

The Extended Atmosphere and Evolution of the RV Tau Star R Scuti

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Abstract. We identify H₂O, CO, SiO and CO₂ bands in near-infrared ISO/SWS spectra of the RV Tau star R Sct. These molecules originate from an atmosphere around the photosphere. RV Tau stars are commonly considered as post-AGB stars. We argue that R Sct may be a thermal-pulsing AGB star, observed in a helium-burning phase.

RV Tau stars are pulsating variables characterized by alternating deep and shallow minima in their light curves. The spectral types of RV Tau stars range from F to K. R Sct has a rather late spectral type among RV Tau stars; it may become as late as M3 (Kholopov et al. 1988).

We analyzed near-infrared spectra of R Sct taken by the Short-Wavelength Spectrometer (SWS) on board the Infrared Space Observatory (ISO). We find H₂O, SiO, CO₂, and CO in the ISO/SWS spectrum of R Sct. H₂O and CO₂ are not expected from the photosphere of stars with spectral type earlier than M6. Most of these molecular bands are seen in emission. The molecules are probably located in an extended atmosphere above the photosphere.

RV Tau stars are generally considered to be post-AGB stars (Jura 1986). However, the period evolution of R Sct is too slow for post-AGB evolution; from the period–radius relation, a change of –11 days per century is expected, while over the two hundred years for which R Sct has been known, there is no evidence for a change of more than 4 days. We therefore suggest that R Sct may be an AGB star in the helium-burning phase of the thermal-pulse cycle. Details of results and discussions are presented in Matsuura et al. (submitted to A&A).

References

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