MAGNETIC FIELDS AND STAR FORMATION: IMAGING POLARIMETRY OF TWO REFLECTION NEBULAE

S.M. SCARROTT & T.M. GLEDHILL
Physics Department,
University of Durham,
South Road, Durham
DH1 3LE, U.K.

ABSTRACT. Imaging polarimetry has shown that extended objects within star forming clouds may appear polarised due to passage of the light through an intervening region of magnetically aligned dust grains. Two such objects are considered here.

1. PV Cephei

PV Cephei is a variable PMS star associated with bipolar reflection nebulosity and obscuration identified with a circumstellar disc (Gledhill *et al.* 1987). Imaging polarimetric observations of this object (Jun and Aug 1984) have revealed an unusual polarisation pattern with little evidence for the scattering of starlight in the nebular lobes (Fig. 1). There are, however, good reasons to believe that the nebula *is* seen by the reflected light of PV Cephei (particularly the well documented nebular variability). The polarisation pattern seems to be largely dominated by the polarising effects of foreground dust grains aligned in the local magnetic field.

Assuming that the star is surrounded by a circumstellar disc responsible for collimating the outflowing radiation and material, then the polarisation measurements of the star and the central regions indicate the presence of a magnetic field component in the plane of this disc. This field appears to link smoothly with a larger scale cloud field in a manner similar to that proposed in recent magnetic acceleration models—a situation that may have arisen if the ambient field became entrained within the obscuring material around PV Cephei during the formation of the star. However, the variable nature of this object must be emphasised. We have obtained more recent polarimetry (Jul 1989) showing that the optical appearance of the nebulosity has indeed changed dramatically during the interim.

2. NGC2261/R Mon

The polarisation pattern of the cometary reflection nebula NGC2261 appears centrosymmetric indicating illumination by R Mon (Scarrott *et al.* 1989). However, a close inspection of the map shows structure in the vector pattern within the body of NGC2261 suggesting that processes other than simple scattering are occurring. These perturbations of the large-scale pattern are not symmetrically distributed about the nebular axis and are therefore difficult to attribute to the effects of a polarised source.

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Traces of polarisation position angle along a line directly north from R Mon taken from entirely independent datasets show correlations (Draper 1988). These profiles suggest that there exist perturbations in the polarisation pattern which appear to be relatively fixed within the body of the nebula over a period of time (during which the polarisation of R Mon was observed to rotate). Such features cannot be due solely to the effects of a polarised source but must in some way be connected with the local geometry and in particular with the presence of a magnetic field in the region.

3. References

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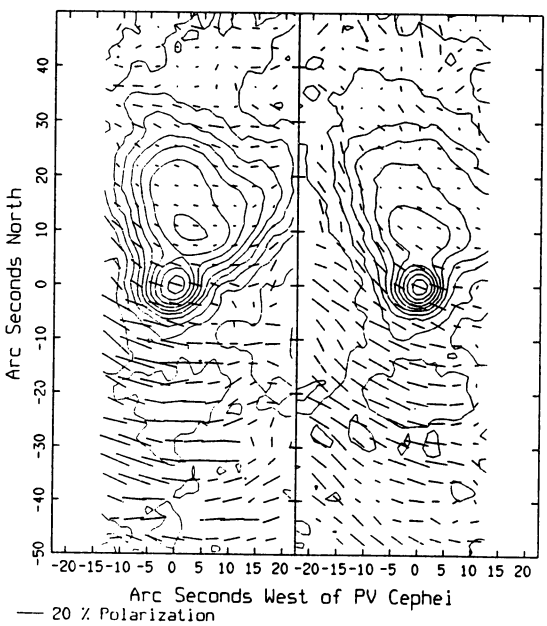

Figure 1. Linear polarisation maps of the PV Cephei nebulosity taken with an unfiltered GEC CCD (left) and an I band filter (right) in June 1984 and August 1984 respectively. Contours of nebular brightness are spaced at 1/3 magnitude intervals. From Gledhill *et al.* 1987.

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