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NEAR-IR SPECTROPOLARIMETRY OF NGC 1068

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INTRODUCTION

The current unified model of Seyfert galaxies, as proposed by Antonucci and Miller (1985), has most, if not all, Seyfert 2 galaxies hosting a Seyfert 1 type nucleus in their cores. The broad lines from the type 1 nucleus can be scattered and be seen in the polarized flux spectrum, provided the geometry is correct. Whether the mechanism is electron or dust scattering has been a question of some debate. Since dust would normally have a low scattering efficiency in the infrared, near-IR spectropolarimetry should help in determining the nature of the scatterers. To this end we present the first near-IR spectropolarimetry of NGC 1068 a "Seyfert 2" galaxy in which polarized broad lines have been observed at optical wavelengths.

OBSERVATIONS

The observations were made at UKIRT, Hawaii, on the nights of 1992 November 12, 16 & 17 with the CGS4 spectrometer and IRPOL, at an effective resolution of approximately 1000 km s^{-1} . Polarization observations were made in the normal way with IRPOL, and the data were extracted using Figaro and TSP, with an effective aperture of 3×3 arcsecond².

RESULTS AND DISCUSSION

The polarization spectra for NGC 1068 in the region of the Pa α line, is presented in figure 1. One obvious feature is the decrease in percentage polarization due to the narrow lines being less (or zero) polarized.

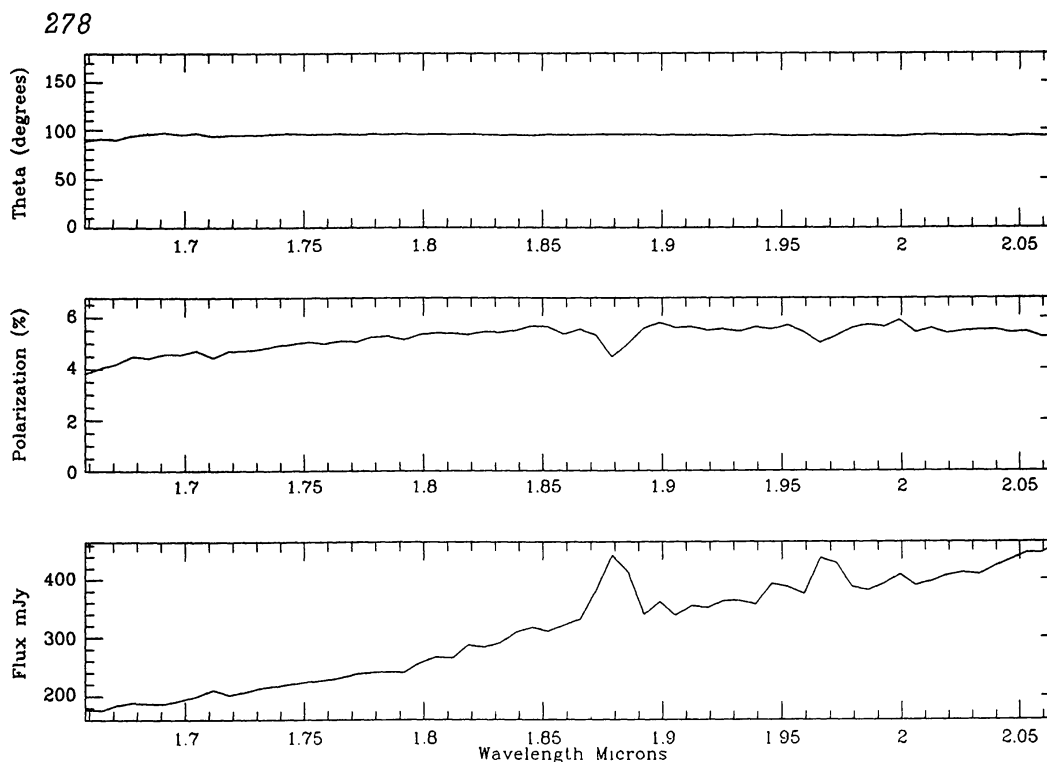


FIGURE I Spectropolarimetric data for NGC 1068

A comparison of the scattered fluxes of the broad Pa α and H α (the latter taken from our WHT observations made in 1991 February) and assuming case B recombination and the interstellar extinction law of Savage and Mathis (1979), as extended to the infrared by Landini et al. (1984) suggests that either

(a) the optical and IR broad lines are scattered by electrons, with an extinction of the scattered light of approximately 1 magnitude, which is typical of the observed values (Ward et al., 1987),

or

(b) the optical broad lines are scattered by dust and the IR broad lines are polarized by dichroic absorption as the radiation passes through a medium containing aligned grains, possibly in the nuclear torus, essentially the model proposed by Bailey et al. (1988).

If the latter is true, then we should also see the broad Pa α in the direct or total flux spectrum. While there is some evidence for a broadening of the Pa α line, in the total flux, our spectral resolution is insufficient to be conclusive.

REFERENCES

- Antonucci R. R. J., Miller J. S., 1985, *ApJ*, **297**, 621
 Bailey J., Axon D. J., Hough J. H., Ward M. J., McLean I., Heathcote S. R., 1988, *MNRAS*, **234**, 899
 Hough J. H., Brindle C., Wills B. J., Wills D., Bailey J., 1991, *ApJ*, **372**, 478
 Landini M., Natta A., Oliva E., Salinari P., Moorwood A. F. M., 1984, *A&A*, **134**, 284
 Savage B. D., Mathis J. S., 1979, *ARA&A*, **17**, 73
 Ward M. J., Geballe T., Smith M., Wade R., Williams P., 1987, *ApJ*, **316**, 138

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