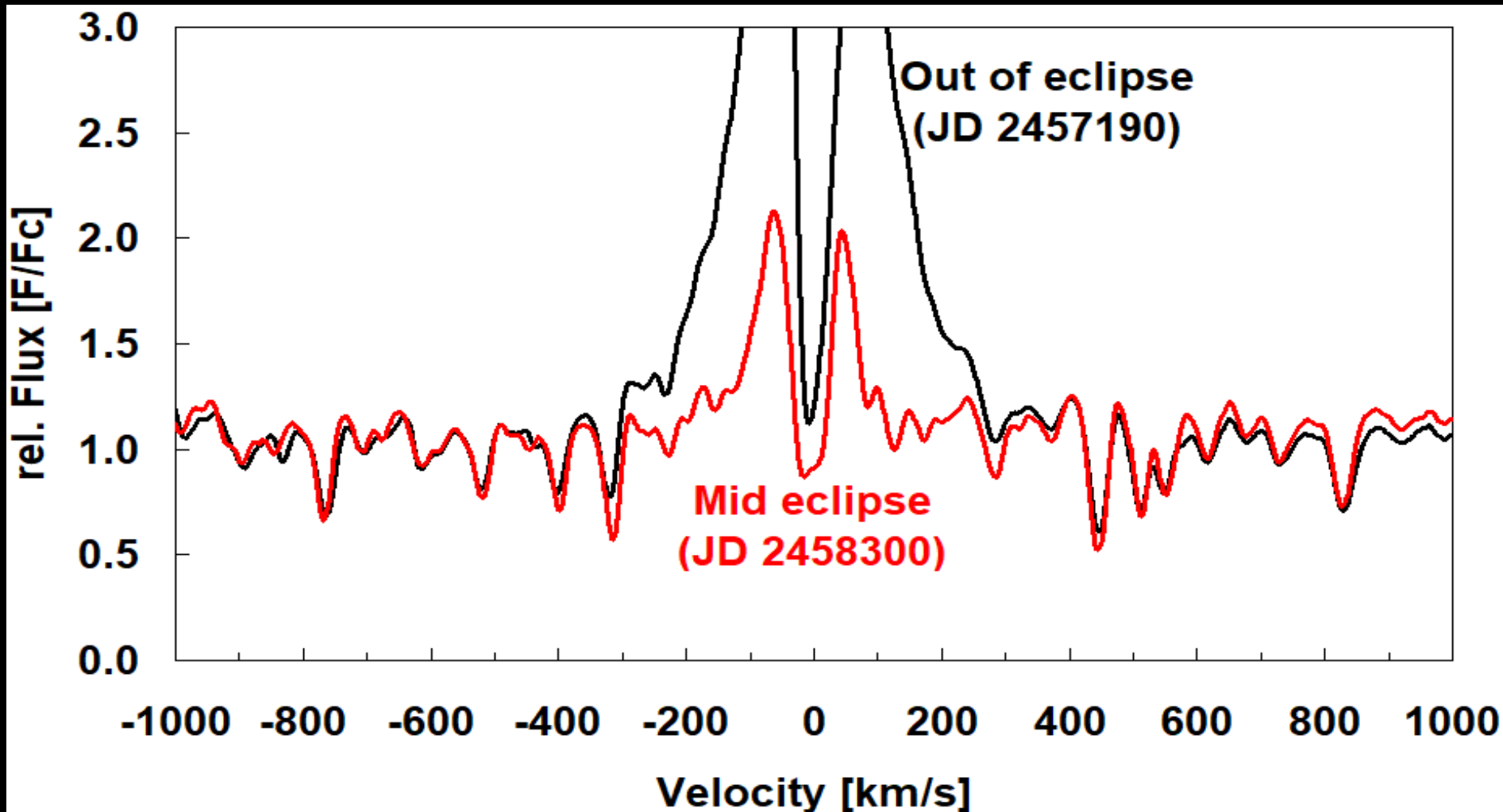


Periodic Variability

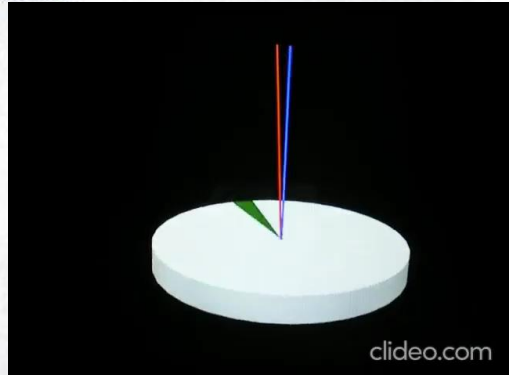
