Optical Spectrum of Z UMi during its Maximum Light

Tõnu Kipper [1] and Valentina Klochkova [2]

1 - Tartu Observatory, Tõravere, 61602 Estonia, 2 - Special Astrophysical Observatory, Nizhnij Arkhyz, Russia

Using the high resolution spectrograph NES of the 6 m telescope we obtained and analysed the spectra of a R CrB type star Z UMi. The atmospheric parameters of Z UMi were estimated: $T_{\rm eff}$=5250±250 K and $\log g$=0.5±0.3. This places Z UMi among the coolest R CrB stars. We confirmed the hydrogen deficiency of Z UMi. The abundances of other elements resemble those found for the minority group of R CrB stars. We note very low iron abundance, [Fe/H]=−1.85, and an essential excess of lithium, [Li/Fe]=+1.9.

Z UMi is associated with an IR-source IRAS 15060 + 8315. The photometric observations showed typical of R CrB stars light drop by 6^m in 1992, which lasted about 300 days. Low resolution spectra obtained during the light minimum showed only the Na I D lines in emission and the C_2 Swan system bands in absorption. No Balmer lines were detected. The hydrogen-deficient nature of Z UMi was established by Goswami et al. (1997, PASP 109, 796), who used the high resolution spectra of the star during the maximum light. Weak or absent CH bands in Z UMi spectra were considered as the indicators of hydrogen deficiency. In This poster we present the high resolution spectra of Z UMi during its maximum light. Determining the abundances from individual spectral lines is extremely ambiguous in the case of Z UMi. There are no lines belonging to atomic species, which are not blended with molecular lines, and therefore no equivalent widths could be measured and the procedures like determining the microturbulence parameter $\xi_{\rm t}$, adjusting $T_{\rm eff}$ using abundance versus excitation potential and $\log g$ determination using ionization equilibrium, are not applicable. Synthesizing the spectra only the upper limit of abundances could be found. As the lines, which could be used in this case are strong, the errors due to the errors in the structure of model atmosphere could not be estimated. Also, the error in the accepted microturbulence parameter $\xi_{\rm t}$ of about 1 km s^{-1} translates directly into abundance errors greater than ±0.3 dex. The found abundances are listed in Table.

We found that Z UMi is one of the coolest R CrB star with its $T_{\rm eff}$ ≈5250 K. The coolest known R CrB stars S Aps, WX CrA, and U Aqr have $T_{\rm eff}$ ≈5000 K. The declines of these stars are very slow and much more symmetrical than the R CrB stars declines (Alcock et al. 2001). We conclude that the chemical composition of Z UMi resembles that of minority group R CrB stars. Similarily to V CrA, VZ Sgr, and V3795 Sgr it is very metal-poor. Nitrogen is overabundant as in majority group and V CrA from the minority group.