WHERE IS NOVA 1437? - SURPRISES IN THE SPACE DENSITY OF CATACLYSMIC VARIABLES

M. M. Shara and M. Potter
Space Telescope Science Institute

A.F.J. Moffat
Université de Montréal

M. Bode
Lancashire Polytechnic

F.R. Stephenson
Durham University

Abstract: A U-B search to 21st magnitude in a 1°x1° region centered on the best position for the Korean nova of 1437 has revealed no unique candidate. Instead, we find 7 faint UV-bright stars with CV-like emission lines. The implied space density is two orders of magnitude higher than the classical space density for CV's.

Background: The Korean Chronical Sejong Sillok reports that in AD 1437 "a guest star began to appear between the second and third stars of Wei, nearer to the third star and about half a chih away; it lasted for 14 days". From this description and from the lack of reported motion, the star was probably a fast nova. Wei is the tail of Scorpius, and the indicated position is about 0.5 degrees north of Zeta Sco.

Search Method: In an attempt to recover this old nova, we have digitized and analyzed UK Schmidt U and B plates of the target region. Initially we have selected UV bright stars to B = 21 mag in a 1°x1° field centered on the nova's position. Slit spectra of the candidates were obtained at CTIO and SAAO.

Results: Of the 21 UV-bright stars found in the 1°x1° field, 7 show mainly only Balmer emission lines (cf. Fig. 1). These 7 could in principle be any of: (1) Be stars, (2) planetary nebulae (PN), (3) symbiotic stars (SS) or (4) cataclysmic variables (CV). The first three are unlikely: the candidates are too faint ($\langle B \rangle \simeq$ 19) and little reddened to be Be stars; lack of forbidden nebular lines such as [OIII], [OII], [NII] or [SII] makes PN unlikely; and the stars are too faint to be SS, at least with giant companions as most seem to have (Kenyon and Fernandez-Castro (1987)). Indeed, CV'S are the most likely.

The lack of HeII 4686 or strong HeI 5876 emission implies relatively low luminosity for the underlying stars, assumed to be CV binaries. Thus, we take $M_B \simeq$ +8 to +10. Furthermore, adopting $A_B \simeq 1$ mag kpc^{-1}, the 7 blue emission-line stars observed to B = 21 lead to a space density of (70 - 600) x 10^{-6} stars pc^{-3}.

Conclusions: The above space densities are consistent with the hibernation scenario of CV binaries which become very faint for a significant time between nova eruptions (Shara et al. 1986), but inconsistent with lower "classical" space densities of ~ 10^{-6} stars sc^{-3} for CV's. It is also not clear which, if any, of the 7 emission-line stars is the nova of 1437. Follow-up studies will include deep Hα online-offline imagery to search for ejected shells, and high speed photometry to search for flickering and/or orbital periods.

References

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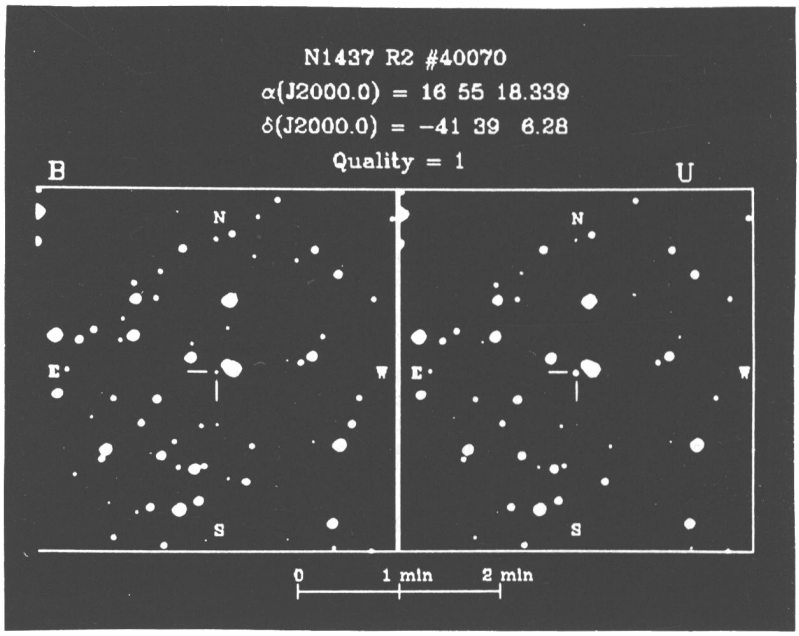

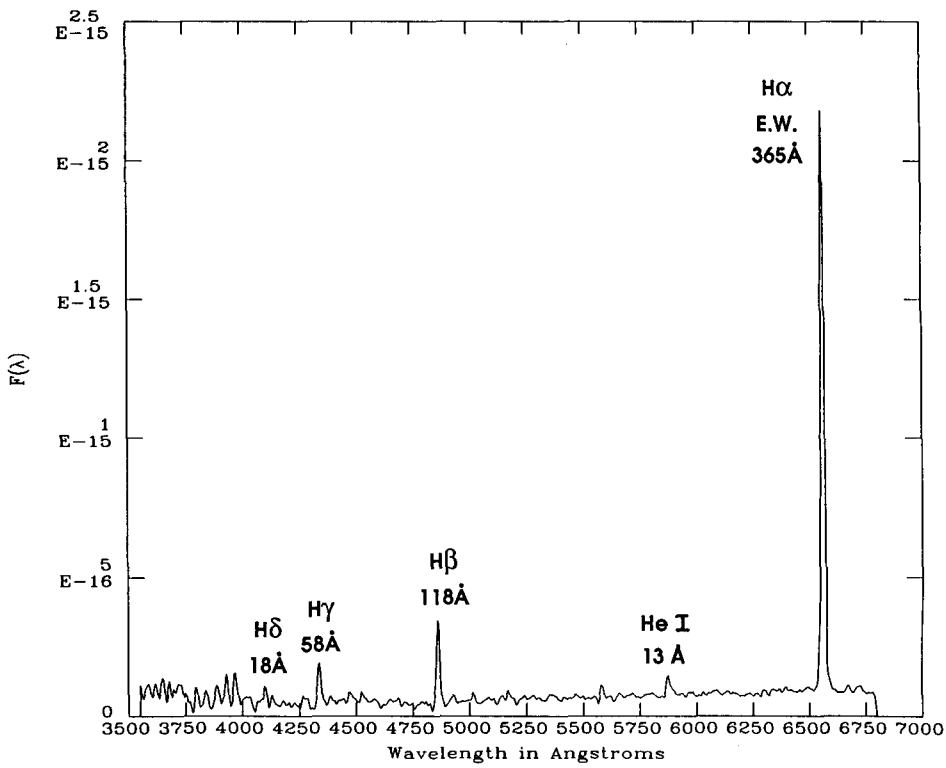

Figure 1: Identification and spectrum of a typical example of one of the 7 UV-bright emission-line stars in the 1°x 1° Nova 1437 field.

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