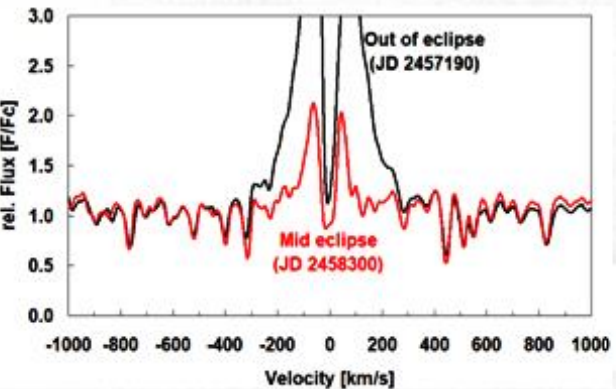
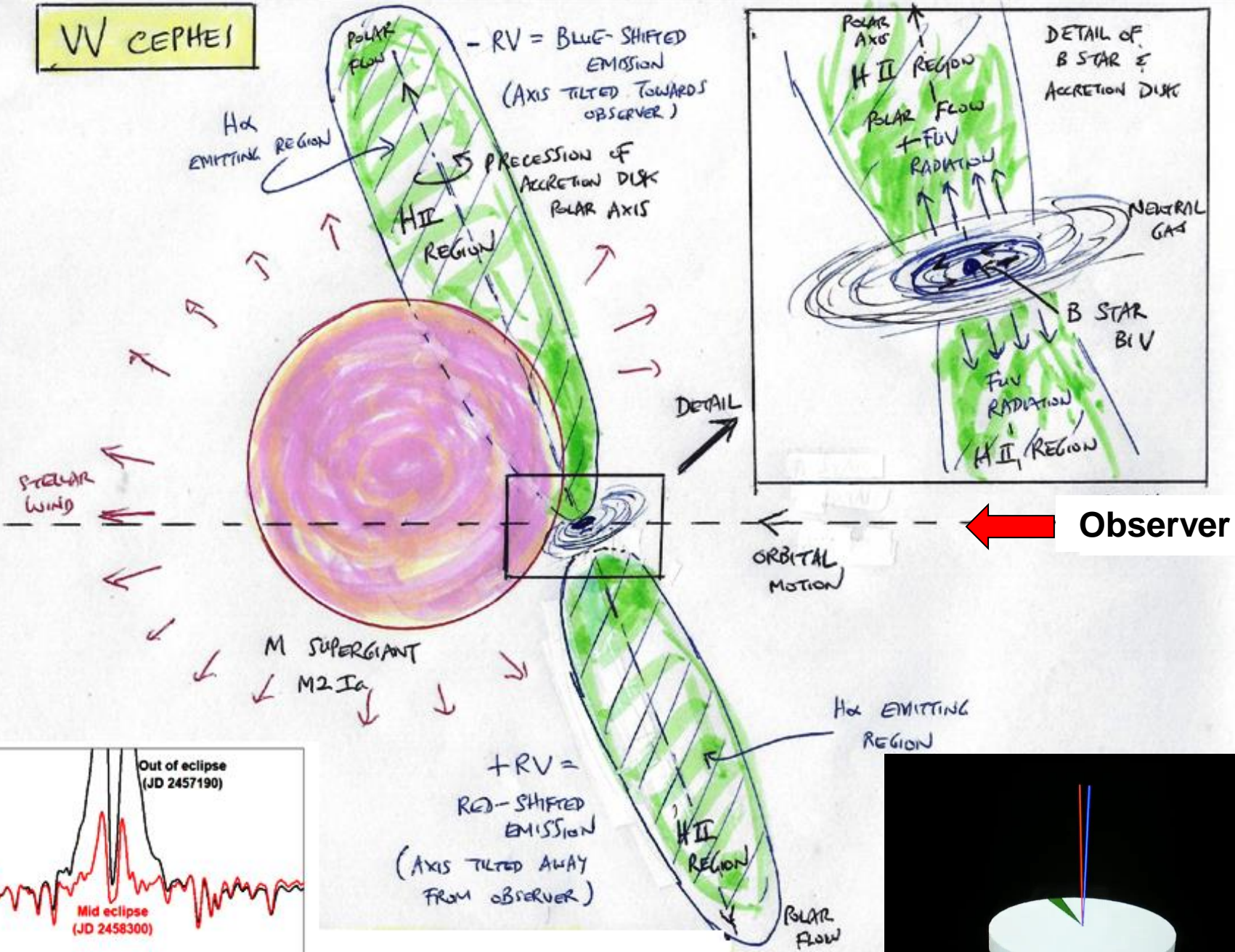
EW (left)
Flux (right)

