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CH Cyg - STILL IN ACTIVITY

The last active phase of CH Cyg has continued for nine years yet. One of the most interesting periods began in July/August, 1984 when the decrease in brightness (Panov et al. 1985) was accompanied by significant variations in the ultraviolet spectrum (Selvelli and Hack 1985), optical spectrum (Tomov 1984, Mikolajewski and Biernikowicz 1986) and radio outburst with expanding radio jets (Taylor et al. 1986). The changes in the brightness and spectrum of CH Cyg from mid 1984 to September 1985 are described by Mikolajewski and Tomov (1986).

A new increase in the star's activity has started since 1985 (Fernie 1985). This paper is a follow-up of the work of Mikolajewski and Tomov (1986), giving some photometric and spectral observations of CH Cyg from November till end of April, 1986.

The observations were carried out at the Observatory of the Nicolaus Copernicus University in Torun, Poland and at the Rozhen National Astronomical Observatory of the Bulgarian Academy of Sciences. The spectra in the blue and red region were of dispersion 18 Å/mm.

In the beginning of the new increase in activity in November/December, 1985 the magnitude of CH Cyg in the V-filter was about $7^m.5$-$7^m.6$. More significant were the changes in the colour indices. On November 6 and December 8 and 27 the B-V were respectively $+1^m.18$, $+1^m.00$ an $+0^m.82$, while the U-B were $+0^m.35$, $+0^m.20$ and $-0^m.21$ (Mikolajewski and Mikolajewska 1985, Mikolajewski and Wikierski 1986). On April 23 and 24, 1986 the V-magnitude was about $7^m.8$-$7^m.9$, while the B-V were $+0^m.78$ and $+0^m.79$, and the U-B were $+0^m.05$ and $-0^m.01$.

The observations carried out from the beginning of November, 1985 till end of April, 1986 have shown significant variations in the absorption and emission spectrum of the star. The [FeII] emissions were still the most numerous and bright lines in the spectrum. In April their intensity increased by three times as compared to November. The FeII emission lines which were much

more weaker than the [FeII] lines also increased in intensity by about four times. Their profiles were not any longer so narrow and sharp as during the period from May to September, 1985. On the spectra obtained in the end of April some of the strongest FeII lines, for example 4233Å, showed an absorption component in the red emission wing.

The nebular lines [NeIII] 3868Å, [OIII] 4959 and 5007 Å, and [SII] 4068Å were strong and probably due to the blending of two or three components and emission wings of about 500-600 km/s. Although weaker, the line [OIII] 4363Å was also visible.

The emission lines of HeI 4026Å, 4471Å and 4713Å had gradually increased their intensity and also showed emission wings of about 600 km/s in width.

The presence of veiling blue continuum (Tomov 1986) is the reason for the drop in intensity of the TiO absorption bands and yet, they could be well observed in the CH Cyg spectrum.

The absorption lines of FeI, TiI, VI, CrI and MnI were much weaker than the time-interval when the absorption spectrum of M6III was dominating.

The absorption line CaI 4227Å was weaker in November than in the summer of 1985, showing merely a wide profile typical of M stars. From December till April its intensity did not change much. Its central depth throughout the period was approximately 0.4-0.5. A shell-component appeared which was particularly strong and sharp in April.

The H and K lines of CaII showed once again 3-4 absorption components of varying intensity.

From the absorption lines of ionized metals there were lines of TiII and ScII with $\lambda<3640$Å, while after $\lambda<3640$Å, only the strongest absorptions of SrII and ScII could be definitely identified.

We should like to discuss in more details the variations in the Balmer lines of HI. Their intensity strongly increased. Two-component emissions and wide emission wings were again observable. Particularly interesting were the intensity variations of the violet (V) and red (R) emission components. In the beginning of November the relation of the intensities of these components was V>R for H_β, while for H_γ it was V≤R. The violet components of H_β and H_γ remained more intensive towards the end of February, 1986. Between February 22 and 26 the intensity relation had changed (R>V) and the red component was more intensive than the violet one for a period of about one month. The V>R relation was again restored between March 18 and 24.

