

## Optical Spectroscopy of the nova-like variable V445 Puppis

U.S. Kamath\* & G.C. Anupama†

*Indian Institute of Astrophysics, Koramangala, Bangalore 560 034.*

**Abstract.** V445 Puppis is a peculiar variable which had a nova-like eruption in December 2000. The early spectra did not show any emission lines of hydrogen or helium. Fe II lines were very dominant during this phase. We present optical spectra of the early-decline phase of V445 Pup obtained from the Vainu Bappu Observatory during Feb–April 2001.

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### 1. Introduction

V445 Puppis was discovered in December 2000 as an apparent nova of magnitude 8.6 by Kazuyoshi Kanatsu on his T-Max 400 film exposures (Kato et al. 2000). The star remained at a magnitude of 9–10 till March 2001 and faded thereafter (eg., Gilmore & Kilmartin 2001). Surprisingly, early optical spectra showed no emission lines of H I and He I, indicating that the object was unusual, although it resembled a nova in some other respects (for e.g., Platais et al., 2001).

We present here some preliminary results based on medium resolution optical spectra of V445 Puppis during the early post-outburst stage, obtained from the Vainu Bappu Observatory during Feb–April 2001. These spectra cover the wavelength region of 4000 – 10000 Å, with dispersions of 2.7 Å/pixel (Feb) and 5.4 Å/pixel (Mar–Apr).

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\*e-mail:kamath@iiap.ernet.in

†e-mail:gca@iiap.ernet.in

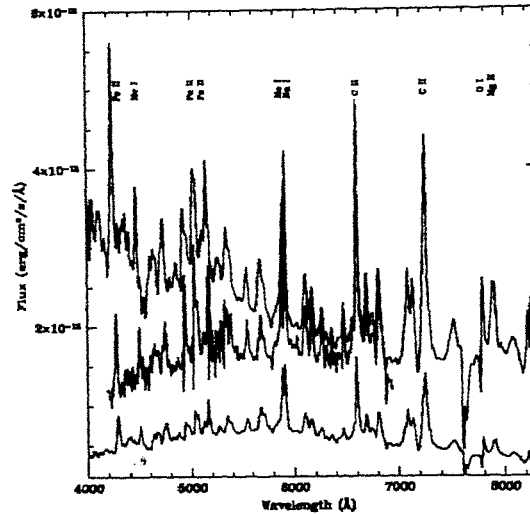


Figure 1. Blue region spectra of V445 Pup obtained on 15 February (middle), 18 March (top) and 30 April 2001 (bottom). Prominent emission lines are labelled.

## 2. Temporal evolution of the spectrum

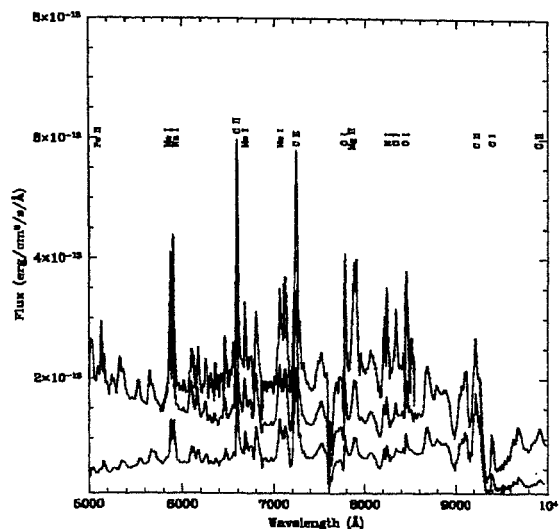
Optical spectra of V445 Pup obtained in different epochs during its early decline stage can be seen in Figs 1 and 2.

The spectra are dominated by numerous emission lines arising from Fe II (multiplets 27, 37, 38, 42, 46, 48, 49, 74) ; Na I (5890 and 6160 Å) ; C II (6580, 7121, 7239 Å) at all epochs. Several lines of N I, C I, Mg II can also be seen. Although V445 Pup does not show hydrogen emission lines, He I is present in emission (4471, 5875, 6676, 7069 Å). Lines of O I at 7775, 8446 Å are also observed.

P-Cygni profiles, with absorptions shifted by  $-400$  to  $-500$  km/s from the peak, are seen on several emission lines in the 15 Feb spectra. The P-Cygni features had weakened by 18 March.

The object brightened up and became bluer in March and reverted to its earlier state in April. The brightening could be related to the significant variability observed in the ultraviolet by Garnavich & Quinn (2001).

We have calculated monochromatic magnitudes of V445 Pup in different epochs at 4400 Å (denoted as  $b$ ) and 5500 Å ( $v$ ), following the standard practice of estimating



**Figure 2.** Red region spectra of V445 Pup obtained on 15 February (top), 18 March (middle) and 30 April 2001 (bottom). Prominent emission lines are labelled.

magnitudes of objects such as novae which are dominated by emission lines. Accordingly, we find  $(b - v)$  to be +0.9, +0.4 and +0.9 respectively on Feb 15, Mar 18 and Apr 30.

### 3. Concluding remarks

The spectra of V445 Pup are unlike those of other novae, and particularly unique because of the lack of hydrogen emission lines although lines of other common elements like carbon, oxygen, helium and iron are present. The P-Cygni profiles in the early outburst phase are evidences of mass-loss, which probably stopped or lessened significantly about four months after the outburst.

### References

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 Gilmore, A.C., Kilmartin, P.M., 2001, IAU Circular, 7620  
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 Platais et al, 2001, IAU Circular, 7556