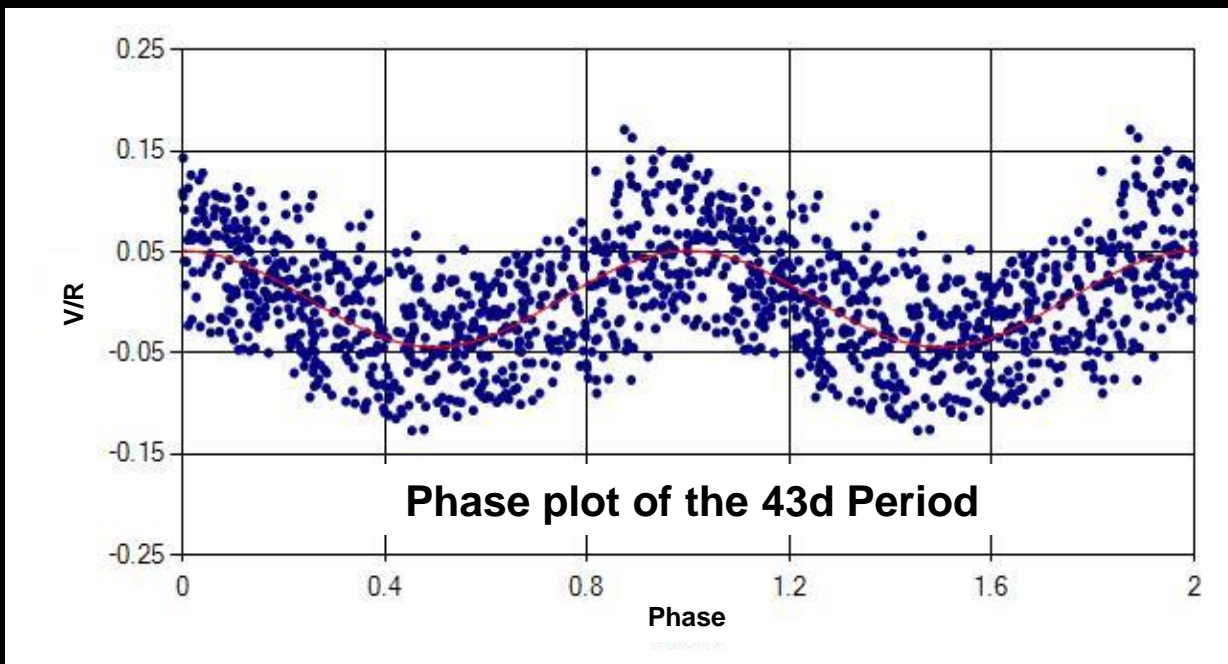
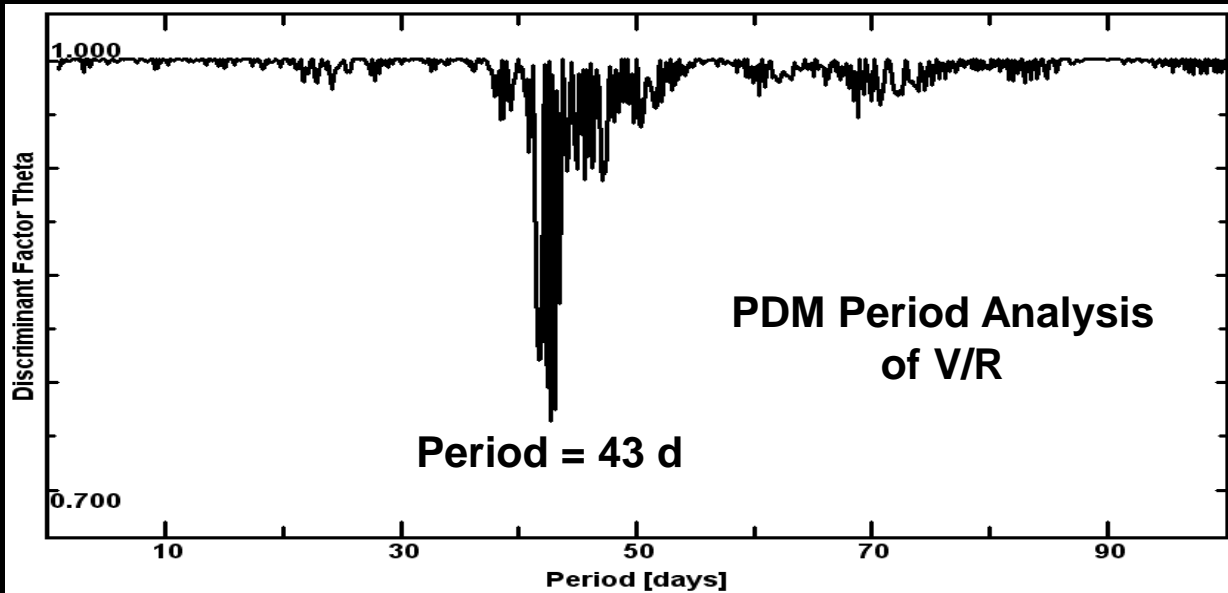


Significant narrower profile shape during total eclipse
implies low-velocity emission source far from accretion disk

