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HONDA'S VARIABLE IN CYGNUS: A NEW LONG PERIOD VARIABLE

Following Honda's discovery of a probable nova in Cygnus on 1980 November 29 (Honda, 1980), a spectroscopic program was initiated at the Kavalur Observatory. The spectra reveal that this star is not a nova but a long period variable of type M4e.

The spectrograms were obtained between 1980 December 8 and 1981 January 5. An image tube spectrograph was used at the Cassegrain focus of the 102cm reflector at the Kavalur Observatory. Most of the spectra were recorded at a low dispersion of  $400\text{Åmm}^{-1}$  since a spectroscopic programme on the recent supernovae in NGC 6946 and 1316 was in progress (Prabhu, 1981). However, one spectrogram was obtained at a higher dispersion of  $65\text{Åmm}^{-1}$  on 1981 January 4.61 UT to facilitate detailed analysis. This spectrogram covers the wavelength region of 4200Å-6200Å while the lower dispersion spectrograms cover 4200Å-8400Å.

Even as the first spectrum was recorded, the prominent molecular bands and the sharp emission lines of hydrogen showed this star to be a red variable and not a nova. Subsequent observations at higher dispersion allow us to classify the spectrum. A density plot of this spectrogram in the region of 4800Å-6200Å appears in the figure. The plot is digitally averaged over ten sampling intervals of  $8\ \mu\text{m}$  each. The narrow emission line of  $H_{\beta}$  and the absorption bands of TiO have been labelled in the figure. The identifications have been made following Merrill (1940), Merrill, Deutsch and Keenan (1962) and Keenan and McNeil (1976).

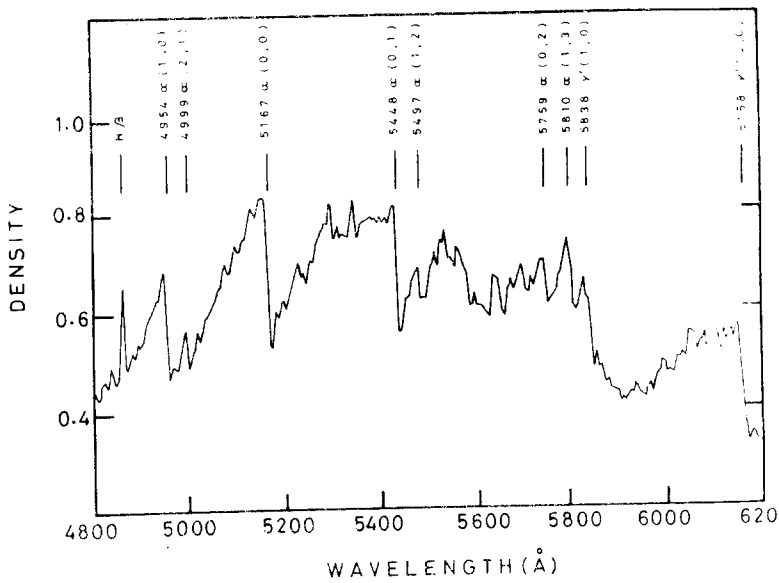
The prominence of TiO bands and the absence of ZrO bands show that this variable has a spectral type of M. The 5736Å band of VO, a characteristic of stars later than M6, is not visible in the spectrum. The TiO  $\alpha$  system at 5759Å (0,2) and 5810Å (1,3) are clearly visible and hence the spectrum cannot be of type earlier than M3. The strengths of the above bands and also the

bands at 5448A (0,1) and 5497A (1,2) belonging to the same system indicate a spectral type of M4.

Though the region between  $H_{\beta}$  to  $H_{\gamma}$  has a lower exposure on our spectrogram, a few more features could definitely be identified by us as also the Balmer emission lines seen in our spectrograms appear in Tables I and II.

Table I  
Emission Lines

6563A	$H_{\alpha}$
4861A	$H_{\beta}$
4303A	$H_{\gamma}$
4101A	$H_{\delta}$



Spectrum of the variable in the region 4800A-6200A on Jan. 4.61 UT

Table II  
Absorption Bands of TiO

5167 $\alpha(0,0)$	5448 $\alpha(0,1)$	5759 $\alpha(0,2)$	5810 $\alpha(1,3)$
4955 $\alpha(1,0)$	4999 $\alpha(2,1)$	5497 $\alpha(1,2)$	
4761 $\alpha(2,0)$	4804 $\alpha(3,1)$		
4584 $\alpha(3,0)$			
6158 $\gamma(0,0)$	5838 $\gamma(1,0)$		
7054 $\gamma(0,0)$	7589 $\gamma(0,2)$	8206 $\gamma(0,3)$	
6651 $\gamma(1,0)$	7125 $\gamma(1,2)$		

The identifications between 6200A and 8400A have been made on the low dispersion spectrograms. The sharpness of the emission lines of  $H_{\beta}$  and  $H_{\gamma}$  indicates that the variable was already in its post-maximum phase.

Waagen (1980) finds from the Harvard photographic plates that this object has varied in brightness from a mag  $>14$  to mag  $\sim 10$  between 1938 and 1951. Continuous photoelectric observations of this variable are necessary in order to ascertain its period and the range of light variations.

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References:

- Honda, M., 1980, I.A.U. Circular No.3546  
Keenan, P.C., McNeil, R.C., 1976, An Atlas of Spectra of the Cooler Stars: Types G,K,M,S, and C  
The Ohio State University Press.  
Merrill, P.W., 1940, Spectra of Long Period Variable Stars,  
University of Chicago Press.  
Merrill, P.W., Deutsch, A.J., Keenan, P.C., 1962, Astrophys.J.  
136, 21  
Prabhu, T.P., 1981, in press  
Waagen, E., 1980, I.A.U. Circular No. 3553.