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JHK Spectroscopy of the Enigmatic Variable V445 Puppis

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Abstract. Near-IR spectroscopic observations are reported for the enigmatic, nova-like, variable V445 Puppis. The near-IR spectra are hydrogen-deficient and unusually rich in CI lines. The spectra indicate that the object could be a rare Helium nova.

1. Introduction

V445 Puppis - a nova like object - was first reported to be in outburst on 30 December 2000 by Kanatsu (Kato and Kanatsu, 2000). Spectra in the visible region taken by others showed many permitted lines of FeII, CaI, CaII, OI and NaI. A striking feature of the optical spectra was the absence of Hydrogen lines in the spectra. Near-IR spectra reported here also confirm the absence of Paschen and Brackett Hydrogen lines in the *JHK* bands. The deficiency of Hydrogen in V445 Puppis shows that it is not an usual nova but rather a strange object.

2. Observations and Results

Near-IR *JHK* spectra at a resolution of ~ 1000 were obtained at the Mt. Abu 1.2m telescope using a Near Infrared Imager/Spectrometer with a 256×256 HgCdTe NICMOS3 array. We present, in Fig. 1, the *J* and *H* spectra of 1 January 2001. The *K* band spectrum was found to be featureless. The emission lines that are seen in the *J* and *H* spectra are almost all due to CI (Ashok and Banerjee, 2003). The prominent CI lines are found at 1.133, 1.166, 1.175, 1.189, 1.26 and 1.689 μm. It may be seen from the *JHK* spectra that V445 Pup is hydrogen-deficient. Lines generally seen in novae spectra viz. Brackett gamma line at 2.1656 μm, other Brackett series lines (Br10 to 19) in the *H* band and Paschen beta at 1.2818 μm in the *J* band are all missing. It may be pointed out that in the optical spectra several HeI lines were prominently seen (Wagner et al. 2001) while at the same time the Balmer Hydrogen lines were absent. It is also important to note that many Carbon lines are also strongly seen in the optical spectra (Kamath & Anupama 2002). Thus the

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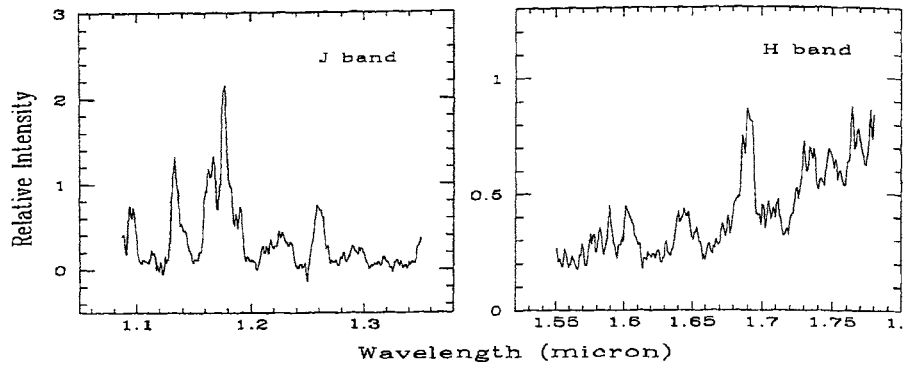

Figure 1. The *J* and *H* band spectra of V445 Puppis of 1 January 2001.

IR and optical evidence indicate that not only is V445 Puppis a hydrogen-deficient object but also that it is rich in Carbon and Helium.

3. The Nature of V445 Puppis

The nature of V445 Puppis is rather enigmatic. It differs from novae, born-again AGB stars, V838 Mon-type of objects and also RCB/HdC stars in several aspects. The detailed differences between V445 Puppis and other eruptive variables is discussed in an accompanying article in this volume (Banerjee and Ashok). It is quite possible that V445 Puppis is a rare Helium nova in the proposed scenario of Kato et al. (1989) and Iben & Tutukov (1994).

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