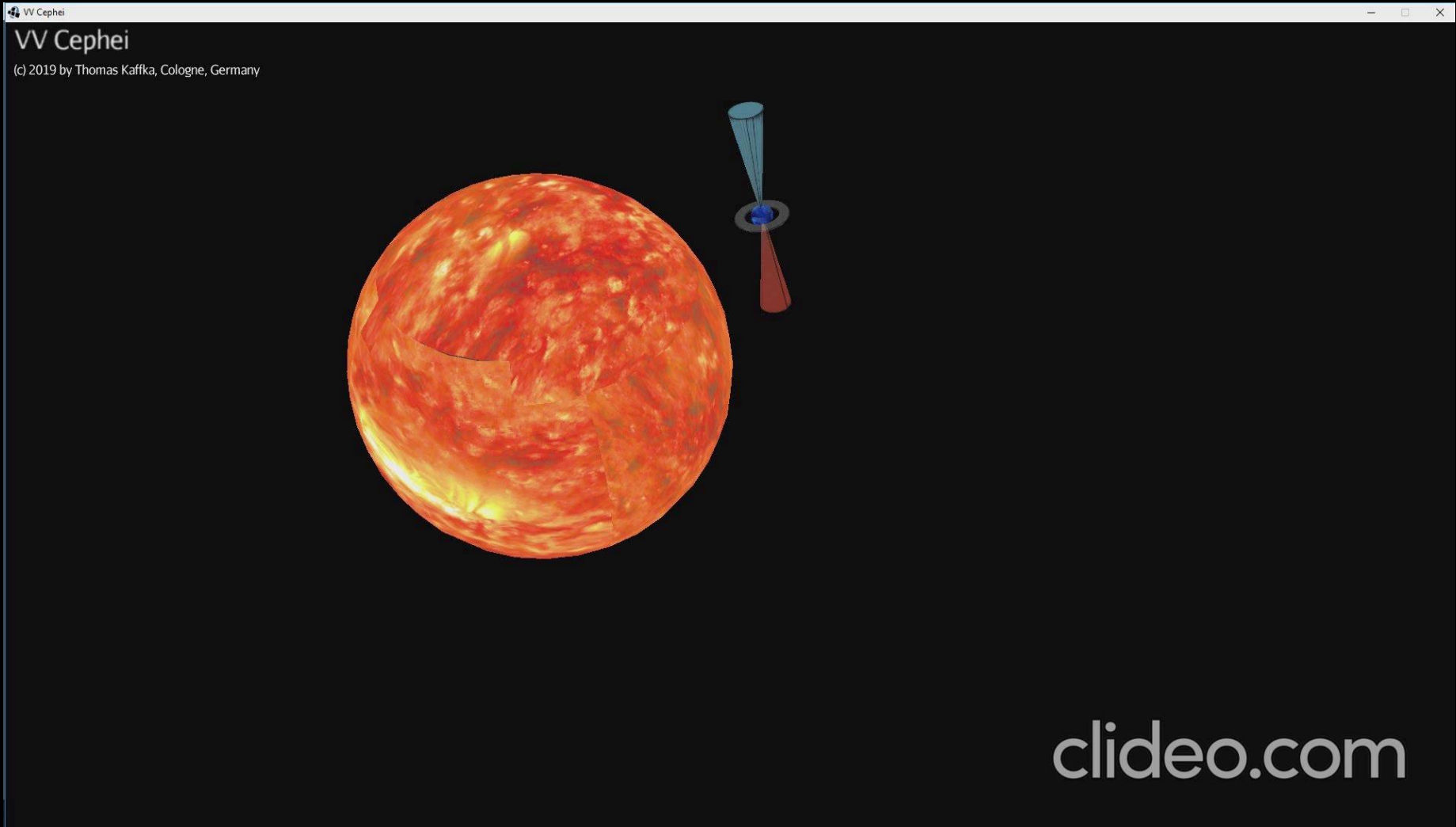


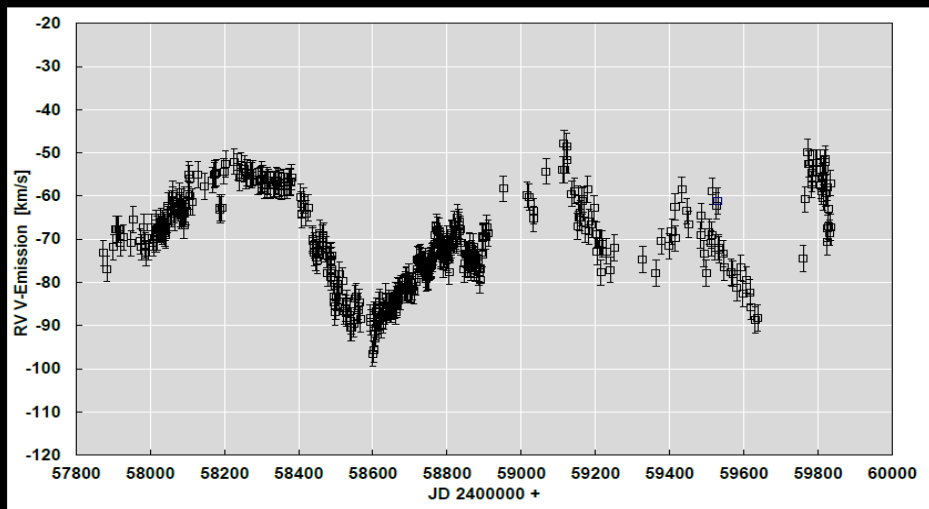
VV CEPHEI





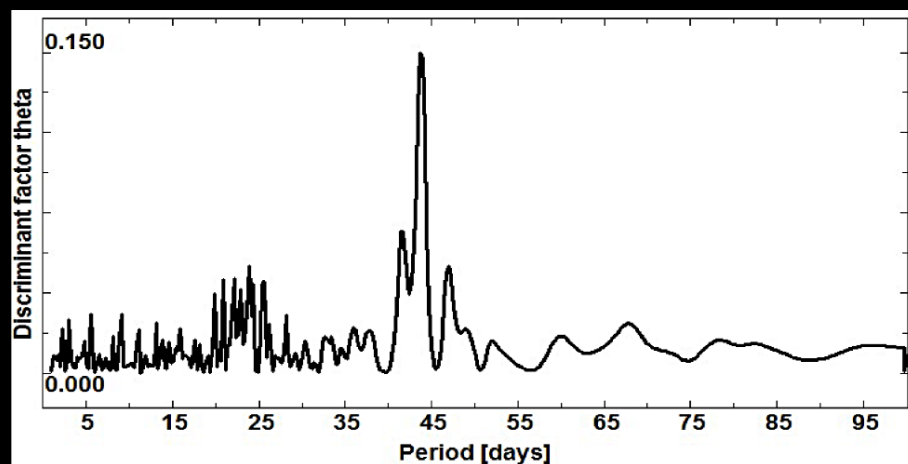
Libration of the B star's rotation axis on the orbit around the M star.
V and R emission lobes follows this movement (Fig. not to scale)



