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HST AND SPITZER POINT SOURCE AND DUST LANE DETECTION IN POWERFUL NARROW-LINE RADIO GALAXIES

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We present the analysis of infrared HST and Spitzer data for a sample of 13 FRII powerful radio galaxies at $0.03 < z < 0.11$ that are optically classified as narrow-line radio galaxies (NLRG). Under the context of the unified schemes of Active Galactic Nuclei (AGN), the direct view of the AGN in NLRG is impeded by a parsec- scale toroidal structure when this is viewed edge-on (Barthel 1989; Antonucci 1993). Our high resolution infrared observations provide new information about the optical extinction, orientation, and direct AGN detection of the inner kpc-scale region of the AGN.

We have found that the point-like nucleus detection rate increases from 25% detected at 1.025 μm to 80% and 100% detection rate at 2.05 and 8 μm, respectively. This detection towards longer infrared wavelengths supports the idea that a large proportion of NLRG host an obscured AGN in their centre.

The optical extinction produced by the obscuring structures have been estimated from X-rays, near-IR and mid-IR data using five different methods. All the extinction estimates are consistent (A_V = 3 — 170 mag), with the exception of that estimated using the silicate absorption line, which is lower (A_V = 0 — 25 mag. See Fig. 1). This discrepancy challenges the simplified idea of an homogeneous dust torus extinguishing the AGN light as a foreground screen. The disagreement can be explained by thermal mid-IR emission from an extended narrow-line region, by non-thermal emission from the base of the radio jets, or by a clumpy torus model diluting the silicate absorption line.

Furthermore, at 1.025 μm, we detect a kpc-scale dust lane in 70% of our sample, of which 55% are perpendicular to their inner kpc radio jet axis within $\pm 20°$. Assuming that the torus is perpendicular to the radio jet, this suggests a continuity from the parsec-scale torus to the kpc-scale dust lane. On the other hand, the misalignment in the other 45% can be explained by the presence of warping in the disc (e.g., Sanders et al. 1989; Schmitt et al. 2002).

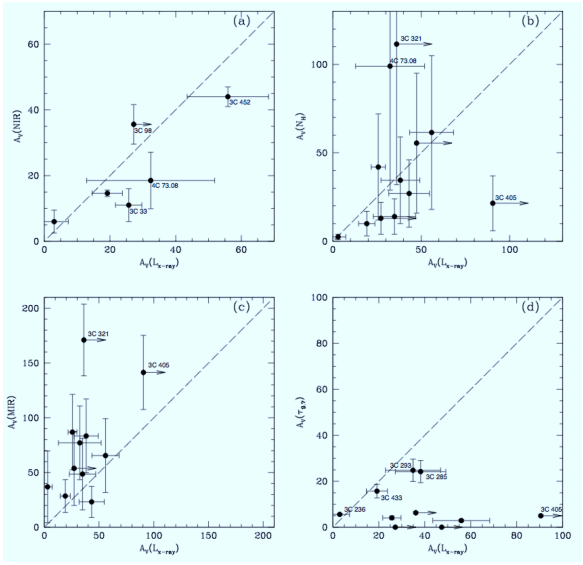

Fig. 1. Extinctions estimated in this work versus the extinction derived from the X-ray/near-IR luminosity comparison, $A_V(\mathrm{L_{X-ray}})$. Note that in the case of the extinction based on the silicate absorption line ($\tau_{9.7}$, graph (d)) the points cluster towards the bottom right-hand corner of the graph, indicating lower extinction compared with the estimates based on the X-ray/near-IR luminosity (and consequently the other methods).

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