HIGH RESOLUTION SPECTROSCOPY OF RY TAURI: VARIABILITY OF THE NA D LINE PROFILES

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ABSTRACT. Ejection and accretion of gas clouds in the vicinity of RY Tau were discovered. The existense of large scale "stellar prominences" around young stars is suggested.

For a long time the large scale gas flows around TTau-type stars have been a subject for discussion among the astronomers studying the problems of star formation. Both processes - outflow and accretion have been observed through the investigation of line profiles, mainly the hydrogen lines (see, e.g. Grinin et al.,1985).

Spectroscopic CCD observations of the TTau-type star RY Tau in 1986/87 revealed the variability of the NaI D line profiles. Each of the doublet line incorporates three different components:

- broad absorbtion of photospheric origin (its profile corresponds to the rotational velocity of the star v sin i = 55 km/s);
- narrow absorption of interstellar origin;
- additional *variable* absorption, which disturbes the line profile and shows day-to-day variations.

In order to extract the variable component of the NaI lines the average spectrum of RY Tau was subtracted from each of the individual spectrum of the star. The derived differential (residual) spectra contain mainly the NaI D absorptions which are variable in intensity and radial velocity. The radial velocity of the residuals vary from -100 to +100 km/s, sometimes weak absorptions appear at larger radial velocity, up to 200 km/s.

The analysis of the differential spectra of RY Tau leads to a conclusion that the residual NaI lines originate from relatively cool gas clouds, which are moving inside the stellar wind, ascending and descending on a time scale of a few days, at the distances within three stellar radii. This phenomenon resembles the eruptive solar prominences - ejection of cool gas into corona up to the distance of about one solar radius.

Physical conditions in the "prominences" of RY Tau are also close to these of solar prominences. The phenomenon of "stellar prominences"

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in other young stars can be studied through spectroscopic monitoring of selected spectral features using techniques of high signal-to-noise ratio and high resolution spectroscopy.

More details about this investigation are included in the paper "Prominences of RY Tau" submitted to the "Astrophysics and Space Science".

References

Grinin V.P., Petrov P.P. and Shakhovskaya N.I. (1985) "The result of spectroscopic and photometric patrol observations of RW Aurigae. I. Variability of the Balmer lines", Bull. Crimean Astrophys. Obs. 71, 109-127.

HERBST: Do you find any correlation between the brightness of the star and the spectral features?

PETROV: No such correlation was found.

APPENZELLER: Do you assume your absorbing clouds to move supersonically with respect to their environment or do you expect a very hot surrounding gas so that 100 km/s is subsonic?

PETROV: The clouds are moving inside the hot stellar wind of RY Tau. The presence of the hot wind is evident from the specific Balmer decrement and other lines, like the He I D3.

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