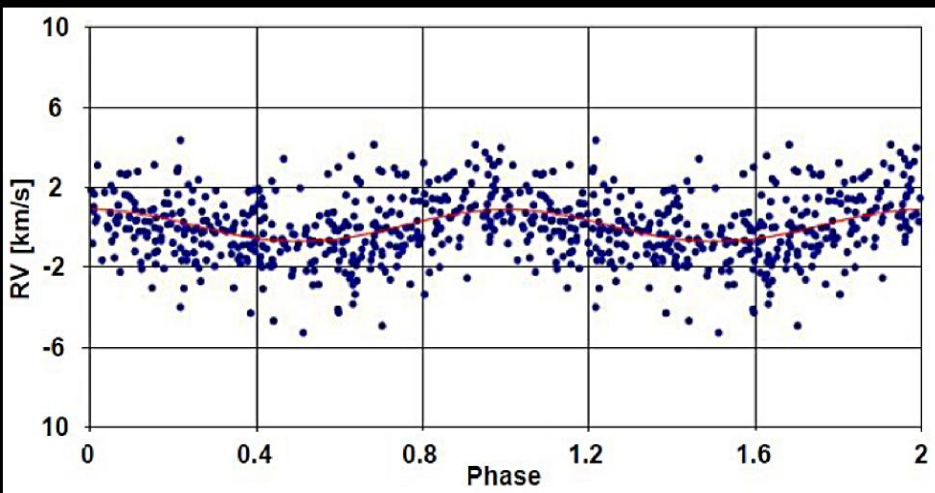


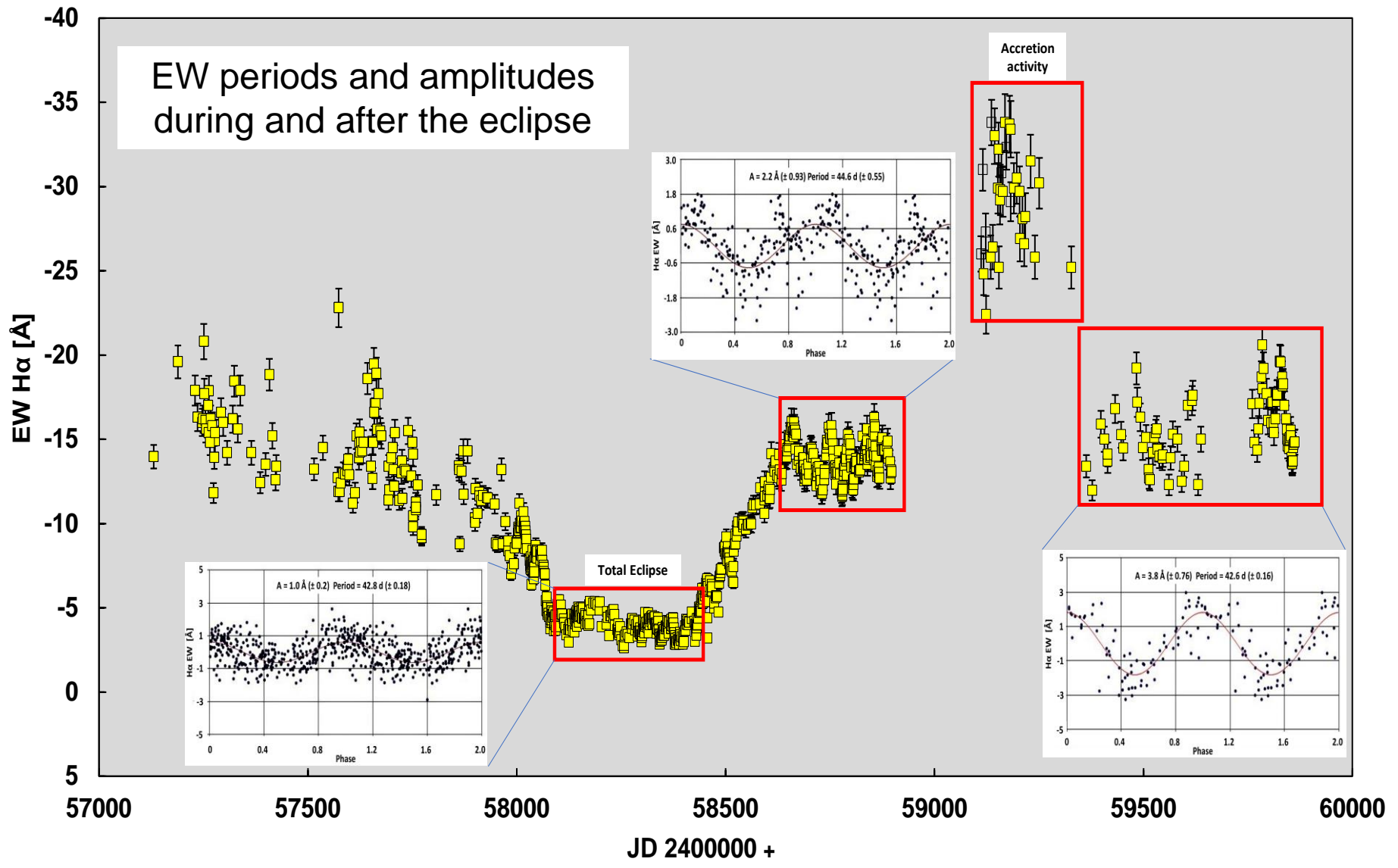
Radial velocity of the V-component

Period Analysis
Period = 43.8 d



Phase plot of the 43.8d Period



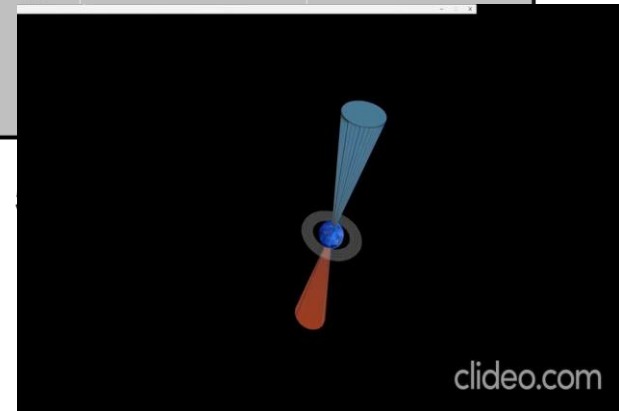
