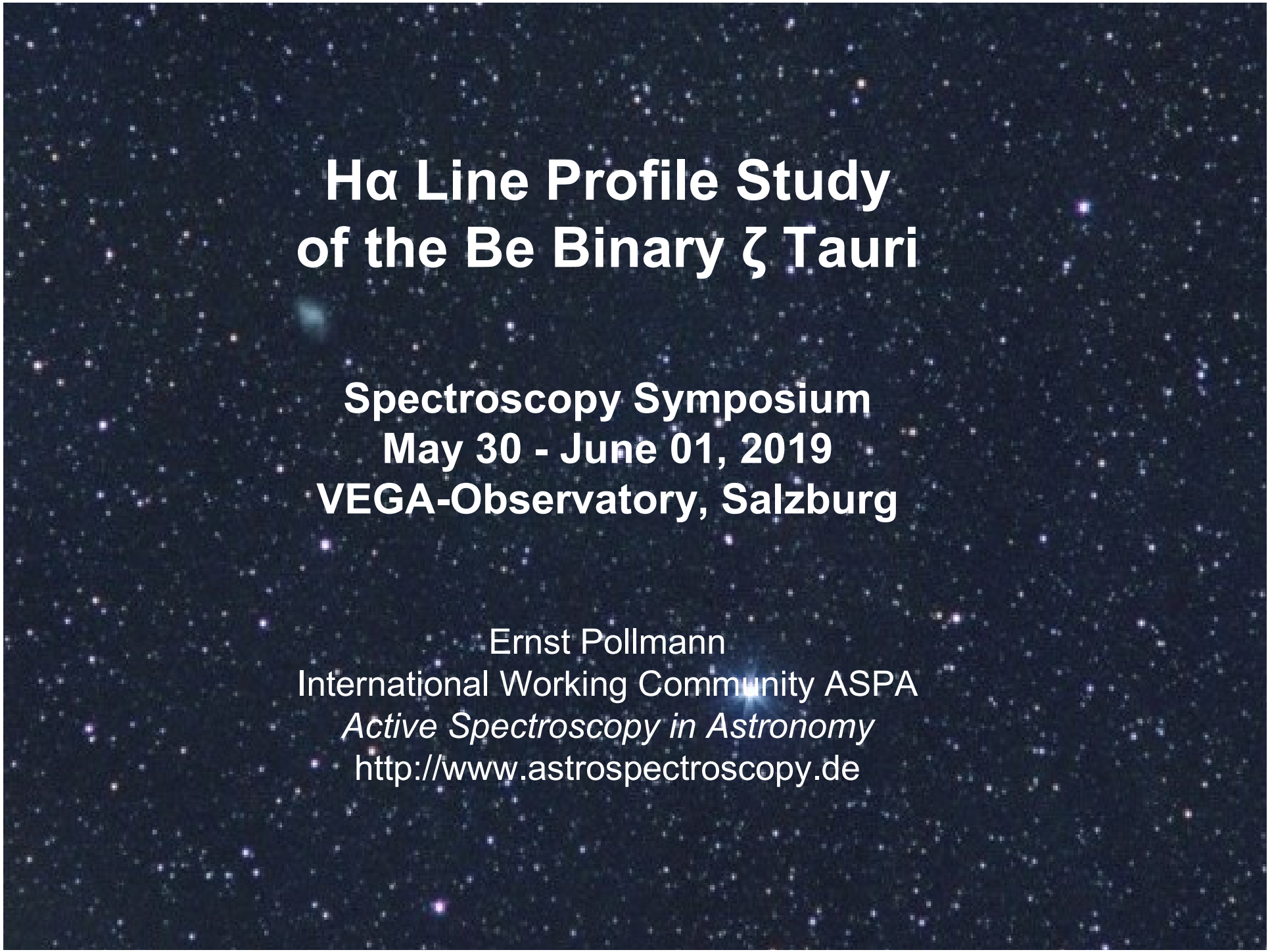
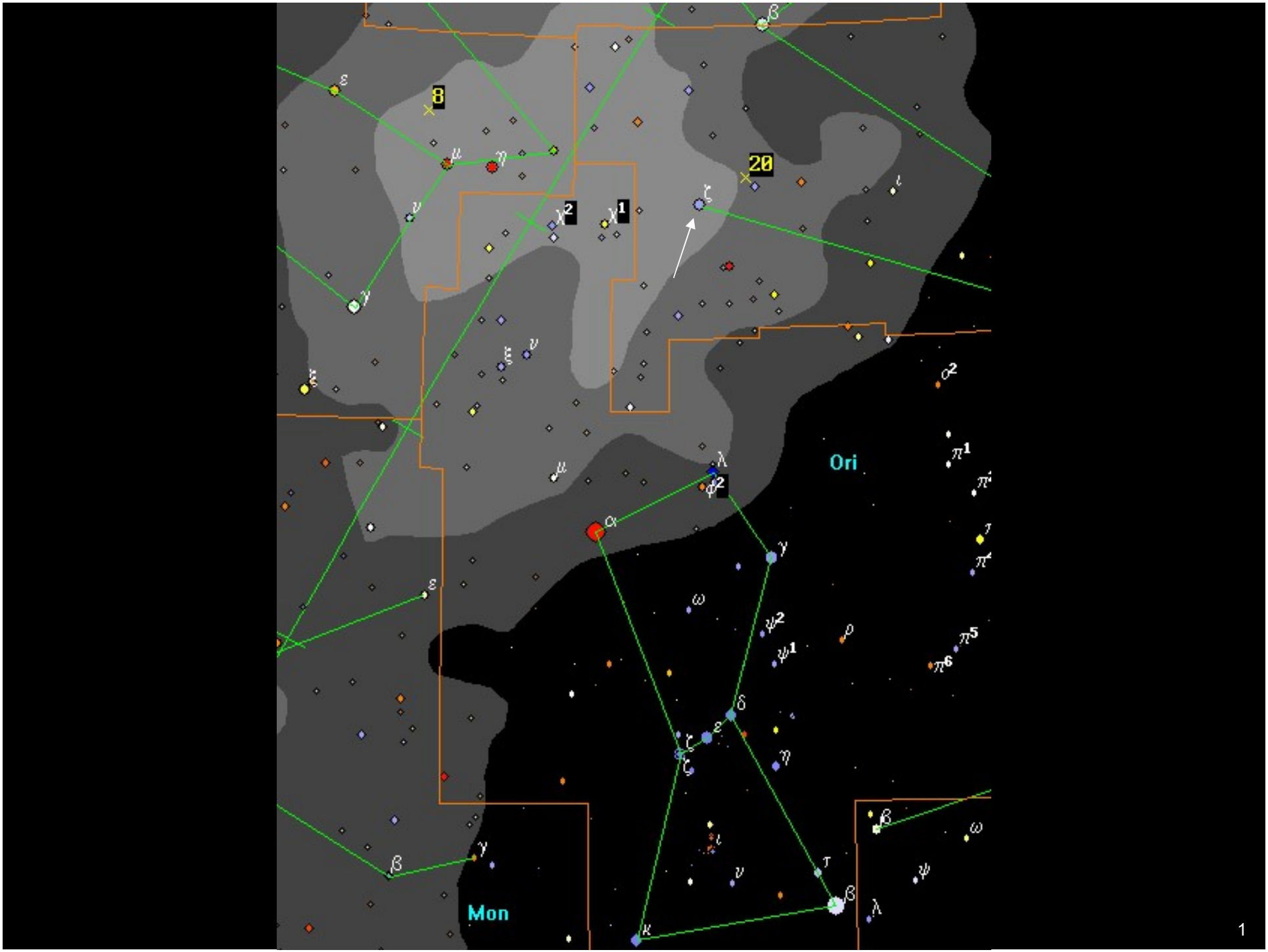


