

Observational signatures of past mass-exchange episodes in massive binaries : The case of HD149404

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Abstract

Mass and momentum exchanges in close massive binaries play an important role in the evolution of such systems and produce several observational signatures, such as asynchronous rotation and altered chemical compositions, that remain once the stars detach again. We investigate these effects for the detached massive O-star binary HD149404 (O7.5 If + ON9.7 I, P = 9.81 days), that is thought to have experienced a past episode of case A Roche lobe overflow. Using phase-resolved spectroscopy, we perform the disentangling of the spectra of the two stars. The reconstructed primary and secondary spectra are then analyzed with the CMFGEN model atmosphere code to determine the stellar parameters such as the stellar effective temperatures and surface gravities, and to constrain the chemical composition of the components. We complement the optical study with the study of IUE spectra which we compare to the synthetic binary spectra. We confirm a strong overabundance in nitrogen ($[N/C] \sim 100 [N/C]_{\odot}$) for the secondary star, and a slight nitrogen overabundance ($[N/C] \sim 5 [N/C]_{\odot}$) for the primary star. Comparing the two stars, we find evidence for asynchronous rotation, with a rotational period ratio of 0.504 ± 0.077 .