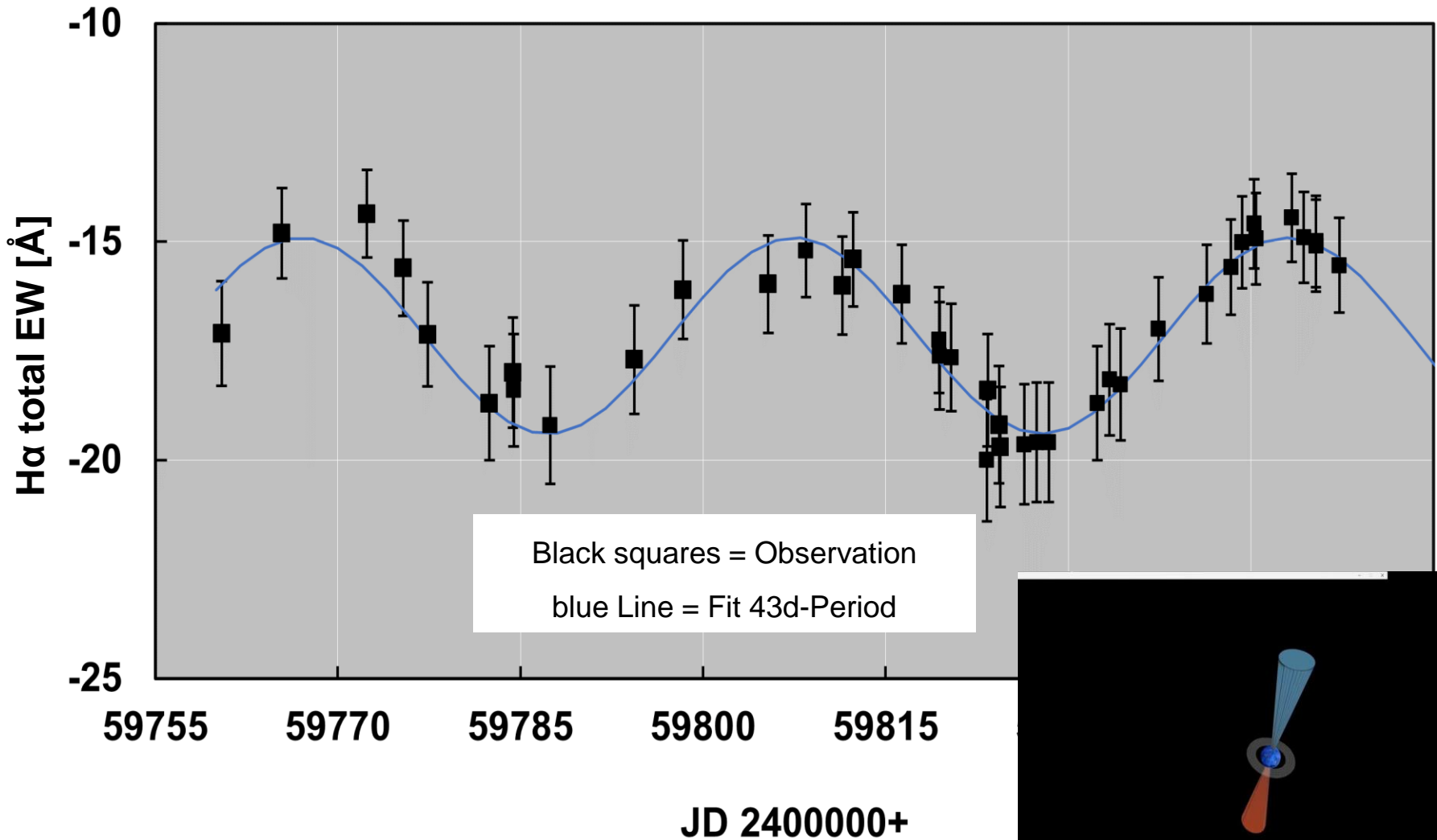


Time section	Hα-EW Amplitude [\AA]	Period [d]
JD 2458068-58441	1.0 (\pm 0.2)	42.8 (\pm 0.18)
JD 2458663-58897	2.2 (\pm 0.93)	44.6 (\pm 0.55)
JD 2459363-59637	3.8 (\pm 0.76)	42.6 (\pm 0.16)

