Monitoring of the HeI 6678 absorption line intensity of P Cyg

(E. Pollmann, August, 2017)

Apart from the long-term the Hα intrinsic line flux campaigne (http://astrospectroscopy.de/media/files/PCyg_report_2013.pdf) there is still another further monitoring of the He6678 absorption component, to find out characteristics about the mass loss rate. This monitoring has been started in April 2003.

The presented results of the variability of the He6678 absorption line intensity as F/Fc in P Cygni´s optical spectrum, based on 100 high-resolution spectra taken from April 2003 to June 2012. Clear variations in the absorption intensity are observed (Fig. 1). In this plot it can be clearly seen, where the line profile variations is located. The absorption component is shifting towards shorter wavelengths. This could be due to increasing optical depth as a result of increasing mass-loss.

This feature probably represent a fundamental characteristic of the radiation-driven stellar wind and mass-loss. Therefore it is of interest, to study the variability to obtain useful information of its time behavior. Fig. 2 shows the correlation of both, the intensity of the emission and the absorption component. The plot shows, that both measured variables are related only with a correlation coefficient of 0.64. Even if the emission comes by recombination, one would expect that a higher density (= higher mass loss) would produce both more absorption and more emission. The small coefficient of correlation could therefore be an expression for not implausible temperature variations in the stellar wind, whereby the absorption could increase also without change of mass loss, thereby without the emission increasing.

For the time period JD 2454800 until now (August 2017), a cyclic variation of the blue shifted absorption of this line is observable (Fig. 3). A new period analysis of this time section did lead to a period of 780 days (Fig. 4). Fig. 5 shows the phase plot of this period. The lager data set compared with the analysis of November 2015 shows obviously a more pronounced period at 780 days. Whether this period remains existing in the future, is objective of the monitoring among others.

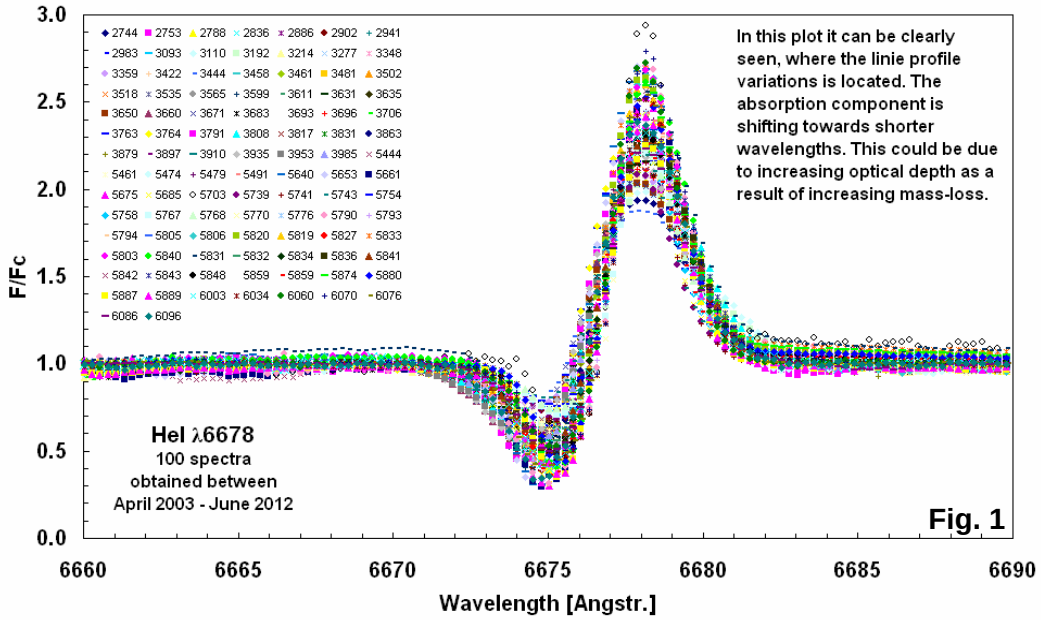
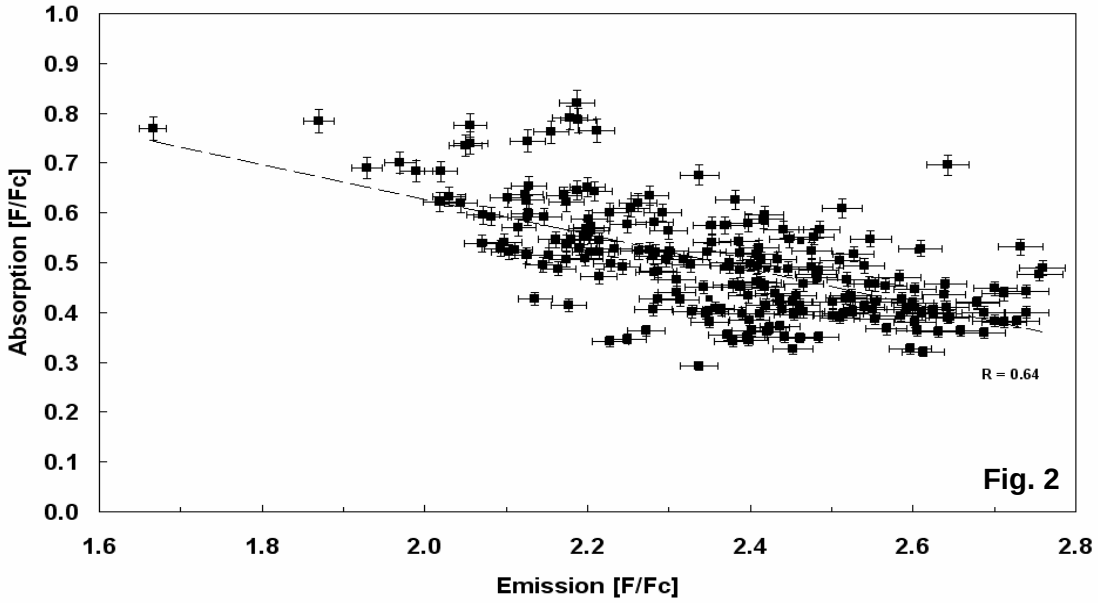
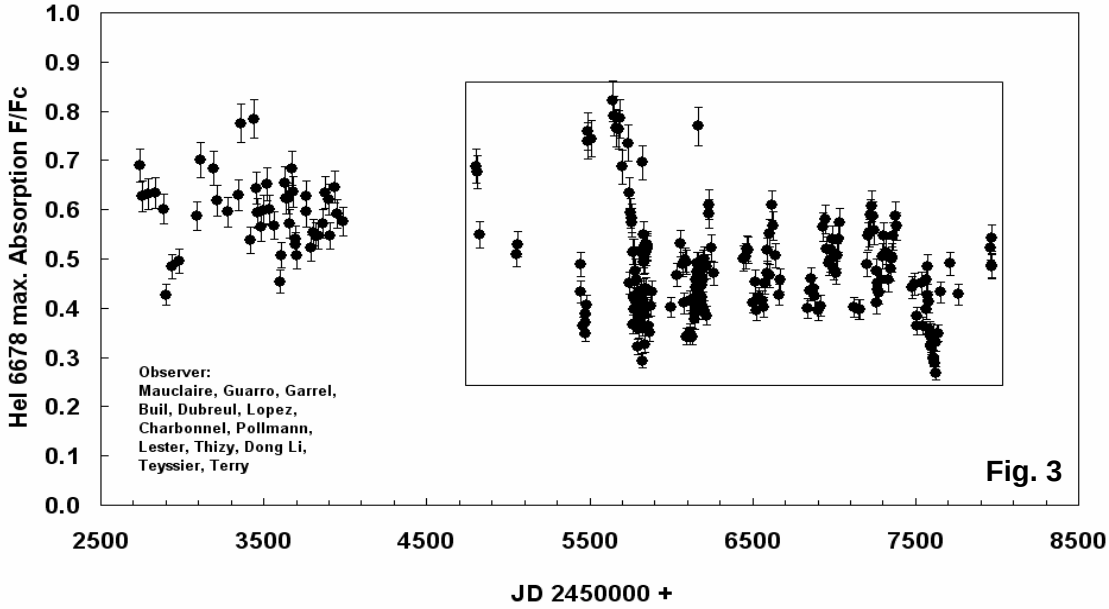