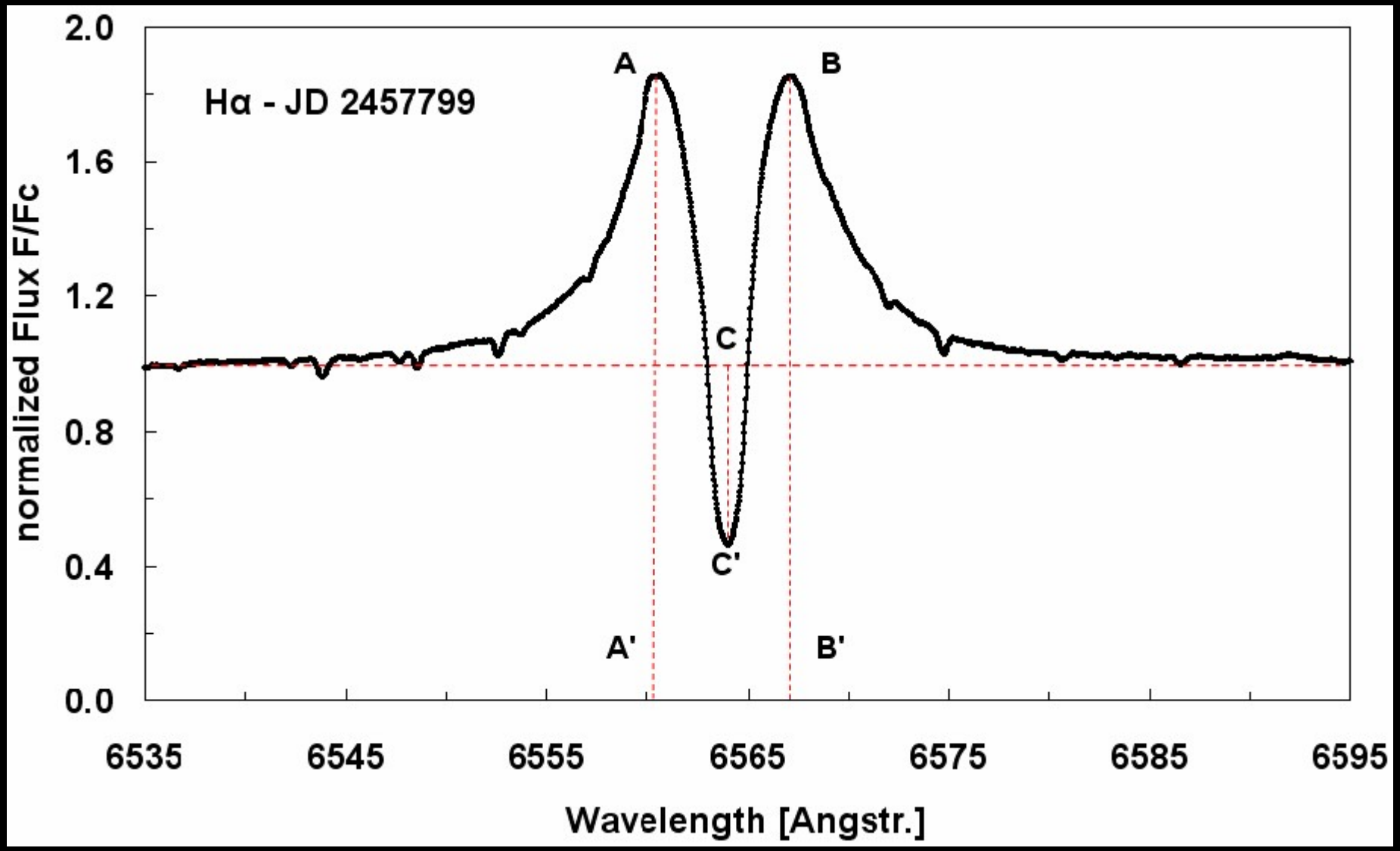
Hα Line Profile Study of the Be Binary ζ Tauri

