N93-26852

NUCLEAR ACTIVITY AND THE ENVIRONMENTS OF NEARBY RADIO GALAXIES

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Much of our present understanding of galaxy evolution over a large redshift range is based on the study of samples selected on the basis of non-thermal radio emission. It is therefore necessary to understand the relationship between radio source activity and the host galaxy. Recent observations suggest that there is a connection between radio galaxy (RG) activity and radio galaxy evolution. For example, high-redshift RGs ($z \gtrsim 0.7$) show evidence for significant populations of young stars, and have optical continuum morphologies nearly always aligned with the radio axis (McCarthy *et al.* 1987; Chambers *et al.* 1987). This phenomenon is generally attributed to radio jet induced star formation (DeYoung 1989), but the lack of high S/N spectra of the galaxy continua, and recent detections of polarized light in a few objects make it hard to rule out other processes such as scattering or synchrotron radiation. A detailed study of the continuum light in the distant RGs is difficult as they are optically very faint. However, nearby RGs ($z \lesssim 0.1$) have bluer *B-V* colours than radio-quiet ellipticals, presumably due to the presence of young stellar populations (Smith and Heckman 1989) and several have extended UV continuum emitting regions along their radio axes (van Breugel *et al.* 1985*a*, *b*, di Serego Alighieri *et al.* 1989), reminiscent of the alignment effect seen in the high redshift RGs.

We have almost completed a continuum imaging survey of *nearby* (and therefore optically brighter), powerful RGs to study any possible relationships between the optical continuum light and radio source activity. In particular we are interested in (1) whether these lower redshift RGs show any evidence for the alignment effect (in their rest-frame UV light) that is seen in the distant RGs, and (2) the effects that the radio source has on the environment of the host galaxy.

Our sample is comprised of 45 nearby ($0.08 < z < 0.2$), powerful (FR II, $P_{408MHz} > 10^{33}$ ergs/s/Hz) RGs selected from the 3CR, B2 and PKS catalogues. We are imaging these galaxies through *U* (liq. $CuSO_4$+UG2) and r' (6500/750) filters which sample the galaxian continuum at $\lambda_{rest} < 3700$Å and $\lambda_{rest} \sim 5700$Å respectively; the filters are uncontaminated by strong emission lines in the redshift range chosen, and the survey is therefore extremely sensitive to the distribution of UV *continuum* light in these galaxies. The main goal of our imaging survey is to search for extended UV excess regions that are associated with the radio source structure, and to determine whether any correlation that may exist between the spatial distribution of these objects and the radio source is statistically significant. The optically brightest cases are then followed-up spectroscopically. High S/N spectroscopy of the blue light will allow us to determine whether or not it is due to stars. If the continuum light is primarily stellar, then modelling of the absorption line spectrum will allow us to study the stellar populations and any possible relations with the radio source. If the continuum light is *not* stellar, modelling the emission-line and continuum spectrum may help us distinguish between various ionization mechanisms.

We present preliminary results of our imaging survey and discuss a few specific cases of interest. Thus far, more than 30% of the galaxies imaged show evidence of patchy,

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extended UV continuum emission along the radio axes both internal and external to the host galaxy. Although *most* of the galaxies in the sample *do* show evidence for extended blue continua, most of these are at very low surface brightness levels ($\sim$ 24 AB mag/sq. arcsec.). Our U-band imaging survey has demonstrated that the alignment effect is also seen in a significant fraction of nearby RGs.

Spectroscopy of the brightest cases shows that there is a variety of processes at work. In most cases the UV continuum emission has associated line emission; in some of these cases the emission line ratios are similar to those seen in HII regions, suggesting that induced star formation may not be an uncommon phenomenon, and in others they resemble those seen in LINERs. In at least one case, 3C346, there is no associated line emission and the UV light is associated with a bright knot in a radio jet implying that it is due to optical synchrotron radiation. Figure 1 shows our data on PKS 1414-212, where we have discovered a very blue continuum object associated with a radio knot. The brightest radio emission straddles the knot rather than being coincident with it. Our spectrum of the knot shows strong line emission, with line ratios typical of those seen in Seyfert 2 galaxies. It is possible that the knot is being photoionized by beamed radiation from the host galaxy nucleus.

