

Monitoring the radial velocity of ζ Tauri

Reported by:

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Name of the object: zeta Tau

Remarks:

The Be-binary star zeta Tau shows periodic behaviour in the radial velocity of the HeI 6678 absorption line. There is a serious request from professional astronomers to amateurs to contribute their observations to the monitoring of this parameter. We observed zeta Tau from February 2008 until March 2009 at different locations with 20 cm Newton- and 40 cm SC-telescopes, 0.1 and 0.3 Angstr./pix spectrographs. The spectra have been reduced with standard professional procedures (instr.response, normalisation, wavelength calibration) by using of the program VSPEC.

One of the most interesting publications regarding radial velocity in zeta Tau is "Long term and orbital changes of zeta Tauri", by Ruzdjak et al. [1]. It is a pleasing coincidence that we started our long-term observing campaign of the He6678 line at the time, when the investigations of the researchers of the mentioned paper ended, approximately at JD 2454500. Our findings on the long-term variability of the radial velocity of HeI6678 is shown in Fig.1 (113 measurements). After subtraction of the long-term component (3th order polynomial) we are left with the residuals in Fig. 2. One of the aims of our investigation is to compare our residual period analysis (phase plot in Fig. 3) with Fig. 6 in the paper of Ruzdjak et al. (here Fig. 4).

Element	Sol. 3	Sol. 4	Sol. 5	this paper
P (d)	132.92 (\pm 0.013)	133.0 (\pm 0.034)	132.901 (\pm 0.044)	132.2 (\pm 0.8) Program AVE 131.3 (\pm 0.9) Program SPS
T _{RV}	47016.4 (\pm 3.6)	47027.2 (\pm 3.5)	47027.9 (\pm 1.3)	54608.9
K (km s ⁻¹)	9.74 (\pm 0.41)	7.6 (\pm 1.2)	8.29 (\pm 0.61)	9.1 (\pm 0.8)
rms (km s ⁻¹)	8.09	16.25	4.44	5.94
No. of RVs	801	509	178	113

Tabl.

Column 1-3 (Solution 1-3) from Ruzdjak et al. A&A 506, 2009

Column 4: our results

As can be seen, our findings are very close to those of Ruzdjak et al. for the most important parameters. Sometimes significant intensity variations of the continuum in the area of the blue and/or red side, as well within the wings of the HeI6678 absorption line, are seen (Fig. 5). So-called "co-rotating circumstellar clouds and/or matter" in the outer photosphere of the primary could be the cause [2]. Because of this phenomenon we cannot expect a smooth continuum within this area all the time.

References:

[1] Ruzdjak, D. et al., A&A 506, 1319-1333 (2009)

[2] Balona, L. A. & A. B. Kaye, ApJ, 521, 407-413, 1999

Webpages:

Pollmann, Ernst: <http://astrospectroscopy.de>

Mauclaire, Benjamin : http://bmauclaire.free.fr/astronomie/spectro/atlas/bestars/zet_tau/