Spectroscopy Symposium
May 30 - June 01, 2019
VEGA-Observatory, Salzburg

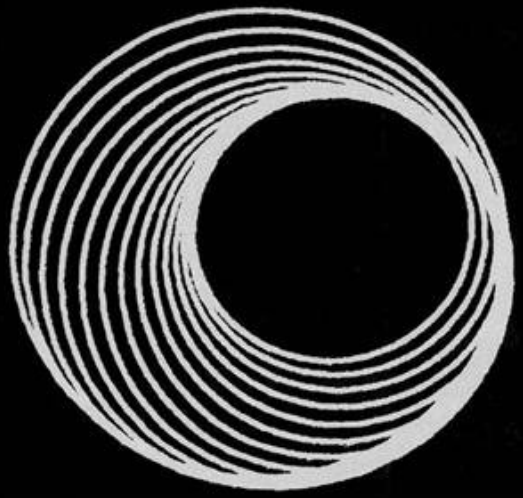
Ernst Pollmann
International Working Community ASPA
Active Spectroscopy in Astronomy
http://www.astrospectroscopy.de


Ori
Mon

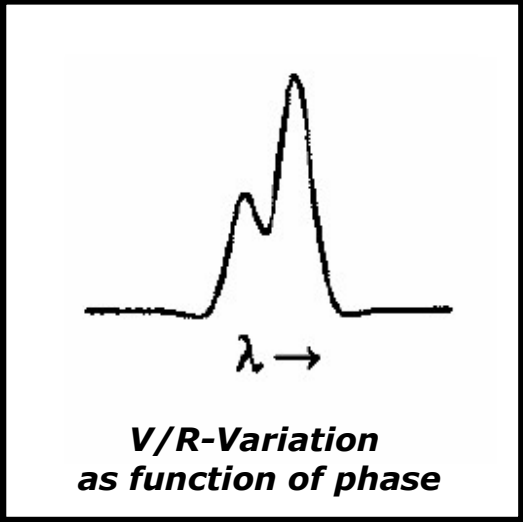
Profil elements of the Hα-Emission in ζ Tau