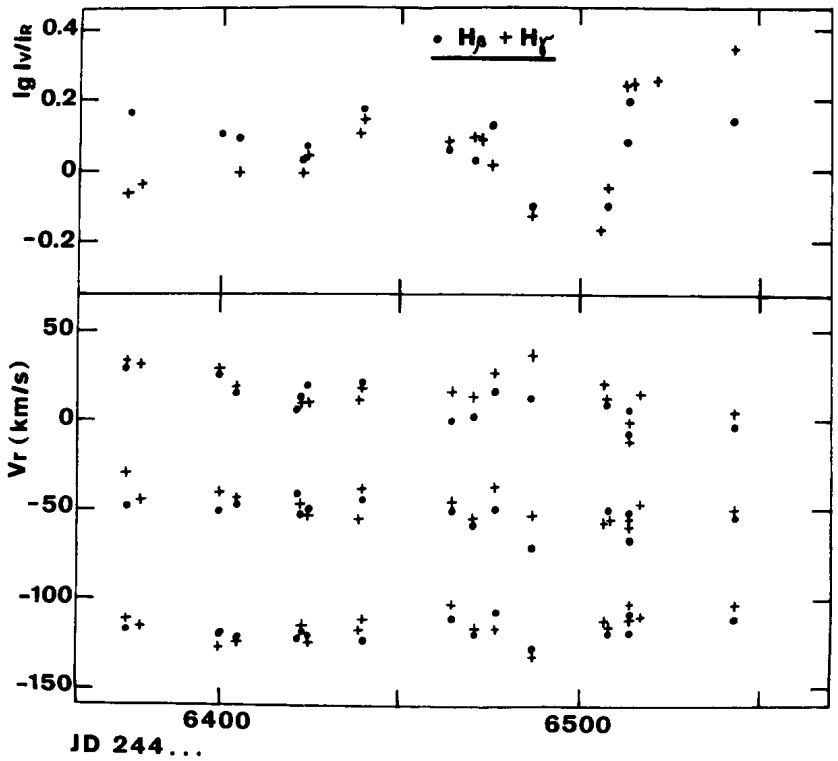

Figure 1

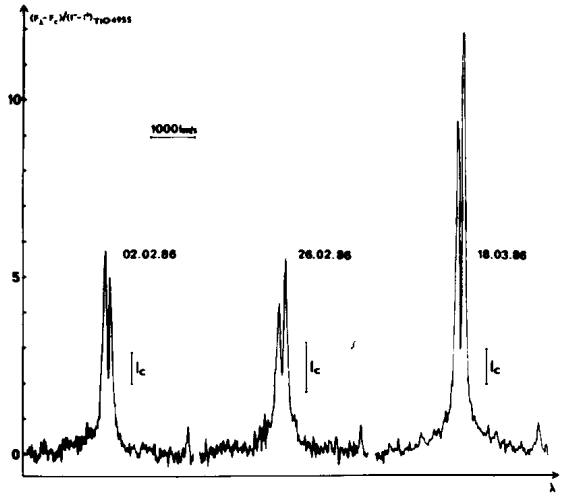

Figure 2

Figure 1 shows the variations of the intensity relation of the violet and red H_β and H_γ emission components and the radial velocities of the two emission peaks and absorption component of the same lines within the period from November, 1985 to April, 1986. It is obvious that the intensities of the emission components are not accompanied by great variations of the radial velocities.

The absolute intensity of the Balmer emission lines had significantly increased during the period when the red component was more intensive. At the same time, an increase of the intensity of the continuum by about 1.5 times was observed. This is shown in Fig. 2 where the H_β profiles on the different dates are reduced to the intensity of the TiO bands by the methods of Mikolajewski and Biernikowicz (1986). The intensity of the continuum in the same scale is also indicated for each profile.

The spectra obtained in the red region after November, 1985 are only three. We are not able to follow in detail the changes in the H_α profile, but it is worth noting that in the end of December the violet component was more intensive than the red one, while in the end of March and April it was the opposite (R>V).

The wide emission wings had also changed. Their width in November/December was about 2400 km/s, while in March it was more than 3000 km/s. Besides, the careful comparison of the H_β profiles obtained at different times suggests that the hydrogen lines are composed of a very wide and not particularly intensive emission and a superimposed two-component emission line of a considerably smaller width. The asymmetry of the profiles also shows that this wide emission has sometimes a violet shift and sometimes a red shift. Very significant is the asymmetry of the H_β profile of April 22. It can be judged by the profile that the shift of the wide emission to the violet was about 800-900 km/s.

Another important event during the period under consideration is the reappearance of rapid flickering in the brightness of CH Cyg. The observations carried out at the Asiago Observatory by one of us (J.M.) with the 122 cm telescope and the two-channel photometer for a period of 68 min. did not show fast changes of the amplitude greater than $0^m.01$ in the U-filter. This was also proved by the observations in September carried out by Luud et al.(1986). On April 23 and 24, 1986 monitoring observations in the U-filter were carried out at the National Astronomical Observatory. For a comparison star the HD 182691 was used and for a check star the SAO 031628 was used. During the two nights fast light variations of CH Cyg were observed.

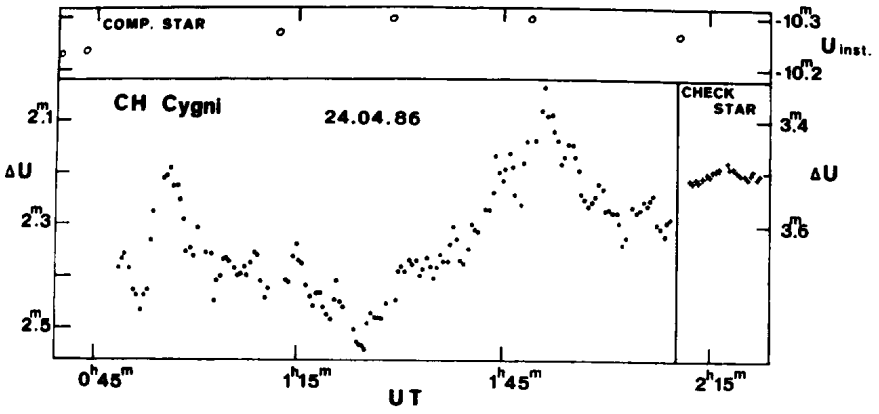

Figure 3

Figure 3 shows the results of the observations during the second night. It is obvious that there is flickering of an amplitude of $0^m.05$-$0^m.1$ and characteristic durations of the order of 0.5 to 2 min., as well as changes in the amlitude of about $0^m.2$-$0^m.4$ and characteristic durations of approximately 10 to 30 min.

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