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LIGHT CURVES FOR NOVA Sgr 1998 AND NOVA Sco 1998

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In 1998 two bright novae were discovered by Liller, one in Sagittarius on Mar. 22.3 UT and one in Scorpius on Oct. 21.0 UT (Liller 1998a and b, respectively). Immediately following the discoveries, the authors began 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 450 nm to 730 nm and thus includes the H α line. As noted in the Circulars, the discovery photographs were made using Kodak Technical Pan film plus an orange filter which yields a passband extending from approximately 610 nm to 690 nm.

The light curves, shown in Figures 1 and 2, are similar in that both show a steady decline. However, they clearly differ in two other respects: N Sco was much “faster” than N Sgr; and while the visual and CCD magnitudes for Nova Sgr never depart by more than a few tenths of a magnitude, those for Nova Sco began to diverge conspicuously immediately after discovery.

Clearly, the quantity t_3 , the time in days that it takes a nova to decline by three magnitudes from peak brightness, depends on the passband of the observation. This annoying fact was emphasized in the classic works of Arp (1956) and of Payne-Gaposchkin (1957). The relationship between t_3 and absolute magnitude has been calibrated among others by Arp (1956) and Rosino (1964), who used blue-sensitive photographs in their work. Consequently, H α , nearly always the strongest emission feature in nova spectra especially shortly after peak brightness, did not contribute to their measurements.

In the blue photographic band, spectra of novae are usually dominated by numerous fainter emission lines including the higher members of the Balmer series, and by the continuum, bluish in the absence of interstellar extinction. As for the dark-adapted eye most sensitive near 500 nm, it has little sensitivity at the wavelength of H α . As a result, values of t_3 derived from visual observations should usually agree quite well with the “classical” values.

On the other hand, both CCDs and Kodak’s Technical Pan emulsion have their sensitivities very close to 656 nm, the wavelength of H α . One would suspect, therefore, that the intensity of H α relative to the neighboring continuum would be the root of the cause for the differing behaviors of the two novae of 1998. Indeed, low-resolution spectrograms taken with a CCD and an objective prism by Liller (1998a) showed for Nova Sgr an H α line in emission at a level ~ 1.5 times brighter than the surrounding continuum, while

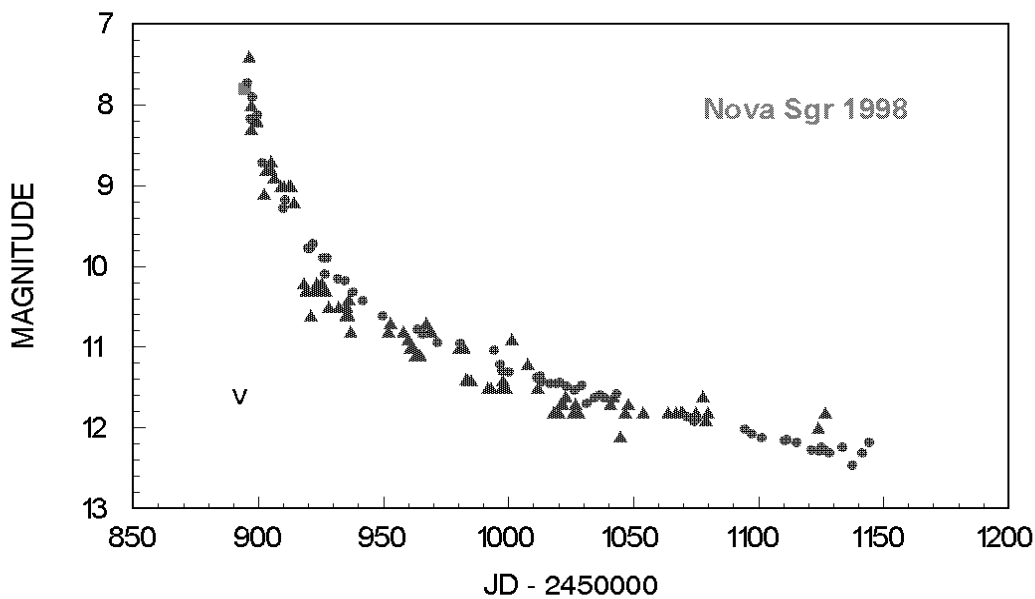


Figure 1. Light curves of Nova Sgr 1998 showing the visual magnitude estimates as triangles and the CCD broadband V observations as circles. The photographic discovery is indicated with a square; the "v" denotes a fainter-than pre-discovery observation.

