PHYSICAL PROPERTIES OF V1329 CYGNI

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In this paper, I shall present another model for V1329 Cyg. Grygar et al. (1979) proposed a long period eclipsing binary model consisting of a massive M giant and a hot component. Some problems, however, have remained on the binary model. Namely, the mass function is too large, the amplitude of the light variations changes from period to period, the light curve differs from that of Algol type systems and is similar to long period binaries, and so on (Iijima et al. 1981). It has been believed that some peculiarities in the system could explain those problems. Recently however, some phenomena which are inconsistent with the binary model were observed (Iijima and Mammano 1981).

Figure 1 shows the intensity ratios of high and low excited lines and the temperatures of the exciting star in 1979 and 1980. The temperatures were derived from the relative intensities of Hβ, HeI 4471 and HeII 4686 by a modified Ambartsumyan's method (Iijima 1981). The intensities of high excited lines and the temperature of the exciting star increased at first. They reached the maxima at phase 0.3, then decreased suddenly. Their minima were found on phase 0.5 – 0.6; namely on the phase of the maximum optical brightness. Following the minima those values are recovering gradually. These phenomena are well known in outbursts of novae (McLaughlin 1960) and nova-like variables (Swings 1970). On the other hand it is difficult to explain these new phenomena with the binary model. This result suggests that the light curve in this period arised from a mild outburst. Meanwhile, the light variation during this period was almost the same as those observed in the last 10 years (Iijima and Mammano 1981). Therefore, it may be reasonable to consider that also all the other light variations in the last 10 years arised from recurrent outbursts.

As seen in figure 1, the temperature of the exciting star changed from 180000°K to 130000°K in this period. If this temperature decrease occurs holding its total bolometric luminosity, which is possible in nova

M. Friedjung and R. Viotti (eds.), The Nature of Symbiotic Stars, 169–171.
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https://doi.org/10.1017/S0252921100097633 Published online by Cambridge University Press

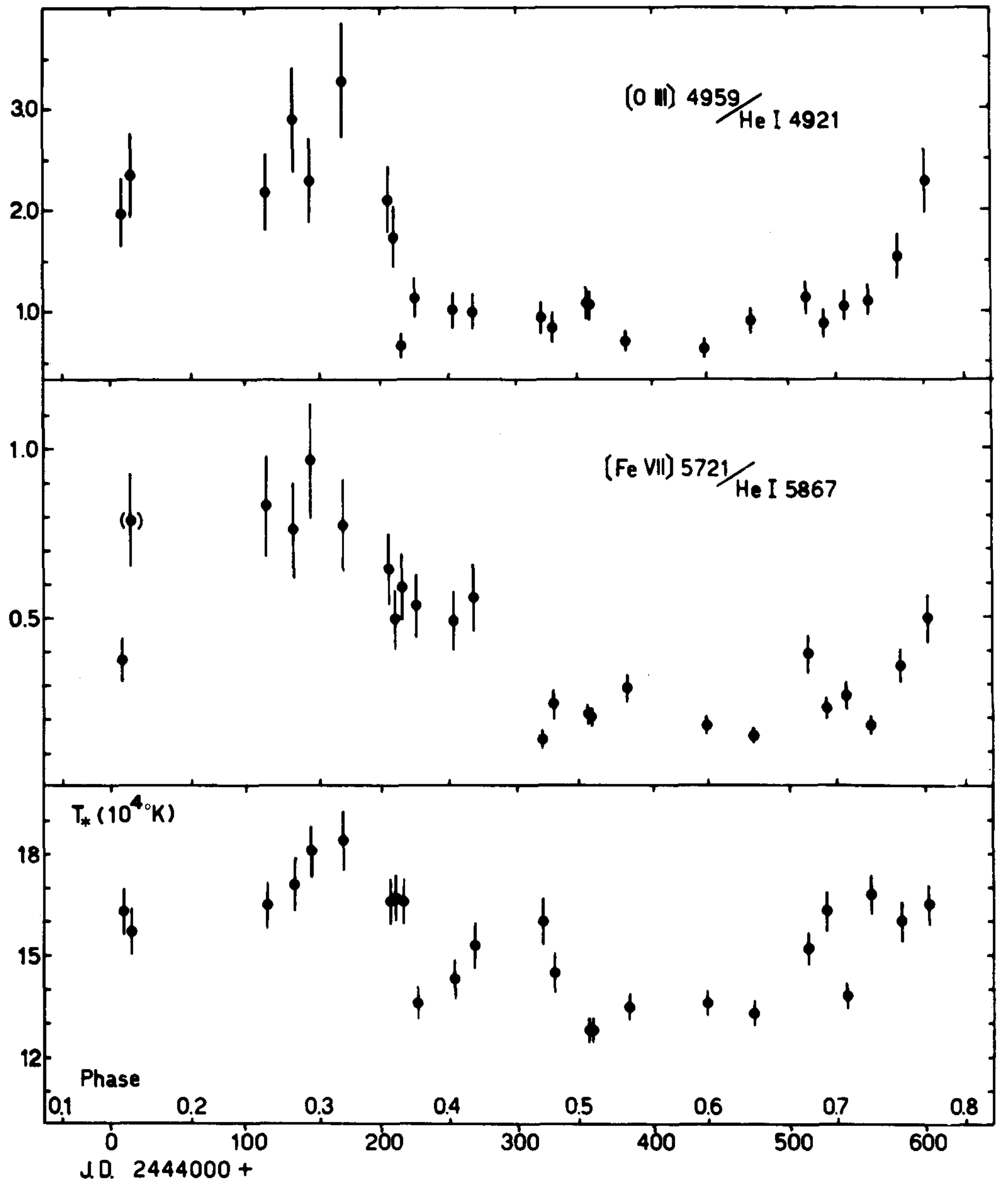

Figure 1. The intensity ratio of the emission lines and the temperature of the exciting star in V1329 Cygni during 1979-80. Phases are reckoned from a photometric minimum (from Iijima and Mammano 1981).

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outbursts, an increase of optical brightness of $\Delta m_V \cong 1^m$ is generated (Bath 1977). This value well agrees with the observed light variations (Grygar et al. 1979, Iijima et al. 1981). Recently, Tamura (1981) suggested that the change of the radial velocity of emission lines may not be due to the orbital motion of the binary system, because the dimensions of the emission line regions are too much larger than that of the binary system.

White dwarfs with rapid mass accretion may be one of the possible models for V1329 Cyg. Nomoto et al. (1979) studied rapid mass accretion ($2\times10^{-5}M_\odot yr^{-1}$) onto a white dwarf. They found that mild hydrogen shell flash arised with little accreted mass ($\sim$7.8 $10^{-5}M_\odot$). The effective temperature of the white dwarf (15×10^4 °K, Nomoto et al. 1979) well agrees with that of the exciting star of V1329 Cyg. Though only one outburst is registered in their model calculations, the mass accretion rate can supply hydrogen for one flash in about 1000 days. It will be possible to reproduce recurrent outbursts with a little modification of the initial parameters. If this is the case, it is reasonable to consider that V1329 Cyg is a binary. However, its orbital period may differ from the period of 950 days, because the M type component must fill its Roche lobe.

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