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GEMINI MID-IR POLARIMETRY OF NGC 1068

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The dusty molecular torus, cornerstone of the unified model of AGN, has been the subject of much observational and theoretical scrutiny in recent years, and much progress has been made with observations and models aiming to reveal, explain and predict its properties.

A compact (few pc FWHM) warm dust distribution is revealed by interferometry, direct imaging and modelling, but evidence exists for more extended material, too. A tilted molecular disk could explain the CO and H_2 emission 70 pc E-W of the nucleus in NGC 1068 (Galliano et al. 2003), and such a disk could perhaps account for the fairly deep silicate absorption 0.4″ from the nucleus (Mason et al. 2006), a feature also seen in several other AGN (Roche et al. 2006; Young et al. 2007). Mid-IR polarimetry increases the contrast between faint emission from aligned dust grains and bright, unpolarised emission, providing a new window on these extended structures. Our 9.7 μm, 0.3″ resolution, imaging polarimetry of NGC 1068 from Michelle on Gemini-N (currently the only mid-IR polarimeter on an 8 m class telescope) shows the following features (Figure 1; Packham et al. 2007):

1: Dichroic dust emission (polarisation PA orthogonal to the NIR dichroic absorption) in the SE, S and NW extended over 1″. The vector connecting the SE and NW regions in polarised flux is strikingly similar to the PA of the H_2 emission and masers.

2: Dichroic dust emission in the NLR at regions of interaction with the jet.

3: A central source with low polarisation or with polarisation PA roughly orthogonal to the surrounding polarised emission. The polarisation PA appears similar to that of the NIR dichroic absorption, so a compact (D $\leq$ 22 pc) torus could account for this component.

The polarised emission SE, NW and S of the nucleus is much more extended than the compact torus proposed by several authors. The apparent conflict between the evidence for a compact, geometrically and optically thick torus and the molecular disks, extended silicate absorption and polarisation data suggestive of a larger structure can be resolved if the small-scale torus is surrounded by a larger, more diffuse dusty structure associated with the central regions of the host galaxy. This, plus the positional coincidence with the H_2 and maser emission (Greenhill & Gwinn 1997; Davies et al. 2006), suggests that these data provide continuity between the small, plump torus and the larger, flatter galactic disk.

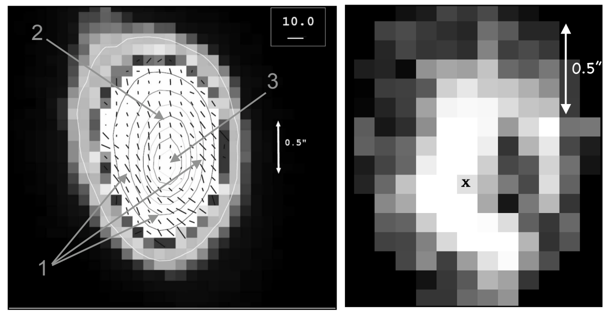

Fig. 1. Left: Michelle 9.7 μm intensity image of NGC 1068 with fractional polarisation overlaid. The white bar indicates 10% polarisation. Right: Polarised flux (total intensity x degree of polarisation). See Packham et al. (2007) for details.

REFERENCES

Davies, R., Genzel, R., Tacconi, L., Müller Sanchez, F., & Sternberg, A. 2006, ASP Conf. Ser. 373, The Central Engine of Active Galactic Nuclei, ed. L. C. Ho & J.-M. Wang, (San Francisco: ASP), 639

Galliano, E., Alloin, D., Granato, G. L., & Villar-Martin, M. 2003, A&A, 412, 615

Greenhill, L. J., & Gwinn, C. R. 1997 Ap&SS, 248, 261

Mason, R. E., Geballe, T. R., Packham, C., Levenson, N. A., Elitzur, M., Fisher, R. S., & Perlman, E. 2006, ApJ, 640, 612

Packham, C., Young, S., Fisher, S., Volk, K., Mason, R., Hough, J. H., Roche, P. F., Elitzur, M., Radomski, J., & Perlman, E. 2007, ApJ, 661, L29

Roche, P. F., Packham, C., Aitken, D. K., & Mason, R. E. 2007, MNRAS, 375, 99

Young, S., Packham, C., Mason, R. E., Radomski, J. T., & Telesco, C. M. 2007, MNRAS, 378, 888

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