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UBVR POLARIMETRY OF HIGH-GALACTIC LATITUDE CARBON STARS

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RESUMEN

Presentamos polarimetría y fotometría en las bandas *UBVR*, en el periodo de un año, de ocho estrellas de carbón de alta latitud galáctica: V Hya, CZ Hya, R For, R Lep, Y Cvn, T Dra, RV Aqr y RT Cap. La polarización observada alcanza su máximo valor en la banda U y es muy variable en el tiempo. Similarmente, la polarización en la banda B es muy variable pero sus valores son siempre inferiores a los obtenidos en la banda U. El origen y la variabilidad de la polarización en estas bandas puede explicarse como el resultado de la dispersión de la radiación de la estrella central en las regiones interiores de la envolvente circunestelar donde los granos de polvo y las moléculas son creados, destruidos y mezclados por ondas de choque.

ABSTRACT

We present *UBVR* polarimetry and photometry obtained over a period of one year of eight high-galactic latitude carbon stars: V Hya, CZ Hya, R For, R Lep, Y Cvn, T Dra, RV Aqr, and RT Cap. The observed polarization is highest in the U band and highly variable with time. Similarly, the polarization in the B band is highly variable but the values are always lower than those in the U band. The origin and variability of the linear polarization in these bands may be explained as dispersion of radiation from the central star at the inner regions of the circumstellar envelope, where grains and molecules are created, destroyed, and stirred by shock waves.

Key Words: circumstellar matter — polarization — stars: carbon — stars: variables: general

1. INTRODUCTION

It is known that some evolved stars present circumstellar envelopes of dust and gas. These envelopes are the result of mass loss from the star driven by a strong wind. The spectral energy distribution emerging from the circumstellar envelope presents a double peak with the one at the longest wavelength produced by dust emission. Also, some of these stars have strong emission of molecular lines associated with the envelope.

The geometry of these envelopes is a fundamental parameter assumed to be responsible for the observed morphologies of planetary nebulae (Johnson & Jones 1991; Trammell, Dinerstein, & Goodrich 1994). Some models used to reproduce the observed morphologies in planetary nebulae take into account the geometry of the original circumstellar envelope (Kahn & West 1985; Habing, te Lintel Hekkert, & van der Veen 1989).

Circumstellar envelopes are usually not resolved. Therefore photometry is not an appropriate technique to study their morphology since it is not possible to determine their evolution by photometric monitoring over the medium to long term, because a change in the shape of the envelope does not necessarily imply a variation in the integrated flux of the object. Polarimetry is the proper technique to study their morphology since modifications in the geometry may be related to variations in the position angle of the polarization vector.

Starlight is not polarized due to the thermal nature of the radiation. However, an evolved star surrounded by an envelope will produce a certain amount of polarization if the shape of the envelope