Annu. Rep. Nishi-Harima Astron. Obs. **15,** 3–5 (2005)

The early spectrum of V2361 Cygni

Hiroyuki NAITO[1], Noritaka TOKIMASA[1], Hitoshi YAMAOKA[2]

1) Nishi-Harima Astronomical Observatory, Sayo-cho, Hyogo 679-53, Japan
2) Department of Physics, Faculty of Science, Kyushu University

E-mail: naito@nhao.go.jp

(Received 2006 January 18)

Abstract

We observed the possible nova spectrum to confirm if it is indeed a nova. What we find out from our early spectrum of V2361 Cyg is it is indeed a classical nova and has "Fe II type" features. However it is normal for the typical classical novae to decline the magnitude slowly, V2361 Cyg is going through the unexpected light curve. Our spectrum reveals it has normal features in the early phase.

Key words: Spectroscopy – Novae: Indivisual(V2361 Cyg) – Fe II type

A possible nova in Cygnus was discovered by Hideo Nishimura on 2005 Feb. 10.85 UT (Nakano et al. 2005, IAUC 8483). The discovery magnitude is 9.7 and the accurate position is R.A. = 20h09m19s.05, Dec. = +39°48'52".9 (J2000). On 2005 Feb. 11.8 UT, after verified the position of the target (Fig. 1), we performed a spectroscopic observation of the possible nova with the 0.60-m telescope and the NILS (NIshi-harima Low dispersion Spectrometer) at Nishi-Harima Astronomical Observatory (NHAO) to confirm that was indeed a nova. An exposure time was 300 seconds, and the wavelength calibration was performed with the use of the comparison spectra by Fe and Ne. A low-resolution spectrum (range 400-850 nm, resolution 150 at 500 nm) of the possible nova is shown in figure 2, and displays prominent and broad Balmer emission lines, which suggests that it is indeed a classical nova. This report was published in IAUC 8484 and V2361 Cygni (hereafter Cyg) has been named to this nova (Samus 2005, IAUC 8487).

We report new other knowledges after detailed reduction in this paper. We showed that the FWHM of the H_α line was 2400 km/s. The spectra of novae can be divided into two classes by whether the Fe II lines are stronger than the lines of He and N or vice versa(Williams et al. 1991). As our spectrum shows Fe II 518.7nm and 531.6nm lines remarkably, it can be classified as "Fe II type" nova. Amang "Fe II type" novae, spectra of V4742 and V4743 Sagittarii (hereafter Sgr) in several days after maximum, have similar features with V2361 Cyg especially within the visual range (e.g. Morgan et al. 2003). There is another notice that our spectrum has a little reddening compared with the normal one, so that has a red continuum. It is thought to be absorbed by dust. However absorption line intensities are low and it is difficult to measure the absorbed amount even from sodium D line.

The classical "Fe II type" novae generally track the gradual decline light curve, but the decline rate of V2361 Cyg was accelerated from 5 day after the discovery (Fig. 3). Furthermore its time scale was quite short equal to ∼10 mag (V-mag) drop during 15 days from the peak luminosity. There is no nova which shows such an anomalous brightness change so far. V4742 and V4743 Sgr whose spectra resemble with that of V2361 Cyg have the quick Duerbeck A type light curve (e.g. Duerbeck 1981), or have gradual decline. V2361 Cyg's sudden magnitude drop is an exceptional case after all. Another example for the novae and related objects with so quick light curve drop is V4332 Sgr (unusual luminous red variable, LRV). As far as we checked the DSS (Digitized Sky Survey) and 2MASS (Two Micron All Sky Survey) images to the limited magnitude, there is no red progenitor and therefor the possibility of LRV is very low.

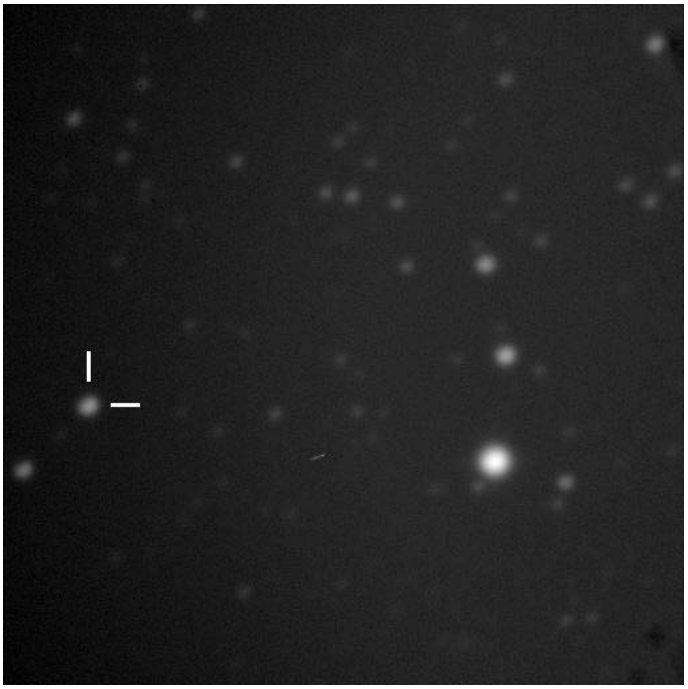

Fig. 1. The no filter CCD image, the FOV of which is 10' × 10' taken with the 0.60-m telescope attached ST-9. North is up, and east is left. V2361 Cyg is pointed.