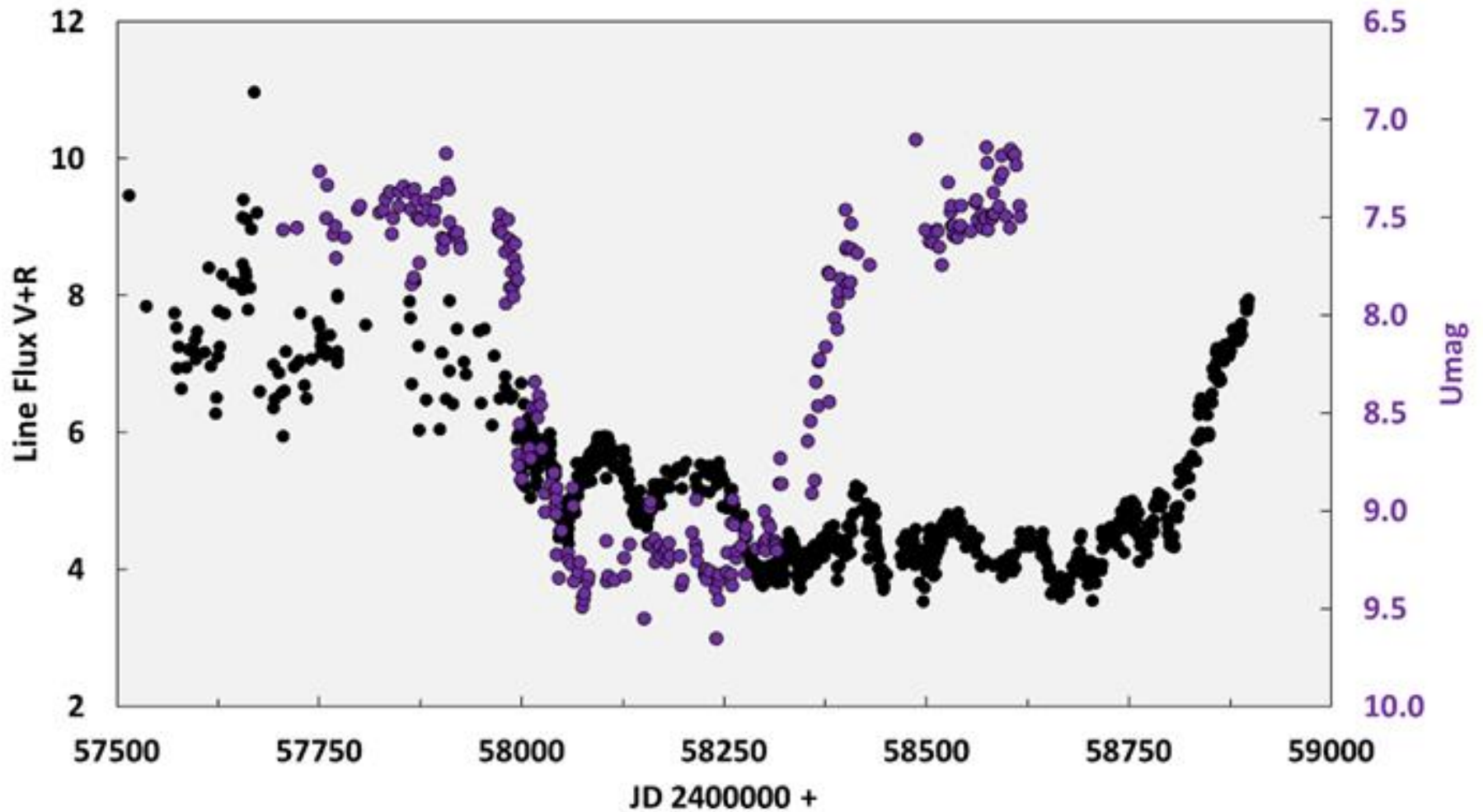
The average 43.3 d (\pm 0.3) period of all three sections is now in excellent agreement with the V/R period of 43 d and the 43.8 d of the radial velocity.

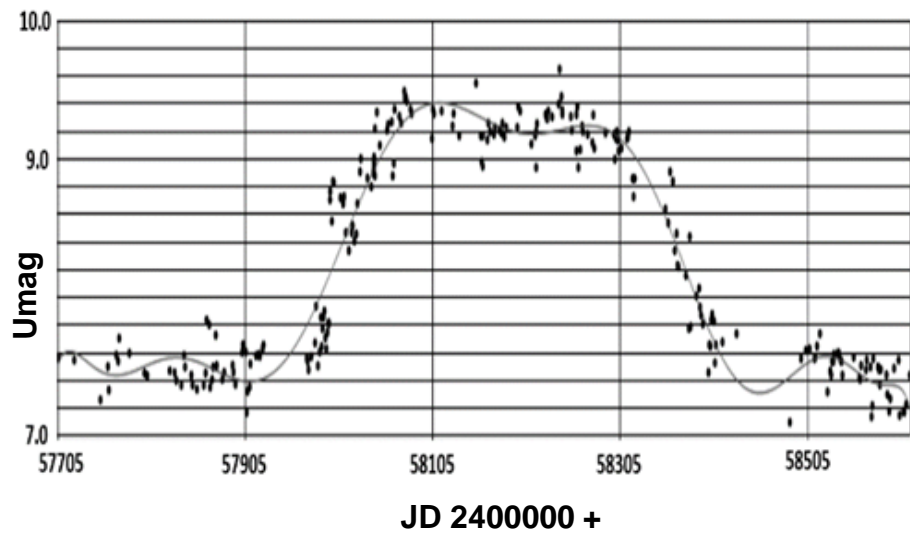
43-day Precession of the total EW

J. Guarro (Spain), A. Stiewing (USA), E. Bryssinck (Belgium), E. Bertrand (France),
A. Maetz (France), K. Alich (Schweiz) E. Pollmann

