

Near-infrared spectroscopy of nova Sagittarii 1998

N.M. Ashok and T. Chandrasekhar

Astronomy and Astrophysics Division, Physical Research Laboratory Ahmedabad 380 009, India

Abstract. Near-infrared spectra of Fe-II type nova, Nova Sagittarii 1998 obtained during the period 30 to 70 days after the discovery date are presented. The near infrared spectrum is dominated by emission lines of hydrogen and accompanied by lines of CI, OI and NI. The 1.129 μm OI line excited by Lyman fluorescence is prominently seen in our first spectrum obtained in April 1998. In addition the OI line at 1.316 μm is also detected indicating the presence of UV continuum fluorescence.

1. Introduction

A program of spectroscopy of novae has been initiated at Mt. Abu Observatory to investigate the characteristics of nova spectra in the near infrared - 1 to 2.5 μm - wavelength range. We report here the near infrared spectroscopic observations of Nova Sagittarii 1998 obtained between 30 and 70 days after the discovery date.

Nova Sagittarii 1998 was discovered on 1998 March 22.36 UT by W. Liller (Liller 1998) at a magnitude of 7.8. The nova is located at α (2000.0) 18^h 21^m 40.47^s and δ (2000.0) -27° 31' 38". Early spectroscopic observations indicate that the nova was discovered in an early stage. The presence of strong permitted FeII lines and FWHM velocity of 1600 kms^{-1} of H α and 1800 kms^{-1} of H β indicate that this nova belongs to the "FeII" class of novae.

2. Observations

The JHK spectra were obtained on the Mt. Abu Observatory 1.2 m telescope using the Near Infrared Imager/Spectrometer with 256 \times 256 HgCdTe NICMOS3 array. The resolution of the spectrometer is 1000. The spectra in different bands are obtained by rotating the grating. For each position of the grating two spectra were taken with the nova placed at two different positions on the slit. The slit width is 2 arcsecond and is oriented in North-South direction. An integration time of 60 seconds was used for all observations. The spectroscopic observations were obtained immediately following the imaging observations.

	<u>Date</u>	<u>Details</u>
1998	April 22,99 UT	JHK Spectra
1998	May 7.99 UT	JH Spectra and JHK Imaging
1998	June 3.88 UT	JH Spectra and JHK Imaging

3. Analysis

The spectra were analysed using the IRAF package. The OH airglow lines that register alongwith the object spectra have been used for spectral calibration. The image pairs were subtracted from each other to remove the dark current of the array. This procedure also removed the sky and background emission. The standard star spectra were used to derive the spectral sensitivity function using stellar spectral library of Pickles (1998). The final combined nova spectra were divided by the standard star spectra.

4. Results

The near infrared spectra show a number of interesting features. The strongest lines in the spectra for April 22.99 are the OI line at 1.129 μm and the hydrogen lines Br γ , Br 10-13, Pa β and Pa γ . The FeII lines at 1.1126 μm , and 2.091 μm , NI line at 1.2461 μm , OI line at 1.316 μm , HeI at 2.058 μm are also present. The hydrogen lines have multiple peaks. The profiles of the strong hydrogen lines were fit with Gaussian profile - the derived FWHM velocities lie in the range 1800 to 2000 kms^{-1} .

The OI lines at 1.128 and 1.316 μm are due to fluorescence. The high flux ratio, $F(1.128)/F(1.316) \sim 10$, indicates that OI emission mechanism is dominated by Ly β fluorescence.

The detection of FeII lines supports the classification of the nova based on optical spectra as FeII class.

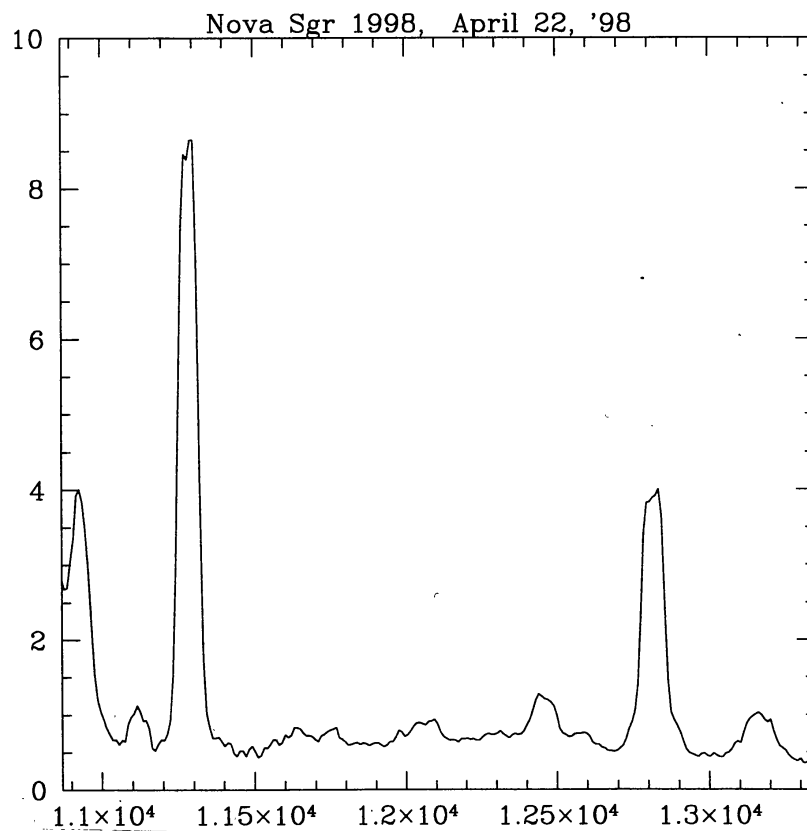
Many of the lines in the April 22.99 spectra are still present in later spectra but are showing significant variations relative to the continuum.

References

- Liller. W., 1998, IAUC 6846,
 Pickles, A.J., 1998, PASP, 110, 863.

Table 1. Emission line list.

No.	Wavelength(\AA)	Identification
1	10938	Pa γ
2	11126	Fe II
3	11287	O I
4	12461	NI
5	12818	Pa β
6	13164	O I
7	15562	Br 16
8	15888	Br 14
9	16117	Br 13
10	16414	Br 12
11	16812	Br 11
12	17370	Br 10
13	20583	He I
14	20910	Fe II
15	21656	Br γ

**Figure 1.** J band spectrum of N Sgr 98 on Apr 22.99, 30 days after discovery date. The fluxes are in normalised units with continuum emission as 1 at $1.25 \times 10^4 \text{\AA}$