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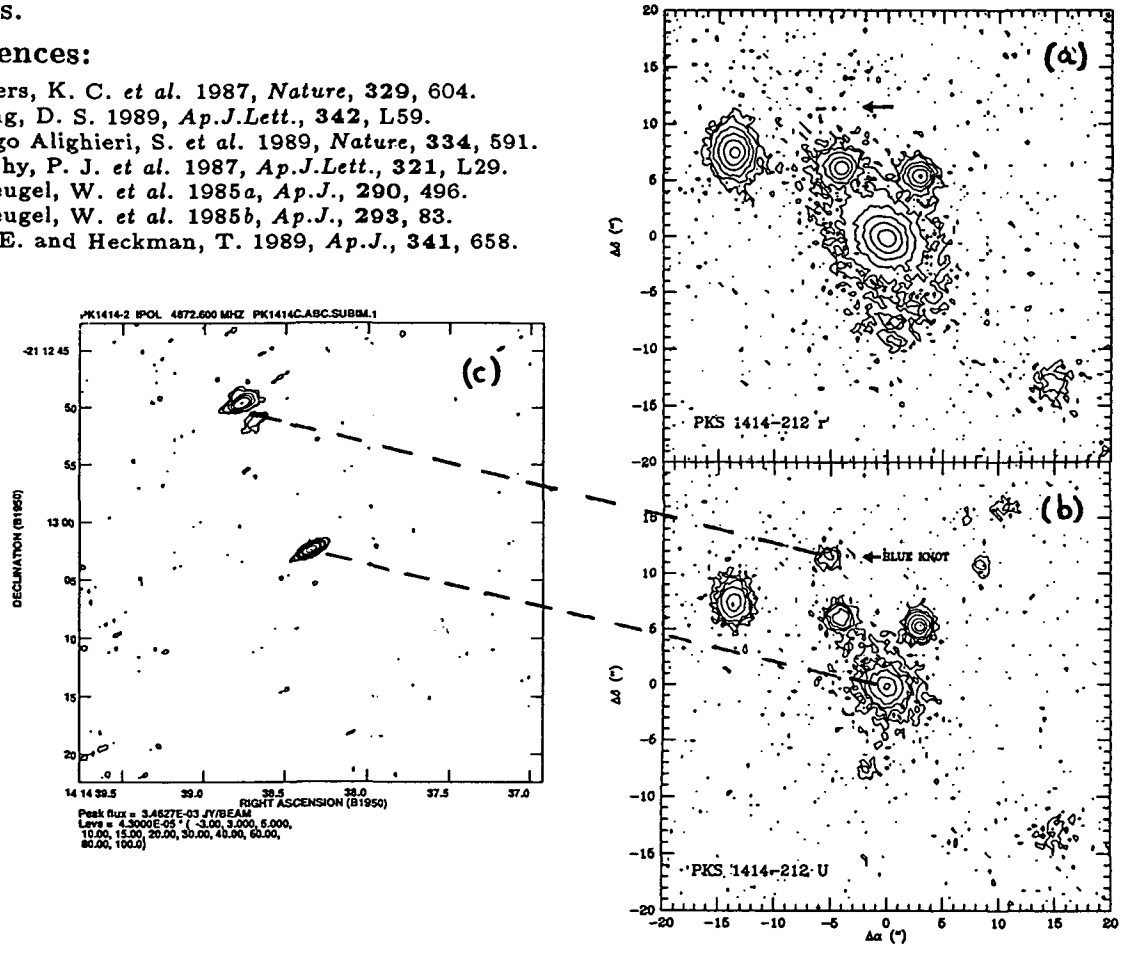

Figure 1: PKS 1414-212. (a) Intermediate-band r' image, and (b) U-band image of PKS 1414-212 obtained using the 4-m PFCCD at CTIO. Note that the feature marked 'BLUE KNOT' in the U-band image is *absent* in the r'-band image. The UV emitting knot lies inbetween the two components of the radio knot seen in the 6cm VLA map (c). The large scale structure of the radio source (not shown) has an FRII morphology.