Bücke, Roland: <http://astro.buecke.de>

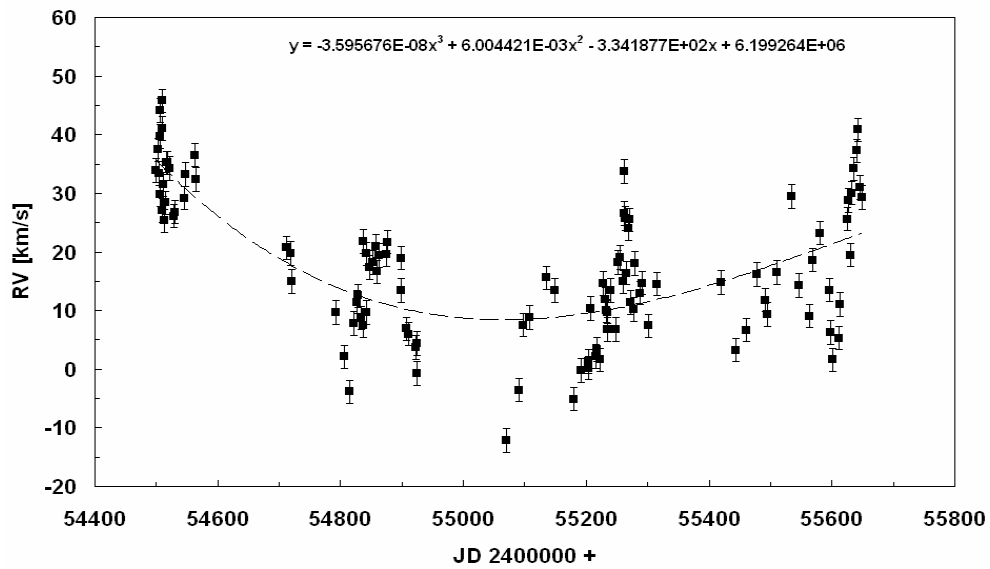


Fig. 1: Irregular long-term RV variations smoothed with polynom 3th order

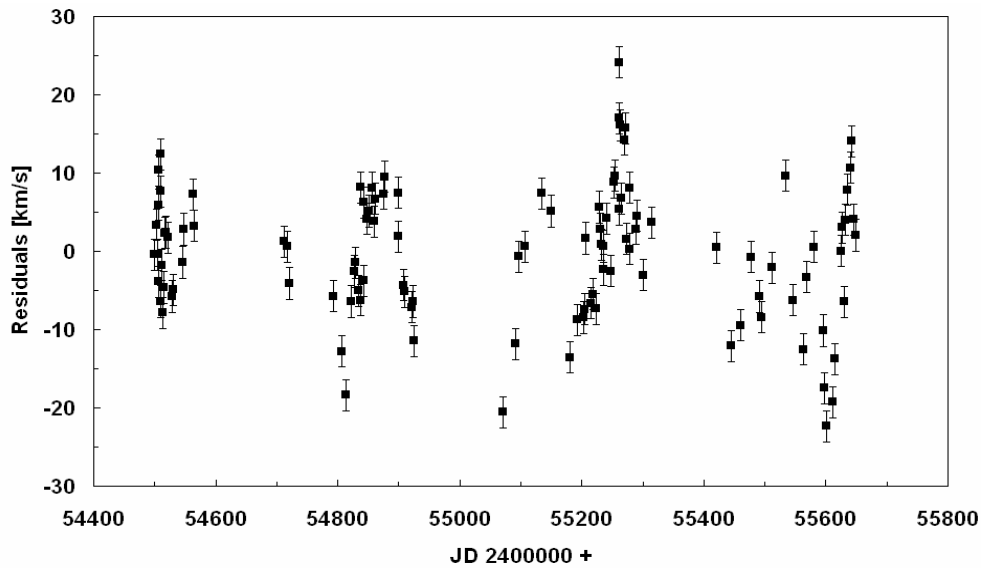


Fig. 2: Long-term behaviour of the residuals

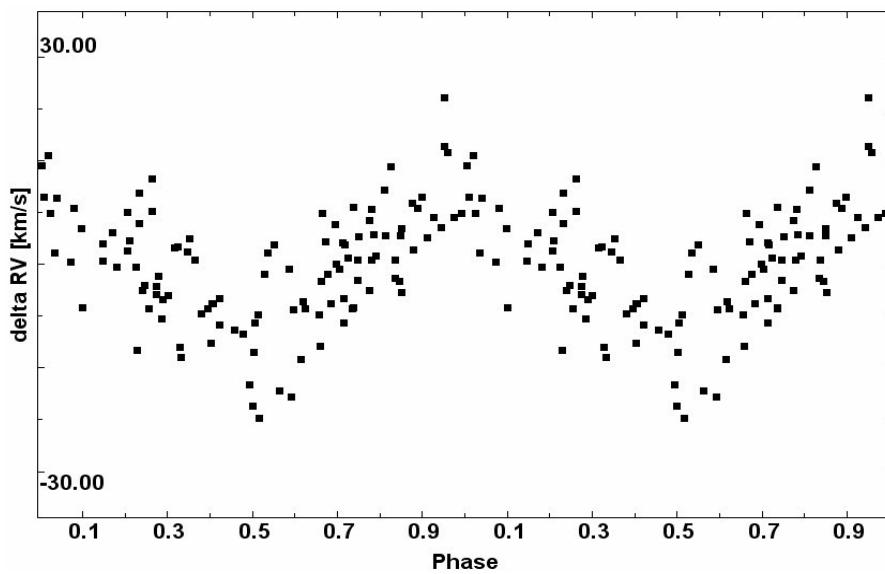