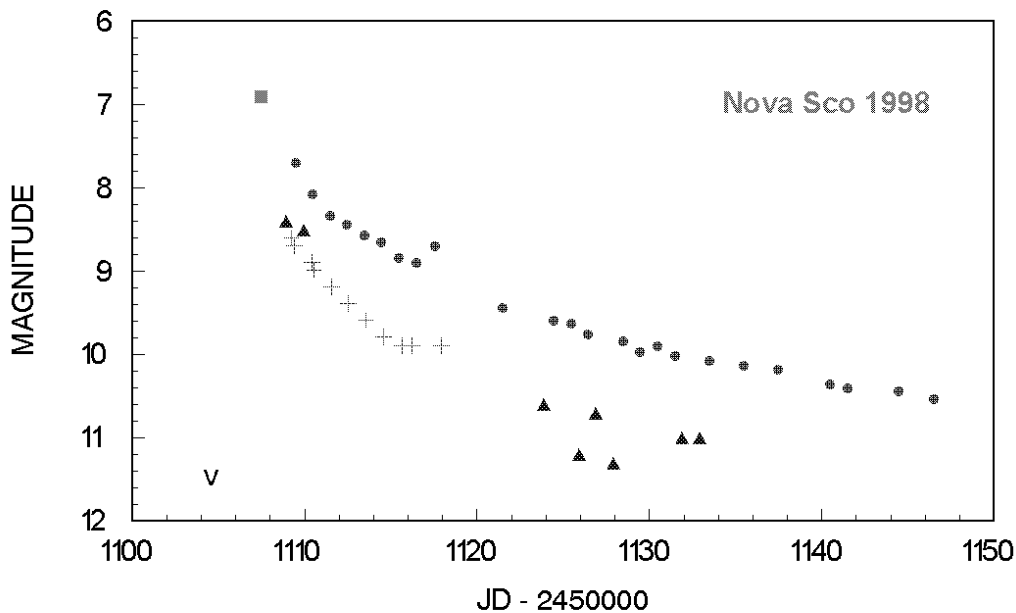


Figure 2. Light curves of Nova Sco 1998 using the same symbols as in Fig 1. Additionally, plus signs (+) indicate several estimates kindly provided by the AAVSO.

for Nova Sco, he reported a broad, intense H α emission at a level of ~ 7.6 times brighter than the surrounding continuum (Liller 1998b).

To our knowledge there have been no reports of magnitude measurements in the R and B bands.

From our light curves we find that for Nova Sgr, $t_3 \approx 35$ and 48 from the visual and the CCD observations, respectively. For Nova Sco, we estimate $t_3 \approx 12$ and 22 days, respectively. As usual, the peak magnitudes are uncertain, but it seems probable that for Nova Sgr, discovery was made before maximum brightness. However, for Nova Sco there remains considerable uncertainty: the previously known photographs of the region were taken 4 nights before the discovery photograph, and the extrapolations of the light curves provide only a hint of what the peak magnitude might have been.

We are most indebted to Drs. Nikolai Samus and Hilmar Duerbeck for urging us to publish light curves of novae, and to Dr. Samus for reading an earlier version of this paper. It is our intention to publish more nova light curves in the near future.

References:

- Arp, H.C.: 1956, *Astr. J.* **61**, 15
Liller, W.: 1998a, IAU Circ. 6846
Liller, W.: 1998b, IAU Circ. 7034
Liller, W., Jones, A.F.: 1996, IBVS No. 4403
Payne-Gaposchkin, C.: 1957, *The Galactic Novae*, North-Holland Publ. Co., Amsterdam, pp. 20–24
Rosino, L.: 1964, *Ann. Ap.* **27**, 497