Investigating the origin of cyclical spectral variations in the ultraviolet resonance lines of hot, massive stars

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Abstract

OB stars are known to exhibit various types of spectral variability, especially in their ultraviolet resonance lines. Discrete absorption components (DAC), localized blueward-migrating UV absorption features, seem to be ubiquitous amongst these stars. These systematic cyclical features have been associated to large-scale azimuthal structures extending from the base of the wind to its outer regions: corotating interaction regions (CIR). Historically, there have been two main competing hypotheses as to what physical processes may perturb the star's surface and locally drive a faster outflow, ultimately generating CIRs, namely magnetic fields and non-radial pulsations (NRP). As part of a systematic study of the origin of the cyclical wind variability in OB stars, here we evaluate the possible relation between large-scale, dipolar magnetic fields and the CIR phenomenon. We report the results of our search for weak magnetic fields in a sample of 14 stars exhibiting well-documented DAC behaviour. Using high-resolution spectropolarimetric data, we find no evidence of magnetic fields capable of significant chanelling of the stellar winds of any of these stars (i.e. wind confinement parameter η_{*} above unity). It thus appears that dipolar fields are not likely to be responsible for these structures in massive star winds, r

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