Variability of the Hα Double Peak profile of ζ Tau



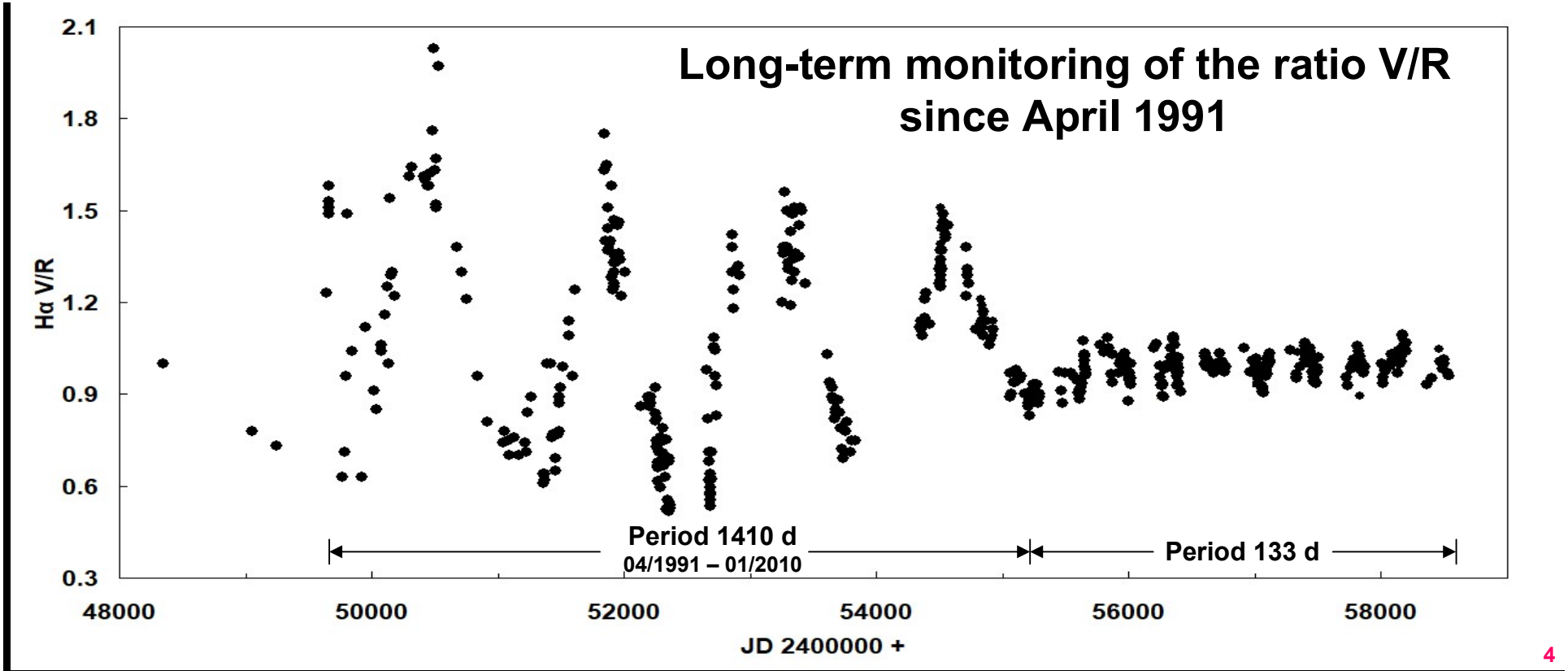
Observer

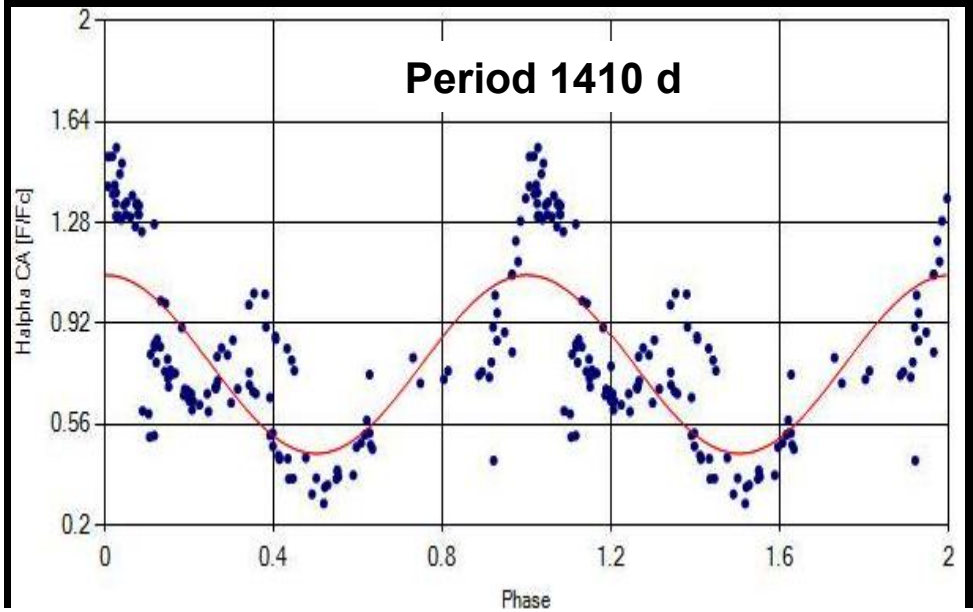


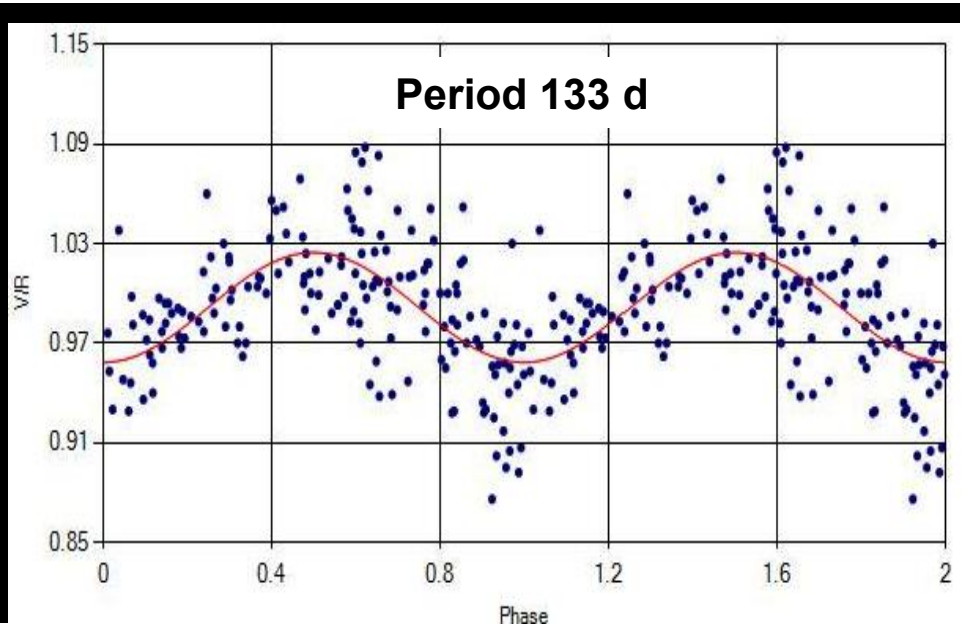
V/R-Variation as function of phase

