SPECTROPOLARIMETRIC MONITORING OF WR140

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Abstract. We report on eight years of spectropolarimetric monitoring of the WR140 binary. The broad-band linear polarization decreased systematically after the 1985 periastron passage. By 1991, it settled to a constant value at which it has remained through the 1993 periastron passage. We do not detect, in data taken after 1989, a line-effect in He II λ4686. This suggests either that the continuum and the line emission scatter at the same region, or that any intrinsic polarization has been below our detection limit. We conclude that the presently observed polarization of WR140 is consistent with interstellar foreground polarization.

Key words: stars: Wolf-Rayet – polarization – individual: WR140

WR140 (HD 193793) is a WC7+O4-5 binary in a highly eccentric orbit. Periodic outbursts at 7.9 yr intervals have been recorded in the IR flux from the system, and are thought to be related to activity occurring during the periastron passage of the binary. It has been suggested that the formation of dust is the result of wind-wind interaction at periastron. The most recent event started in March of 1993 (Williams, these proceedings) and was observed with a variety of techniques (Williams & van der Hucht 1993).

We have been monitoring the linear polarization of WR140 since the summer of 1985, first with a Lyot polarimeter, and more recently, with a half-wave spectropolarimeter mounted as a dedicated instrument on the University of Wisconsin's 36-inch telescope. Our observations with the Lyot system were reported by Whitney *et al.* (1988). Data collection started two months after the 1985 periastron passage. We measured a systematic decrease of the linear polarization in the spectral region (5700±1300)Å, averaging at (1.52±0.04)% in 1985 through (1.40±0.02)% in 1987, with a rotation in position angle from 28° to 33°. The polarization was interpreted to arise from dust scattering in a cloud which was receeding from the binary.

Since January, 1989, the half-wave spectropolarimeter has provided us with a very stable, highly accurate system for spectropolarimetry in the range from 3200 to 7600Åwith a resolution of 25Å. We observed WR140 on twelve occasions between August, 1989, and December, 1993. There was no significant change in linear polarization associated with the periastron passage of 1993. We also measured the polarization in the He II λ4686 emission line, and find that it is not significantly different from the polarization of the continuum. By 1991, the polarization of WR140 settled to a value

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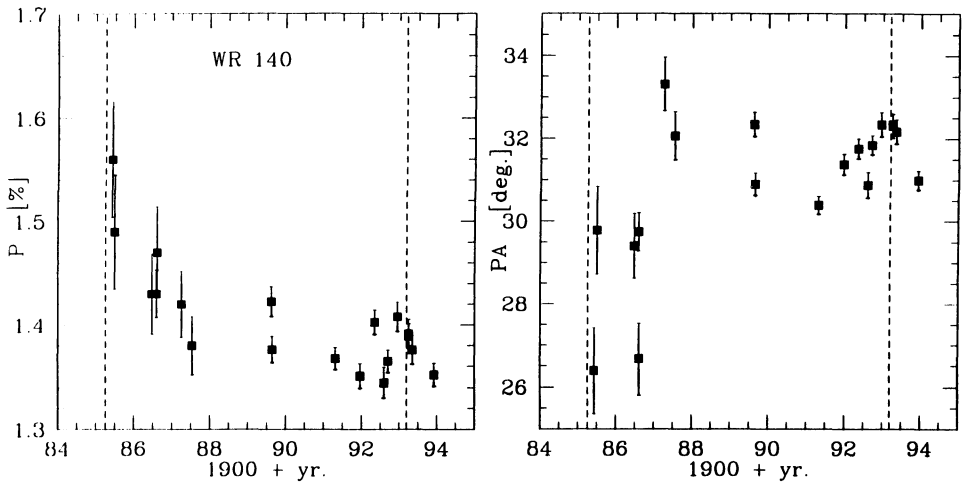

Fig. 1. The observed percentage polarization (left) and position angle (right) of WR140 in a spectral band centered at 5700Å as a function of time in years. The errors are $\pm 1\sigma$ in size. The dashed lines indicated the times of periastron passage.

of about (1.38±0.03)% at a P.A. of (31.5±1.5)°, which we attribute to interstellar foreground polarization. The lack of polarimetric variability since 1991 indicates that any source of intrinsic polarization has been very small, <0.07% (this is 5 times our largest statistical error). The observed polarization can be modelled extremely well assuming that it is due to interstellar polarization alone. Accordingly, WR140 is on an average galactic sightline, with λ_{max} = (5600±50)Å, and a resulting total-to-selective extinction R_V = 3.1±0.2.

We are in the process of checking for systematic errors using standard stars observed over the 8-yr monitoring period, to investigate the 1985 variations and to find out whether any small-scale variability might be found in the recent data.

Acknowledgements

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References

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