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CH CYGNI IN ECLIPSE?

AN APPEAL FOR OBSERVATIONS

Eighteen months ago, after the decrease in the brightness and variations in the spectrum of CH Cygni, we assumed that the active phase of the star was coming to an end (Tomov, 1984). The observations till November 1985 completely confirmed the activity of the star. The magnitude in the V reached $7^m.6 - 7^m.8$, while in the B-V and U-B it was $1^m.4$ and $0^m.7$ respectively. In September, 1985 the rapid light variations typical of CH Cygni during an active phase were not observed (Luud et al., 1986). At the same time, the spectrum resembled more the spectrum observed during the quiet phases of the star. The hot continuum and shell-absorption lines disappeared. In the absorption spectrum only the lines and bands of TiO typical of the M6III star were observed. The central width of the CaI 4227 Å line was ~0.9 . The emission lines of HI, FeII and the forbidden lines of [OI], [OIII], [NeIII], [SII] and [FeII] were present. The emission lines of HI and FeII were very weak, the Balmer lines being practically one-component and very narrow as compared to those in the period from August to December, 1984. The intensity only of the forbidden lines and above all of the lines of [OIII] 4959 Å and 5007 Å, and [NeIII] 3868 Å has increased (Mikolajewski and Tomov, 1986; Luud et al., 1986).

Since the beginning of November, 1985 the observations of the star have shown new interesting variations in the brightness and spectrum. From the photometric measurements carried out at the Tartu Observatory in November and December it is obvious that the slight changes in the V filter correspond to the considerable changes in the B-V and U-B (Luud et al., 1986). In November M. and J. Mikolajewski (1985) also observed a slight increase in the brightness in the V of about $0^m.2$ as compared to the summer of 1985. The two spectra of the star obtained at one and the same time show that the Balmer emission lines have increased their intensity and are again two-component,

the short-wave component being more intense. It is interesting that the Balmer lines have broad emission wings again.

On December 25, 1985 we obtained one spectrum in the blue and one in the red region with the coudè spectrograph of the 2-m telescope at the Rozhen National Astronomical Observatory with dispersion 18 Å/mm (unfortunately the red spectrum is underexposed). The analysis of the two spectra confirms the results of M. and J. Mikolajewski (1985). The half-width of the emission wings of H$\beta \sim$ 1200 km/s measured by us actually coincides with the half-width measured by them. In addition to the Balmer lines in the spectrum, there are also emissions of [OIII], [OI], [NeIII], [SII], [FeII], FeII and HeI. The emissions of FeII which were very weak in August and September, 1985 and showed very narrow and sharp profiles (similar to forbidden lines) have now increased their intensity and are much wider than the Balmer lines.

Significant changes have occurred in the absorption spectrum of CH Cygni as well. The absorption lines of FeI, VI, TiI, ScI, MnI, etc. and the TiO bands have strongly weakened. The hot continuum filling the absorption lines in the spectrum of the M6III star has appeared again. The central depth of CaI 4227 Å is about 0.5 . This value may serve as an indicator of the intensity of the hot continuum. Figure 1b shows the variation from mid-July 1984 to the end of December 1985. It can be seen that before the decrease in the brightness the hot continuum filled nearly the whole of the CaI 4227 Å line. After that, with the decrease in the intensity of the hot continuum, its central depth reaches the value typical of red giants. The line is now very weak which indicates an enhanced intensity of the filling continuum. For comparison, Figure 1a shows a part of the spectrum around CaI 4227 Å in May and December, 1985. Both spectra have approximately equal density and Figure 1a is an actual illustration of the changes which have occurred.

Another important fact is that some of the strongest shell absorption lines of TiII, SrII and ScII which had been most intense in the spectrum till the abrupt decrease in the brightness in 1984, have appeared again.

The photometric and spectral observations of CH Cygni in the end of 1985 showed a new increase in the activity of the star. The question is whether this is a new increased activity or the brightness and spectrum variations of the star after July 1984 are the result of an eclipse in the system of CH Cygni.

This was a suggestion of Mikolajewski and Biernikowicz (1985) which was brought back again by Mikolajewski and Wikierski (1986). We agree with them that a great part of the brightness and spectrum variations of CH Cygni can

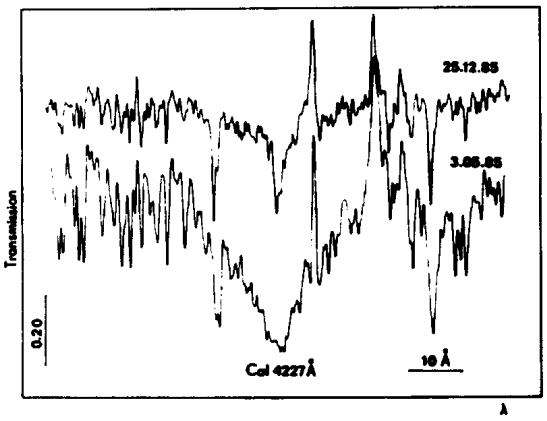

Figure 1a

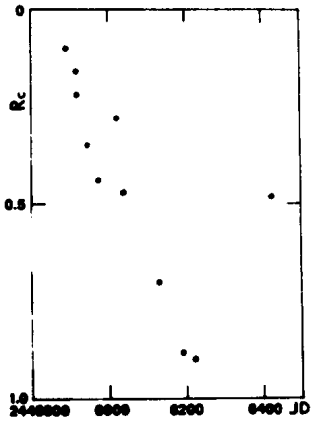

Figure 1b

be explained with the eclipse of the hot component and accretion disc of the red giant. The spectrum of the star obtained in December, 1985 is very close to that observed in the end of 1984 and, like Mikolajewski and Wikierski (1986), we think that the variations now are repeated in a reversed order as compared with those observed about a year ago.

On the other hand, the measured radial velocities of the main star and the companion after the decrease in the brightness in 1984 also show that it is possible CH Cygni to have been in eclipse during the past eighteen months. The radial velocities reduced in accordance with the orbital elements of Yamashita and Maehara (1979) show values about the γ velocity of the system.

If this is really an eclipse and the present variations in the spectrum repeat in a reversed order those observed in the beginning, then we can expect that the eclipse will be over in the period from March to May, 1986. It would be very interesting to follow in detail the spectral and photometric behaviour of the star during the next few months. Unfortunately it will be very difficult to observe the star from our latitude. Observations from observatories of a more favourable location will certainly contribute to the better understanding of the reasons for the brightness and spectrum variations of CH Cygni.

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