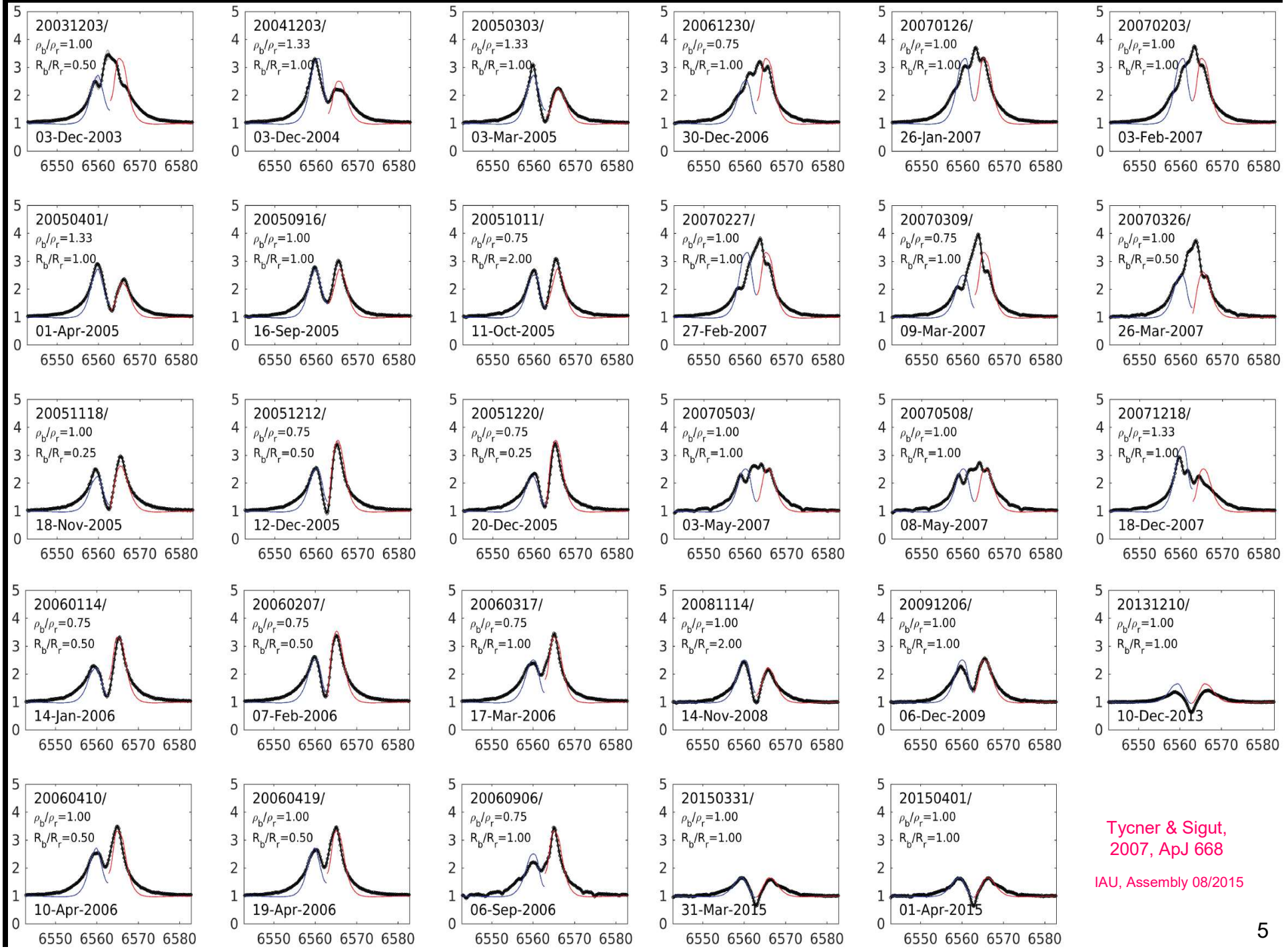
Caused by a radial perturbation, the gas atoms moves on eccentric orbits, creating an one-armed density wave in its common periastron.
This global pattern remains stable.