Fig. 1





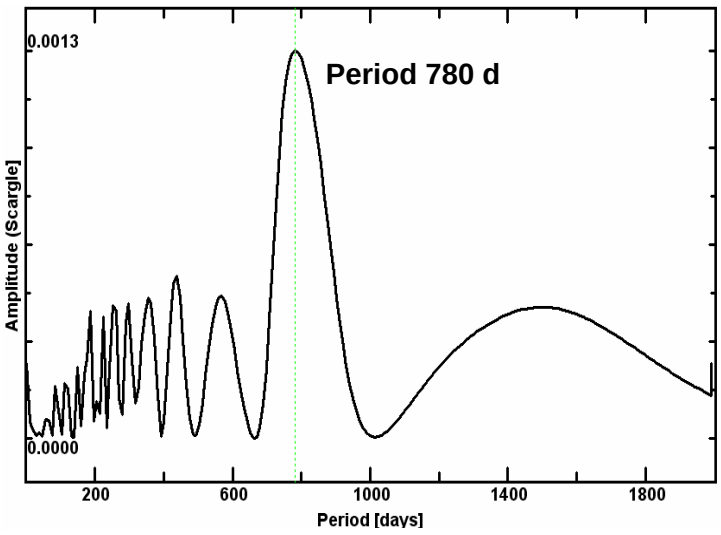


Fig. 4: PDM Analysis of the framed data in Fig. 3

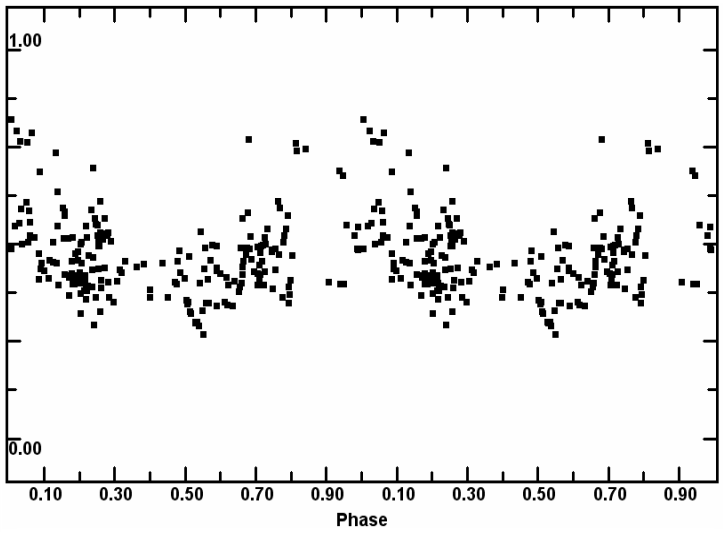


Fig. 5: Phase plot of the 780 d Period