We wish to thank to S. Narusawa and T. Ishida for their useful advice and the staff of Nishi-Harima Astronomical Observatory for their assistance in the observations.

References

Bode, M., Zamanov, R., Marchant, J., O'Brien, T. J. 2005 *IAUC*, **8511**

Ciroi, S., di Mille, F., Rafanelli, P. 2005, *IAUC*, **8487**

Duerbeck, H. W. 1981, *PASP*, **93**, 165

Gaggero, D., Martire, I., Poggiani, R., Puccetti, V., Shore, S. N., Tognelli, E., Bernabei, S. 2005, *IAUC*, **8529**

Morgan, G. E., Ringwald, F. A., Prigge, J. W. 2003, *MNRAS*, **344**, 521

Naito, H., Tokimasa, N., Yamaoka, H. 2005, *IAUC*, **8484**

Naito, H., Tokimasa, N., Yamaoka, H. 2006, *IBVS*, **5699**, report #88

Nakano, S., Nishimura, H., Wakuda, S., Kadota, K. 2005, *IAUC*, **8483**

Russell, R. W., Rudy, R. J., Lynch, D. K., Golisch, W. 2005, *IAUC*, **8524**

Samus, N. N. 2005, *IAUC*, **8487**

Waagen, E. O., Dvorak, S., Miles, R., Bouma, R. J., Hornoch, K. 2005, *IAUC*, **8487**

Williams, R. E. 1992, *AJ*, **104**, 725

Williams, R. E., Hamuy, M., Phillips, M. M., Heathcote, S. R., Wells, Lisa, Navarrete, M. 1991, *ApJ*, **376**, 721

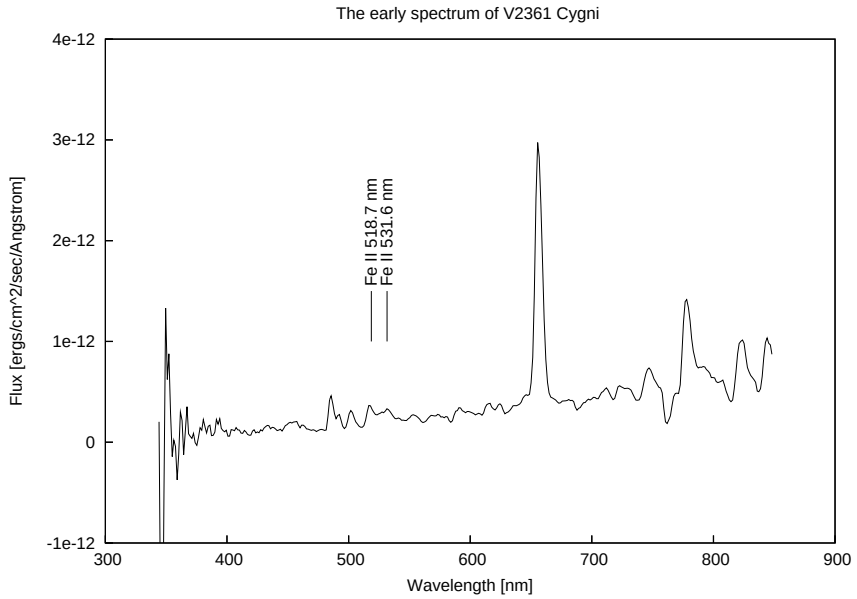

Fig. 2. The early spectrum of V2361 Cyg (published in IBVS No. 5699). This spectrum shows broad Balmer emission lines and "Fe II type" features.

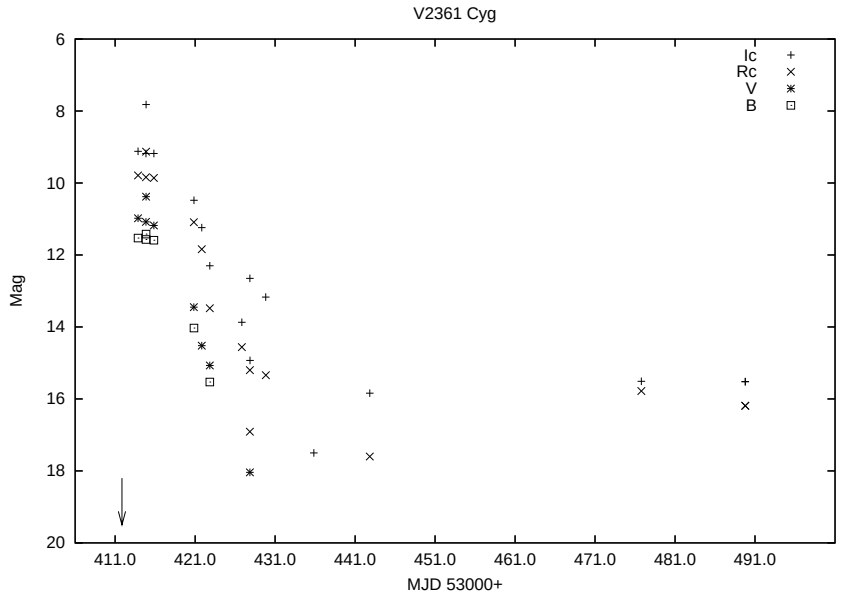

Fig. 3. The light curve of V2361 Cyg published in the VSNET. The arrow points the discovery time of 2005 February 11.85 UT by Hideo Nishimura(MJD = JD - 2400000.5). In the all bands, accelerating magnitude drops are seen from 5 day after the discovery.