In ζ Tau, this density wave preceedes around the central star with a period of about 1400 - 1500 days


Long-term monitoring of the ratio V/R since April 1991
Hα V/R
2.1
1.8
1.5
1.2
0.9
0.6
0.3
48000
50000
52000
54000
56000
58000
JD 2400000 +
Period 1410 d
04/1991 – 01/2010
Period 133 d


Period 1410 d
Halpha CA [F/Fc]
2
1.64
1.28
0.92
0.56
0.2
0
0.4
0.8
1.2
1.6
2
Phase


Period 133 d
V/R
1.15
1.09
1.03
0.97
0.91
0.85
0
0.4
0.8
1.2
1.6
2
Phase

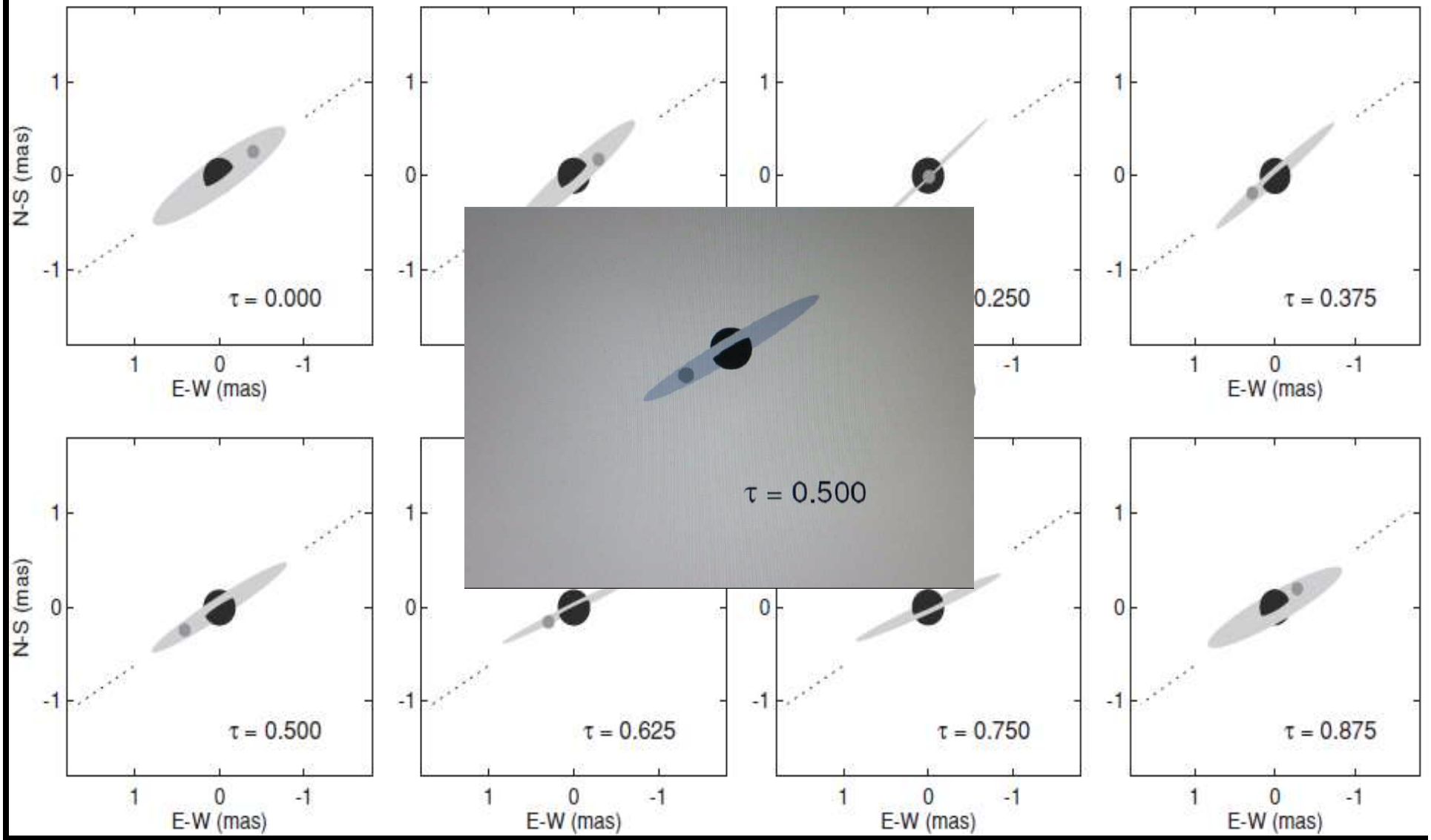


Tycner & Sigut, 2007, ApJ 668

IAU, Assembly 08/2015

Precession of the Be star disk in ζ Tauri

Schaefer et al. The Astron. Journal, 140, 2010

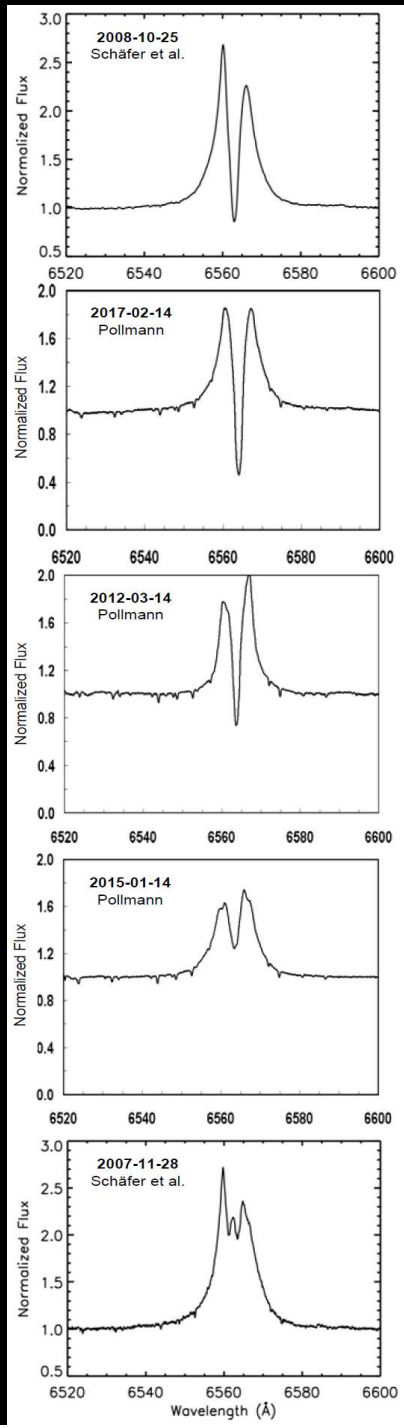


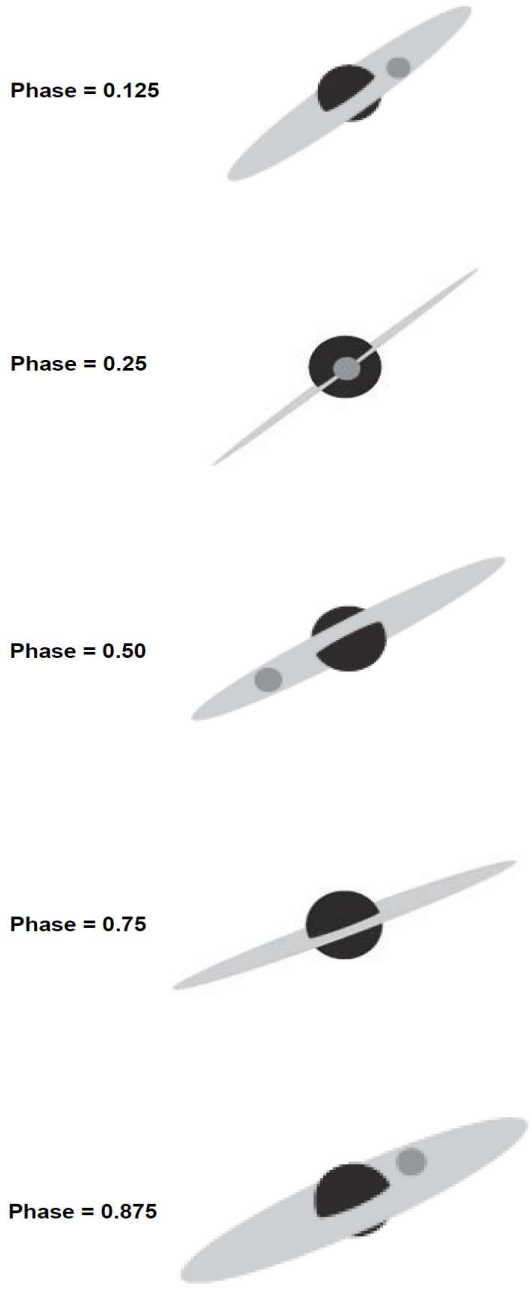
Calculation of the nodding period Pn

(Schaefer et al., AJ, 140, 1838, 2010)

