VARIATION OF LINEAR POLARIZATION IN R AQUARII SYSTEM

M. R. Deshpande, U. C. Joshi and A. K. Kulshrestha
Physical Research Laboratory
Navrangpura
Ahmedabad-380009
India

R Aquarii is a very interesting symbiotic system. There is an emission nebulosity close to the star which extends in North-South direction and a "jet" feature of about 6" with a position angle of 29° has also been observed (Sopka et al. 1982; Mauron et al. 1985; Kafatos et al. 1983). Polarization measurements are important to understand the peculiar geometry of the circumstellar material around the central objects. Wavelength and time dependence of polarization can be used to put constraints on the geometry of the object and to identify the mechanism(s) responsible for polarization. In view of this linear polarization measurements of R Aquarii were carried out by us in UBVRI bands. Observations were made during November-December 1984 on 1 meter telescope of Indian Institute of Astrophysics, Bangalore, with a dual channel photopolarimeter discussed elsewhere (Deshpande et al. 1985). Measured values of percent polarization and position angle at different phases alongwith the earlier observations of Serkowski (1974) and Ladbeck (1985) are plotted in Figure 1.

Figure 1 shows several interesting features -

a) In ultraviolet polarization is large and varies between 5 and 19 percent. The polarization in VRI band is small ($\sim$ 0.5 to 4 percent)

b) The position angle in U band shows small variation about the mean value ($\sim 120^{\circ}$) with time. The position angle in VRI bands, unlike the U band, show large variation ranging 20° to 170°.

All these observations support and may be explained through the binary model for R Aquarii system in which a hot white dwarf companion orbits around a Mira variable. Detailed discussion is given elsewhere (Deshpande et al. 1986). Angle between the position angle of "jet" and mean polarization vector is $\sim 90^{\circ}$. The small variation in position angle in U band around expected value of 119° may be due to the precession of jet around an axis. Emission knots found at different position angle (Kafatos et al. 1983) near the star may perhaps be explained with this model.

475

References

Deshpande, M.R., Joshi, U.C., Kulshrestha, A.K., Banshidhar, Vadher, N.M., Mazumdar, H.S., Pradhan, N.S. and Shah, C.R.1985. Bull. Astron. Soc. India, 13, 157.

Deshpande, M.R., Joshi, U.C., Kulshrestha, A.K. 1986. Publ. Astron. Soc. Pacific (In press).

Kafatos, M., Hollis, J.M. and Michalitsianos, A.G. 1983, Astrophys. J. (Letters) 267, L103.

Ladbeck, R.S. 1985, Astron. Astrophys. 142, 333.

Mauron, N., Nieto, J.L., Picat, J.P. Lelivre, G. and Sol, H. 1985, Astron. Astrophys. 142, L13.

Serkowski, K. 1974, I.A.U. Circular No. 2712.

Sopka, R.J., Herbig, G., Kafatos, M. and Michalistianos, A.G. 1982, Astrophys. J. (Letter) 258, L35.
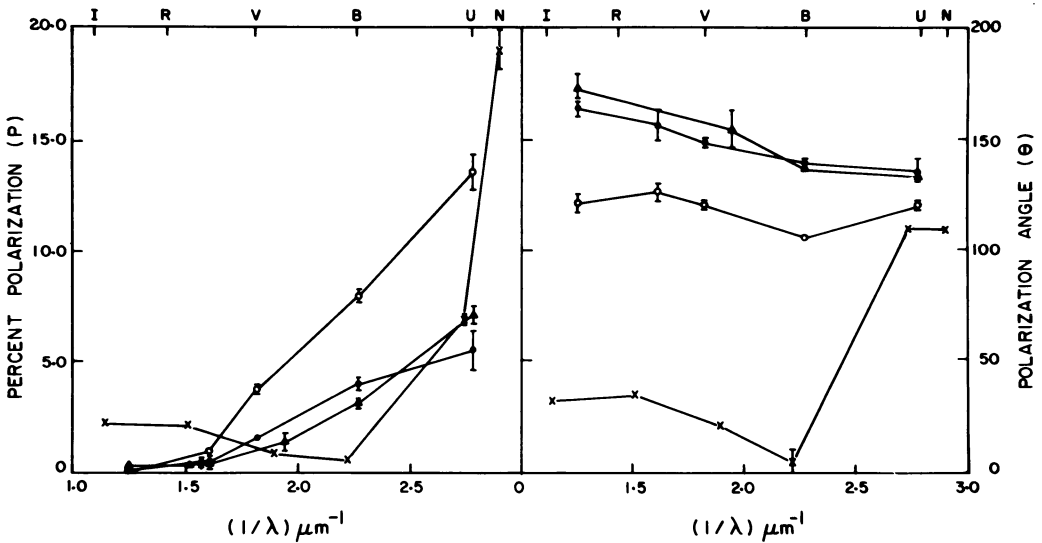

Figure 1. Plots showing wavelength dependence of polarization and position angle. Symbols represent the data taken from -
x Serkowski (1974); ▲ Ladbeck (1983)
● Present data (Nov. 1984); 0 Present data (Dec. 1984).