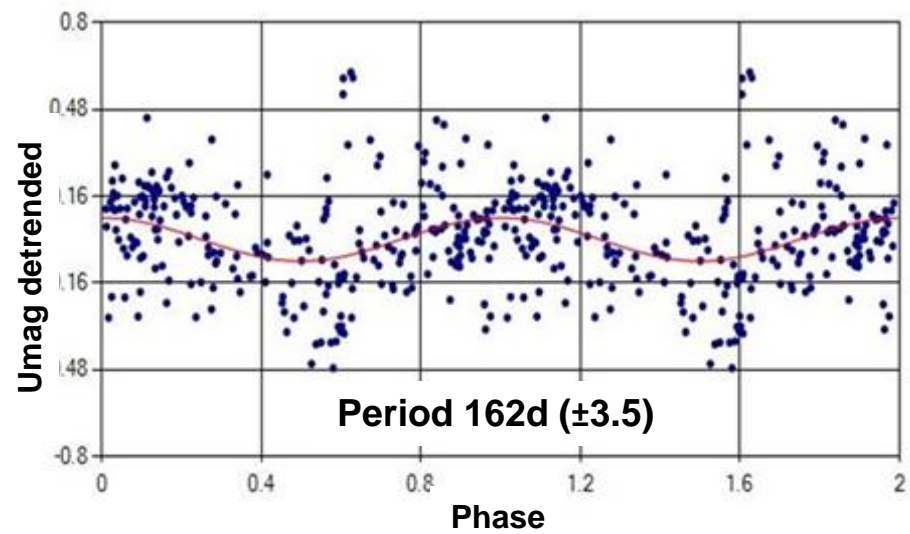


H α Flux (V+R) and U α mag (UV flux) during eclipse

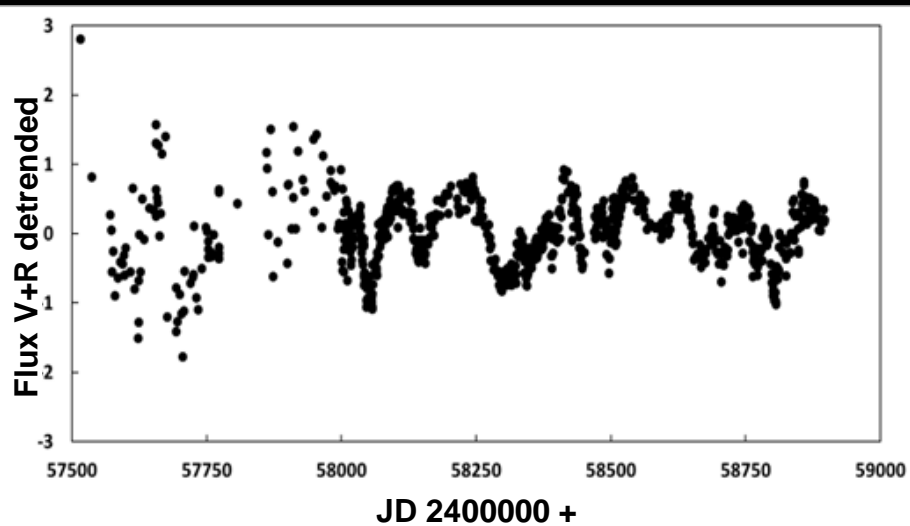




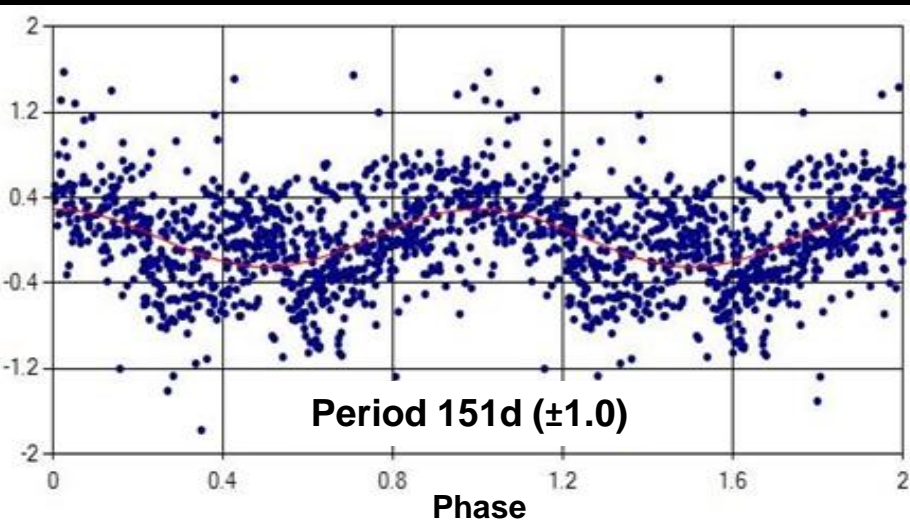
Umag measurements during total eclipse



Period analysis of the detrended data (polynomial degree 15)



Flux V+R polynomal detrended (degree 3)



Period analysis of the detrended data