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Optical spectroscopy of nova V1494 Aquilae 1999

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1. Introduction

Nova V1494 Aql (1999 #2) was discovered on dec 1.875 UT (Pereira et al. 1999) at a visual magnitude of m_{vis} = 6.0. The nova reached a maximum brightness of 4.0 shortly after the discovery, which was followed by a rapid decline. The visual light curve (made by the VSNET group) indicates the nova is a fast one with t_0 = Dec 3.4 UT, $t_2 = 6.6 \pm 0.5$ days and $t_3 = 16 \pm 0.54$ days (Kiss & Thomson 2000). The light curve also shows oscillations during the transition phase.

Spectroscopic studies by Kiss & Thomson (2000) indicate the nova belongs to the 'Fe II' class.

We present here some preliminary results based on medium resolution optical spectra of V1494 Aql during the early decline phases, obtained from the Vainu Bappu Observatory (VBO) during 1999 Dec 6-25 and from the Guillermo Haro Observatory (GHO), Mexico, during 1999 Dec 4-7.

2. Temporal evolution of the spectrum

Figure 1 shows the temporal development of the spectrum of V1494 Aql. The spectrum of December 4 shows strong P-Cygni emission lines. Fe II lines are the most prominent non-Balmer lines. N I and O I lines are also present. By December 6-7 the emission line strengths increased. O I 8446 Å line developed, as also the Ca II IR triplet and N II lines. The O I 8446 Å line strength increased by December 10, indicating increased Lyβ fluorescence. The Balmer and O I lines developed a flat topped profile. The O I 8446 Å line strength further increased on December 16. By this time, the emission lines developed a saddle shaped profile. The blue peak is stronger in Hα, while in Hβ and the O I lines, the peak is stronger. By Dec 23, Hα was the strongest line, while the strengths of other lines appeared to have decreased. A change in the relative intensities of the blue and red peaks in both Hβ and Hα was detected. The red peak was stronger than the blue peak. Figure 2 shows the development of the Hα line profile.

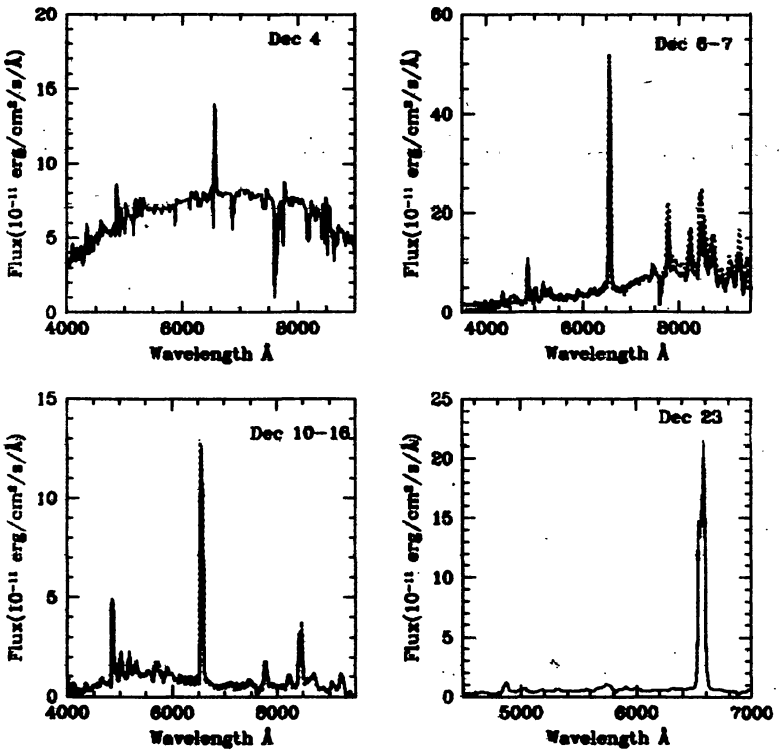

Figure 1. Temporal evolution of the spectrum of V1494Aql.

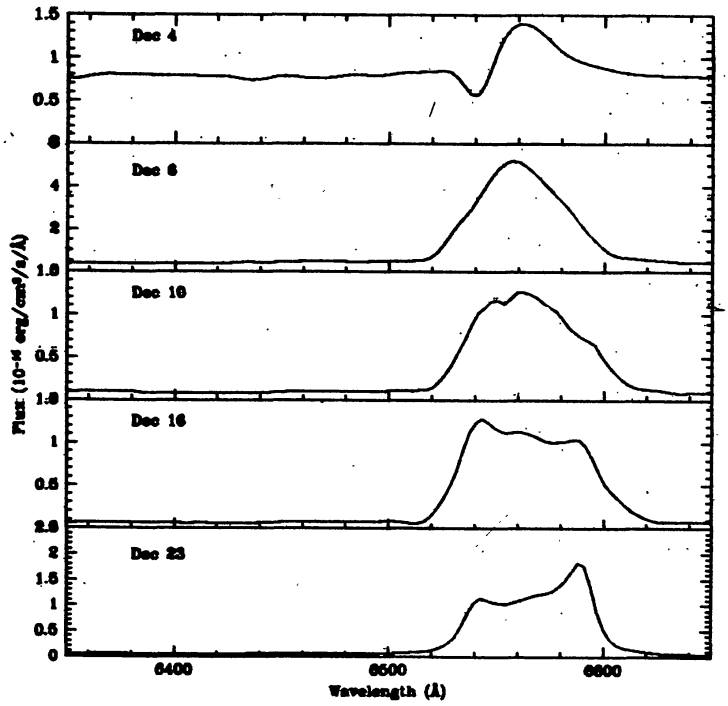

Figure 2. Evolution of the Hα emission line profile.

Absorption velocities: On December 4, Hβ and the Fe II lines indicate a velocity of –1260±70 km s^{-1}, while the Hα and O I 7774 Å lines indicate –1010 ± 100 km s^{-1}. The absorption velocities have increased to – 2200 ± 100 km s^{-1} December 10, and were – 2300 ± 100 km s^{-1} on December 16.

Emission velocities: The Hα line profile showed peaks at –600 km s^{-1} and + 0 km s^{-1}. By December 15, the line profile had changed and the saddle profiles of Hβ, Hα and O I 8446 lines showed peaks at (–716; +1012) km s^{-1}, (–910; +1068) km s^{-1} and (–710; +923) km s^{-1}, respectively.

3. Concluding remarks

Nova V1494 Aql belongs to the fast, Fe II class of novae. The spectrum developed from the P_{Fe} to P^{o}_{Fe} phases in the CTIO classification scheme (Williams et al 1991) during our observations. The emission lines developed a saddle-shaped profile indicating non-spherical symmetry in the ejected shell. The line profiles are similar to that seen in nova shell models with an equatorial ring and polar caps (Gill and O'Brien 1999). The difference in the relative strengths of the blue and red emission peaks imply possible small scale clumpiness in the shell (Gill & O'Brien). The change in the relative strengths of the red and blue peaks could possibly be due to the fact that the shell shaping is not completely over, and/or the emission lines are not yet optically thin.

References

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