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NOVA VELORUM 1999: LIGHT CURVES AND SPECTROPHOTOMETRY

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In May 1999 Peter Williams and Alan C. Gilmore independently discovered a bright nova in Vela (Green 1999), now designated as V382 Velorum. As we have done in the past, the authors carried out photometric observations, Jones visually and Liller with a CCD and a "minus-IR" filter. As noted elsewhere (Liller & Jones 1996), this combination of CCD and filter results in a broad band V system which extends from a wavelength of about 420 nm to 730 nm and thus includes the Hα line. Additionally, Liller recorded low-resolution CCD spectra of the nova using a 10-degree objective prism with a 20-cm $f/1.5$ Schmidt camera. The spectrograms covered the range from Hα to the higher members of the Balmer series, at times reaching beyond Hδ at 410 nm. At the wavelength of Hα, the resolution is 27 Å/pixel and improves to 6.6 Å/pixel at Hδ.

The light curves are shown in Figure 1 and include some pre-discovery magnitudes on various systems taken from IAUC 7176. Our own observations, depicted as filled circles (Jones) and crosses (Liller), are in general agreement showing a rapid decline in brightness for the first 50 or 60 days after maximum, and a slow, smooth fall-off afterwards. Assuming that peak brightness came at JD 2451320.8, we measure the quantity t_3, the time it takes a nova to decline by three magnitudes from peak brightness, to be 12.3 days in the visual and 17.5 days with the CCD. As we have explained before (Liller & Jones 1999), this difference can be understood by remembering that the strong Hα emission makes the nova appear relatively brighter with the CCD than visually since the eye has low sensitivity at this wavelength. In either case, the nova can be classed as "fast" and quite similar to Nova Sco 1998 (Liller & Jones 1999a) but not so fast as Nova Oph 1998 or Nova Mus 1998 (Liller & Jones 1999b).

Perhaps the most interesting feature of Fig. 1 is the cross-over of the two light curves that occurred at about JD 2451490. The reason for this change can be readily explained by considering the spectrograms. Figure 2 shows scans of the nova spectrum taken just when the cross-over was beginning at JD 2451468 (Oct. 16), and then at JD 2451526 (Dec. 13) when the cross-over was complete. Hα, at pixel number 128, continues strong, but in the later scan the blended [O III] lines (496 and 501 nm) are beginning to dominate the spectrum and overpower neighboring Hβ. Since the dark-adapted eye is at peak sensitivity near 500 nm with the CCD peaking in the red, it is apparent that the eye will see the nova fading less rapidly as the [O III] lines strengthen relative to the hydrogen lines. Another conspicuous change is the blend of lines appearing at wavelengths around 464 nm. This

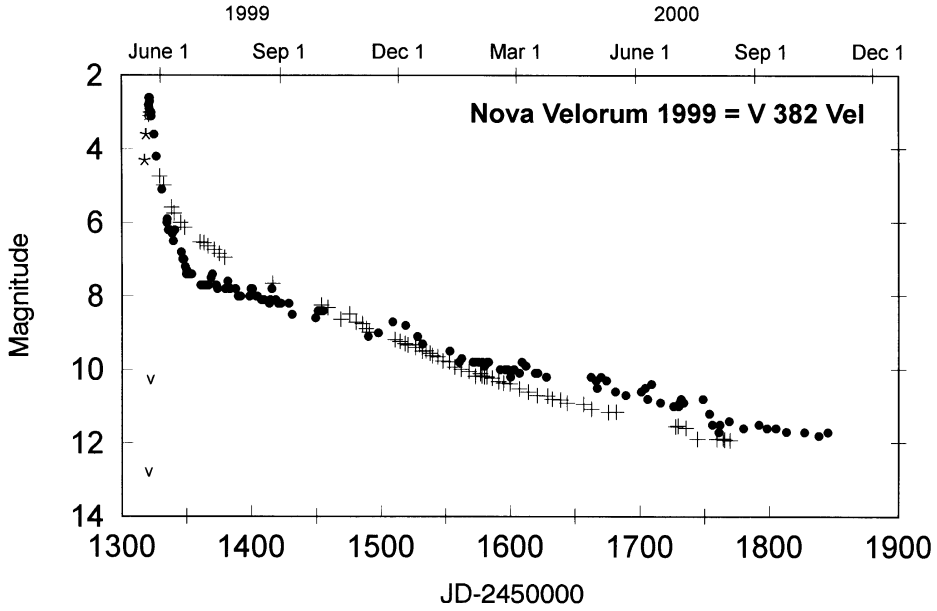

Figure 1. Light curves of Nova Velorum. The filled circles depict Jones's visual observations while crosses indicate Liller's broad band V measurements. Some pre-discovery observations taken from the IAUC are also included, and shown by different symbols

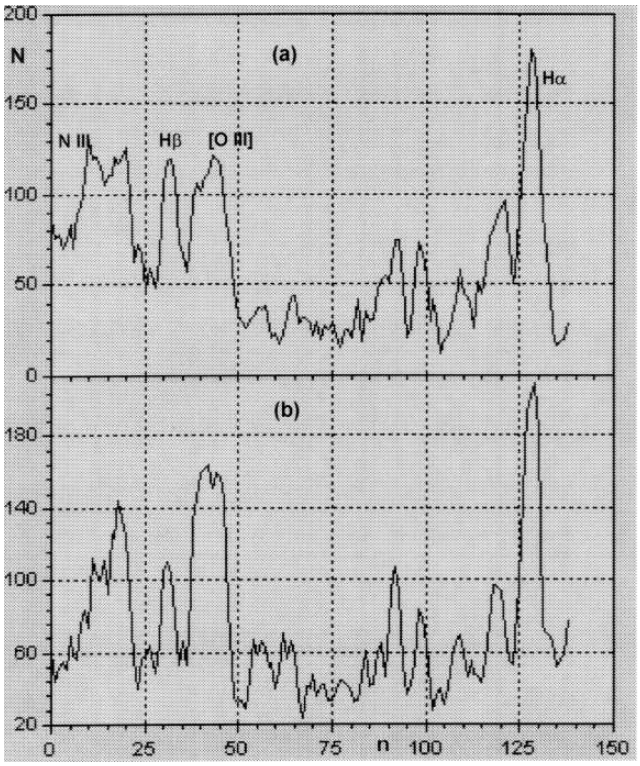

Figure 2. Low-resolution scans of the spectrum of Nova Velorum taken at (a) JD 2451465 and (b) JD 2451526. The wavelengths range from approximately 450 nm at the left to just beyond the wavelength of Hα at the right. Lines of interest are labelled. The scale along the horizontal axis gives the CCD relative pixel numbers, n; the vertical scale shows the relative number of counts per pixel, N

blend is made up primarily of permitted lines of N III around 460 nm which weaken as the nova enters the "nebular stage". However, at this wavelength both the eye and the CCD have loss considerable sensitivity. Finally, note that the continuum, best seen in the vicinity of pixel 75 and just shortward of Hβ, has faded relative to the stronger emission lines.

As always, it is a pleasure to thank Dr. Nikolai Samus for his interest and his encouragement to publish light curves of novae.

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