$$P_n = \frac{1}{2} \frac{P_p P_b}{P_p - P_b},$$

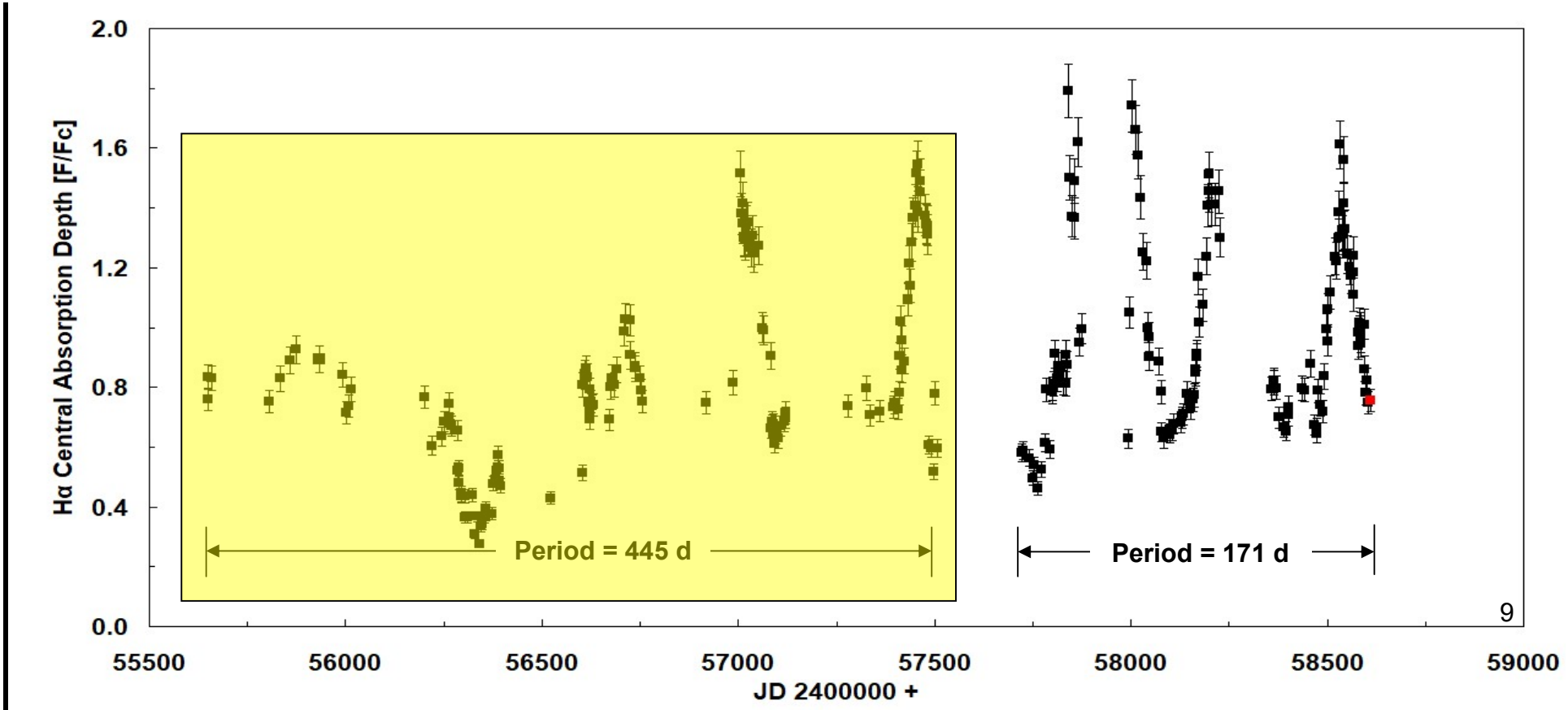
Pp = precession period
Pb = orbital period

