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TIME-RESOLVED SPECTROSCOPY OF Q CYG

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A time-resolved optical spectroscopic study of the long-period (P=10.08h) old nova Q Cyg has revealed persistent yet erratic absorption features indicating the presence of a wind, while the system was rising to one of its stunded outbursts. Data taken with the WIYN 3.5m telescope show P Cygni profiles in the He I triplet lines at 5876Å and 7065Å, which are absent in the He I singlet emission line at 6678Å, despite the fact that the relevant energy levels of those three lines are at very similar excitation levels. The Hα line often has a redward emission tail, characteristic of a receding outflow, and it possess a blueward absorption profile during only one wind event. Kafka et al. (2003) argued that this behavior is due to the strongly metastable 2 ^{3}S effective ground state of the He I triplets, which becomes over-populated in conditions of low density and a dilute radiation field, over-populating in turn the 2^3P common lower level of He I 5876Å and 7065Å, leading to absorption from a low density wind. Therefore, the triplet/singlet lines trace two different parts of the system: the wind and the disk respectively.

Fig 1 shows the strength of the blue-shifted P Cyg absorption in the HeI 5876Å line vs time, alongside a similar plot of the strength of the red-shifted Hα emission wing, likely to be due to the receding backside of the wind. The strength was calculated as the average intensity, relative to the continuum, over the ranges $\lambda\lambda$5853-5868 and $\lambda\lambda$6590-6610, respectively (corrected for orbital motion); it is suggestive that the Hα feature trails the P Cyg absorption by about an hour. This is modestly supported by the system's behavior on all nights, although the wind events are somewhat weaker on other nights, and have incomplete coverage. Note that the measured red wing of Hα is at a mean recessional velocity of $\sim$+1700 km sec^{-1}, while the measured absorption in He I has a mean blueshift of $\sim$-800 km sec^{-1}. This difference might account for some of the lack of coincidence.

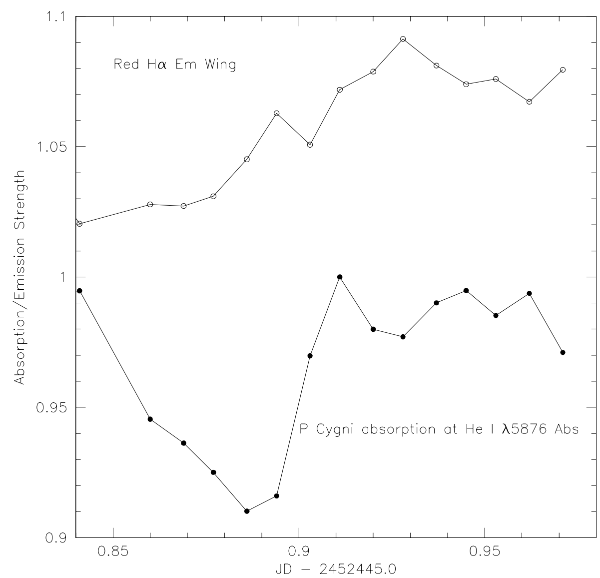

Fig. 1. Strength of the P Cygni absorption and the strength of the red wing of Hα vs time.

In an attempt to locate the source of the wind, we note the strong orbital modulation of the He I 5876Å and 7065Å emission lines and the fact that their EW is almost zero when the secondary is near inferior conjunction, suggesting a wind origin that is almost totally eclipsed by the secondary star despite the low inclination of the system (also see Kafka et al. 2003). On the other hand, the P Cygni absorption is not orbitally modulated. WIth the data in hand we cannot reach definite conclusions on the mechanism and the location of the wind. However, Q Cyg appears to have reliable wind lines that are easily accessible in the optical, a promising situation for future studies of this phenomenon.

REFERENCES

Kafka, S., Tappert, C., Honeycutt, R. K., & Bianchini, A. 2003, AJ, 126, 1472

Cannizzo, J. K. & Cameron, A. G. W. 1988, ApJ, 330, 327

Proga, D., Stone, J. M., & Drew, J. E. 1998, MNRAS, 295, 595

Shlosman, I. & Vitello, P. 1993, ApJ, 409, 372

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