Fig. 3: ΔRV phase plot

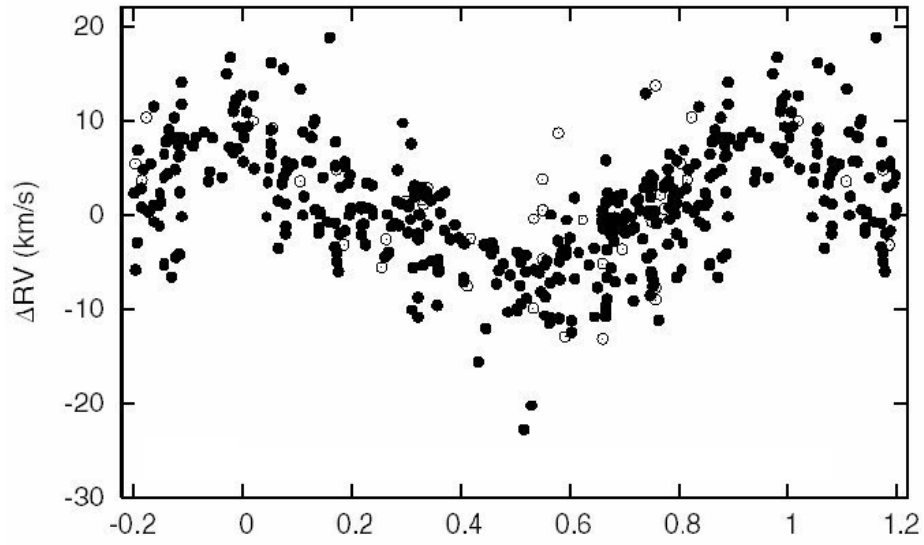


Fig. 4: RV phase plot of Rudzjak et al. (from Rudzjak et al. *A&A*, 506, 2009)

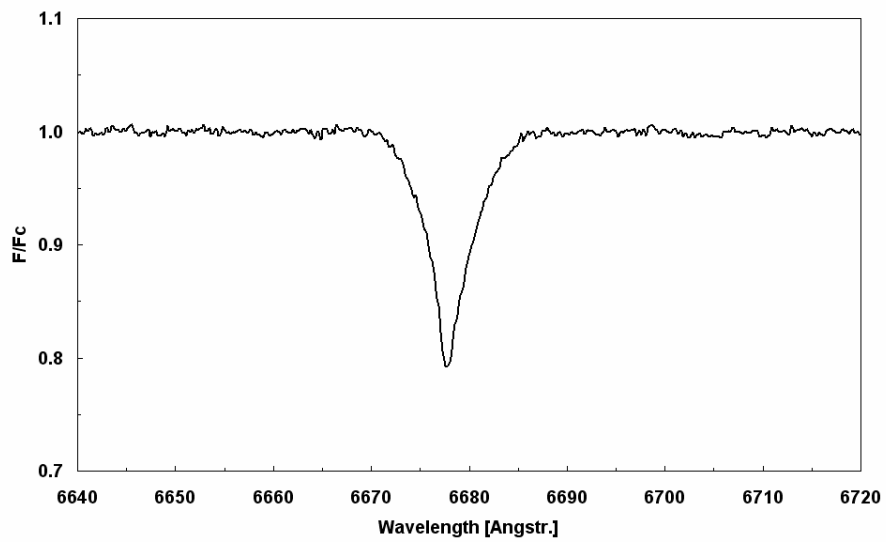


Fig. 5: Example of the He6678 line profile and its adjacent continuum