

Pulsational behaviour of the HADS RY Lep

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RY Lep is a long-period High Amplitude δ Sct-type pulsator ($V=8.^m21$, $\Delta V=0.^m35$) with a main period of $0.^d2254$ (Diethelm 1985). This star was assumed to be monopерiodic with stable light curves for a long time. However, some disturbances have recently been discovered by Laney et al. (2002). New observations were collected at Sierra Nevada Observatory (SNO), Spain, with simultaneous *uvby* photometry, from 1998 to 2002, but only the two data sets collected in 1998 and 2002 are good enough to perform individual Fourier analyses. Additional VJHK data were collected at South African Astronomical Observatory (SAAO), South Africa, during the same epoch.

Besides the main periodicity at $f_1=4.4416 \text{ cd}^{-1}$, the existence of a secondary frequency at $f_2=6.60 \text{ cd}^{-1}$ was confirmed when Fourier analyses were performed for each of the reliable data sets available: our 1998 and 2002 SNO data sets, those of Hipparcos satellite (ESA 1997) and those of Diethelm (1985). Moreover, in some sets it seems that combinations of f_1 and f_2 are also present (f_2+f_1 in 1998; f_2+f_1 and f_2-f_1 in the Hipparcos data). This corroborates the existence and pulsational nature of f_2 together with the observed amplitude ratios and phase shifts between different filters obtained for f_2 and *uvby* and BV photometry. Amplitude variations from season to season are also evident for f_2 , however there are no significant variations for f_1 . On the other hand, the derived phase shifts in *uvby* and BV photometry suggest radial pulsation for f_1 and nonradial for f_2 . In the case of f_1 , it also agrees with the results of Rodríguez et al. (1995). Moreover, a Q value of $0.^d033$ is found for f_1 , which is indication of pulsation in the fundamental mode. This suggests that f_2 corresponds to a nonradial p_2 mode.

The analysis of the VJHK data collected at SAAO confirmed the existence of f_2 and the nature of the modes. Although the expected pulsational amplitude in the infrared filters is very small (about 30% and 20% in J and K relative to the amplitude observed in the *v* filter (Balona & Evers 1999)), f_2 was detected in the J filter of the data set collected during the year 2000. As compared with the *vby* filters, the phase shifts confirm the radial nature of f_1 and the nonradial one for f_2 with an angular quantum number of $l=2$.

In summary, the pulsational behaviour of RY Lep can be well described by a main frequency f_1 , stable in amplitude and being the fundamental radial mode, and a secondary frequency f_2 , variable in amplitude from season to season and corresponding to nonradial pulsation with p_2 and $l=2$. Moreover, binarity is also suggested from our study when an O-C analysis is performed with the derived times of light maximum.

References

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