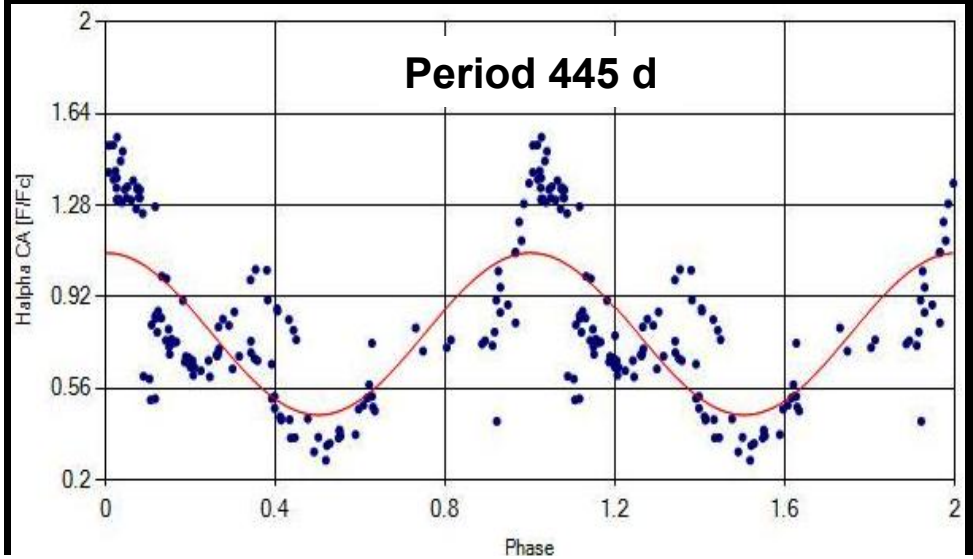


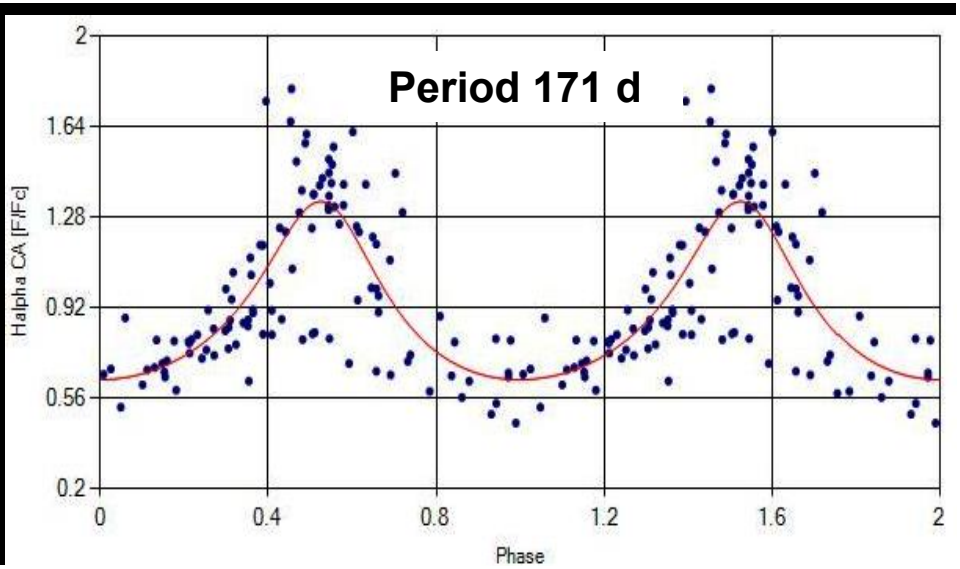


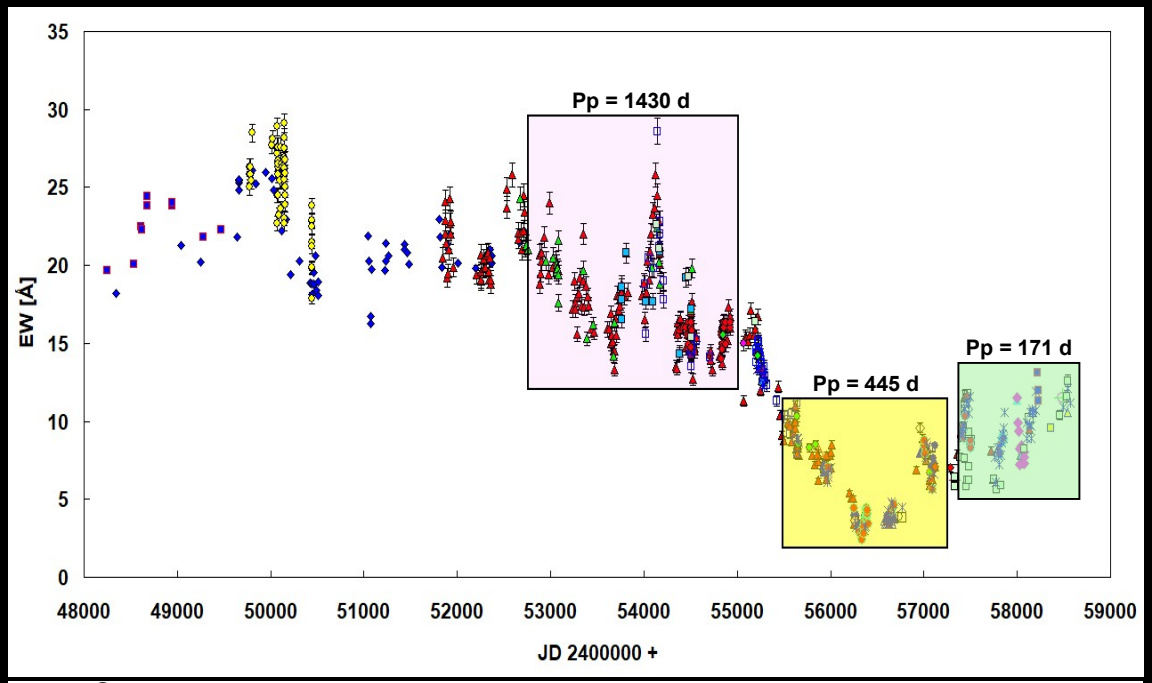
Phases corresp. Schäfer et al.; The Astronomical Journal, 140, 2010

Variability of the central absorption depth CA as a function of precession of the Be star disk

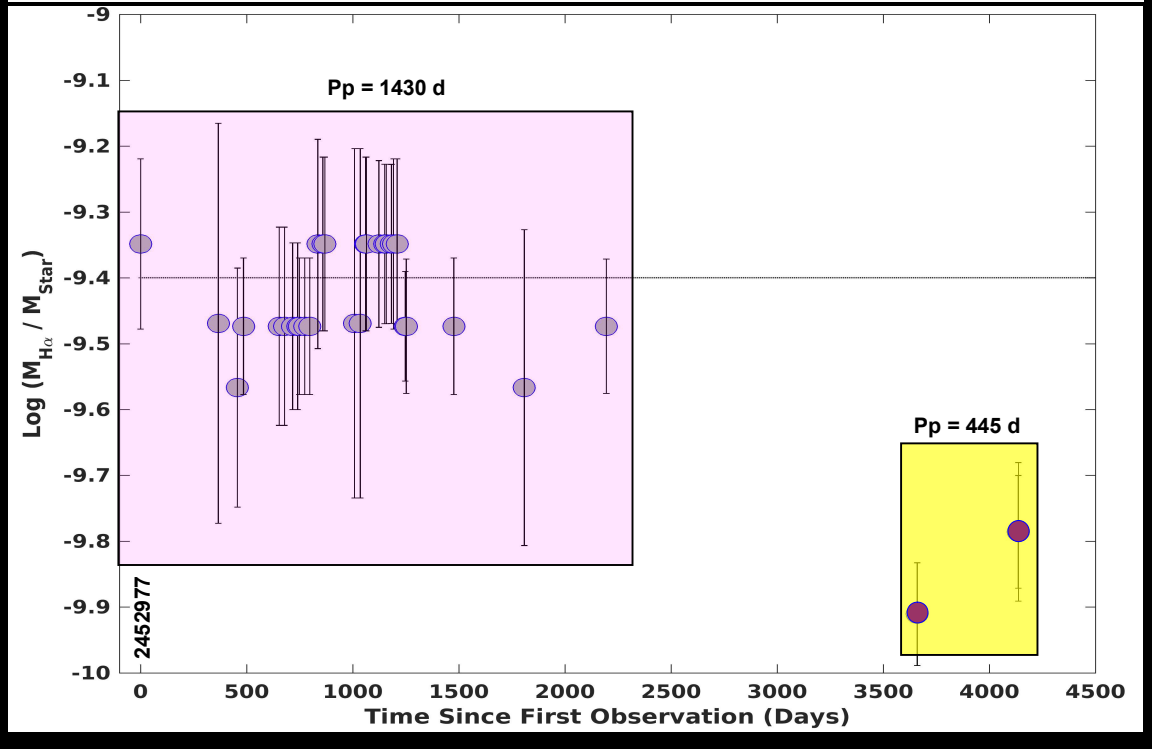

Hα Central Absorption Depth [F/Fc]
2.0
1.6
1.2
0.8
0.4
0.0
Period = 445 d
Period = 171 d
9
55500
56000
56500
57000
57500
58000
58500
59000
JD 2400000 +


Period 445 d
Halpha CA [F/Fc]
2
1.64
1.28
0.92
0.56
0.2
0
0.4
0.8
1.2
1.6
2
Phase


Period 171 d
Halpha CA [F/Fc]
2
1.64
1.28
0.92
0.56
0.2
0
0.4
0.8
1.2
1.6
2
Phase



Hα equivalent width
Monitoring
since December 1975



Disk mass as
function of time

Tycner, Ch., Sigut, A., 2015, "The Variable and Asymmetric Disk of ζ Tau", poster, IAU General Assembly, Meeting 29, 08/2015, id. 2255073

…ready for
observation?