

Spectroscopic Results of the Recurrent Nova RS Ophiuchi

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The recurrent nova RS Ophiuchi has had five outbursts in 1898, 1933, 1958, 1967 and 1985. We present here in brief the spectroscopic results of the 1985 outburst and subsequent quiescence, based on data obtained at the Vainu Bappu Observatory (VBO), Kavalur. Detailed results of the 1985 outburst appear in Anupama & Prabhu (1989).

The 1985 outburst

Spectra were recorded in the range 6200-8900 Å at dispersion of 194 Å mm^{-1} at four epochs: 32, 59 & 60; 89 & 91 and 108 days since the 1985 outburst maximum on January 27.5. In addition, spectra were recorded in the range 4300-5600 and 5000-7600 Å at dispersion of 132 Å mm^{-1} on day 60, and in the range 5700-8000 Å, at dispersion of 194 Å mm^{-1} , on days 89, 91 and 108.

The envelope was assumed to be in Phase II of Bode & Kahn (1985) model at the period of our observations. The observed velocities, estimated from the widths of emission lines, are consistent with those predicted by the model. Observed fluxes in H α line imply that the electron density decreased from $3 \times 10^9 \text{ cm}^{-3}$ on day 32 to $1.8 \times 10^8 \text{ cm}^{-3}$ on day 108, for an assumed filling factor of 0.01. The helium abundance in the ejecta is estimated to be $n(\text{He})/n(\text{H}) = 0.16$. Observed fluxes in coronal lines imply that the temperature of the coronal-line region decreased from $1.5 \times 10^6 \text{ K}$ on day 32 to $1.1 \times 10^6 \text{ K}$ on day 108. These lines arise in the shocked cooling ejecta, which is not isothermal, but contains material at a wide range of temperatures. Considerations of number of photons ionizing H and He lead to the temperature and radius of the central source. The temperature increased from $3 \times 10^4 \text{ K}$ on day 32 to $3.6 \times 10^5 \text{ K}$ on day 204, whereas the radius decreased from $2 \times 10^{12} \text{ cm}$ to $6 \times 10^9 \text{ cm}$ during the same period.

The quiescent spectrum

Spectra were obtained in 1986-1987 (4600-7000 Å, 85 Å mm^{-1}) and in 1988-1989 (4600-8700 Å, 200 Å mm^{-1}). The spectrum is predominantly that of the M giant secondary characterized by TiO band absorptions. Superposed are the emission lines of H α , H β , He I 5876, 6678; O I 8446 and the infrared triplet of Ca II (2). The He I line strengths are continuously decreasing. The presence

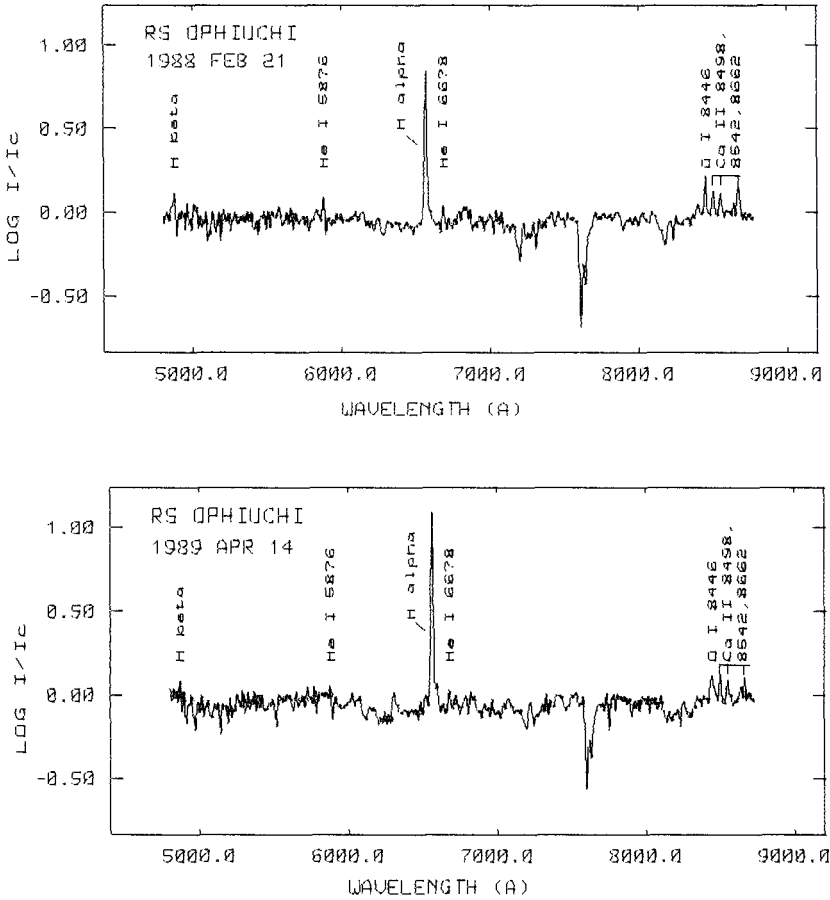


Figure 1. Spectra of RS Ophiuchi observed on (top) 1988 February 21, and (bottom) 1989 April 14. Both the spectra are reduced to the continuum intensities.

of O I 8446 indicates a continued presence of Ly β fluorescence. Sample spectra, obtained in 1988 and 1989 are shown in Fig.1.

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References

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