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SPECTROSCOPY OF THE NOVA-LIKE OBJECT KUWANO (NOVA VULPECULAE 1979) IN THE YEAR 1979

Kuwano (1979) discovered on April 5.8, 1979 sudden increase of brightness of the star in the position (see Ishida et al. 1979):

$\alpha_{1950.0}=20^h19^m01^s.08$; $\delta_{1950.0}=+21^o24'43''.1$.

The photometric history of the object was reconstructed by Liller and Liller (1979). They showed that the star varied irregularly between B=14.5 and 16.6 prior to 1977 and some mini-eruptions were observed within the past 80 years. The present outburst began in late 1977 and within a year the star has reached B=10. After the discovery in April, 1979 the star fluctuated for several months on the level of B=9.5. According to Belyakina et al. (1980) the object dropped to B=13.0 at the end of June 1980.

The spectrum prior to the outburst was seen on some objective-prism photographs and it was classified as mid-M (Stephenson, 1979). Ishida et al. (1979) found the spectrum around the discovery time being of the type A4. According to Mochnacki (1979) the emissions were seen in H_α and H_β lines. P Cygni profile of H_α displayed the absorption component shifted for 50 km/s towards the blue. Sharp absorption Balmer lines up to H_{11} were detected by Schmidt and Green (1979). At the end of June 1980 the spectrum was a mid-M or advanced M-type with H_α and Na D emissions (Belyakina et al.,1980).

Our observational material consists of 7 spectrograms taken with the 350 mm camera of the coudé spectrograph of the 2 m telescope at the Ondřejov Observatory, with the reciprocal dispersion of 1.7 nm mm^{-1} in the blue region (380-497 nm). Kodak IIaO emulsions were used throughout. Depending on the photographic

density of the plates (some spectrograms were rather underexposed) we have found on the plates strong sharp absorption lines H_β to H_8, CaII lines H and K (stellar), and furthermore fainter lines of Al I, Al II, Ca I, Ca II, Cr I, Cr II, Fe I, Fe II, Mg II, Mn I, Mn II, Ni II, Si II, Sr II, Ti I, Ti II, V II, Y II (?) and Zr II. Altogether up to 300 lines were detected.

From the relative intensities of the lines of Ca I (423 nm), Ti II (431 nm) and $H\gamma$ we have derived the spectral type of the star F 5 ($\pm$0.1). This is in agreement with the spectral type as determined from the UBV photometry. Neglecting the interstellar reddening the B-V index is close to 0.4 and this corresponds to the spectral class F 5 (see Allen, 1973).

Radial velocities of almost all identified lines were measured on the Abbé comparator. On four well-exposed spectrograms between JD. 2444118-2444157 (Nos. 3365,3368,3372 and 3420) the distribution of individually determined radial velocities was investigated. The distribution is clearly non-Gaussian, with pronounced asymmetry towards the negative velocities. We believe that we can distinguish two sources of the spectra of the object. Most lines belong to the spectrum of the stationary envelope connected with the M star. Assuming the Gaussian distribution, its average radial velocity is close to $(+30\pm6)$km s^{-1}. The rest of the lines is produced in an expanding envelope; their velocities are distributed in the interval from -40 to +25 km s^{-1}. The distribution of these velocities displays the maximum at +8 km s^{-1}. The existence of the expanding envelope is corroborated by the P-Cygni profile of the $H\alpha$ line.

It is apparent that there is much hesitation how to classify the star in the framework of stellar variability. The proposal that we observe the case of a slow nova is clearly inadequate. Thus the term nova-like was preferred by the discoverer. The existence of the late-type spectrum before the outburst suggests that the object is related to symbiotic stars. This was proposed by Bensammar et al. (1980). Future behaviour of the star should be followed up with vigilance.

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