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

E. A. Ramírez$^1$, C. N. Tadhunter$^2$, D. Dicken$^3$, M. Rose$^2$, D. Axon$^{4,5}$, and W. Sparks$^6$

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 $\mu$m to 80% and 100% detection rate at 2.05 and 8 $\mu$m, 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 $\mu$m, 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 $\pm 20^\circ$. 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).

REFERENCES

$^1$Inst. de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, São Paulo 05508-900, Brazil. (e.ramirez@usp.br).
$^2$Department of Physics and Astronomy, University of Sheffield, Sheffield S3 7RH, UK.
$^3$Institut d’Astrophysique Spatiale, CNRS, Université Paris Sud, 91405 Orsay, France.
$^4$Physics Department, Rochester Institute of Technology, Rochester, NY 14623, USA.
$^5$School of Mathematical and Physical Sciences, University of Sussex, Brighton BN1 9QH, UK.
$^6$Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD21218, USA.