B fields in OB stars (BOB) Detection of a strong magnetic field in the O9.7 V star HD 54879

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Abstract

The number of magnetic stars detected among massive stars is small; nevertheless, the role played by the magnetic field in stellar evolution cannot be disregarded. Links between line profile variability, enhancements/depletions of surface chemical abundances, and magnetic fields have been identified for low-mass B-stars, but for the O-type domain this is almost unexplored. Based on FORS 2 and HARPS spectropolarimetric data, we present the first detection of a magnetic field in HD 54879, a single slowly rotating O9.7 V star. Using two independent and different techniques we obtained the firm detection of a surface average longitudinal magnetic field with a maximum amplitude of about 600 G, in modulus. A quantitative spectroscopic analysis of the star with the stellar atmosphere code FASTWIND results in an effective temperature and a surface gravity of 33 000 ± 1000 K and 4.0 ± 0.1 dex. The abundances of carbon, nitrogen, oxygen, silicon, and magnesium are found to be slightly lower than solar, but compatible within the errors. We investigate line-profile variability in HD 54879 by complementing our spectra with spectroscopic data from other recent OB-star surveys. The photospheric lines remain constant in shape between 2009 and 2014, although Hα shows a variable emission. The Hα emission is too strong for a standard O9.7 V and is probably linked to the magnetic field and the presence of circumstellar material. Its normal chemical composition and the absence of photospheric line profile variations make HD 54879 the most strongly magnetic, non-variable single O-star detected to date..

Keywords

stars: atmospheres, stars: evolution, stars: magnetic field, stars: massive, stars: individual: HD 54879.