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Near-IR Probing of Embedded Structures in Active Galaxies

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Abstract. J and K' surface photometry of several Seyfert and/or starburst galaxies have been obtained to assess the role of potential asymmetries on the galactic nuclear activity. The detailed central morphology and structural properties of those objects were analyzed by ellipse fits. The behavior of the J–K′ color profile suggests that significant nuclear starbursts tend to have a redder center. A new near-IR indicator of nuclear star formation is proposed.

1. Introduction

The connection between the nuclear activity (starburst and/or Seyfert) and the morphological and structural properties of the host galaxy is still controversial. In order to get some more hints, we have performed J and K′ surface photometry of 8 Seyferts extracted from Véron & Véron (1993), and 7 ESO galaxies for which significant starburst or Seyfert component have been suggested by Rowan-Robinson & Crawford (1989) (those 15 galaxies are called ESO2.2 sample hereafter). Radial profiles of surface brightness, ellipticity and position angle, resulting from ellipse fitting, were used to detect peculiar morphological structures such as bars, bars within bars, nuclear spirals, twisted bulges, etc. Detailed results are presented in Greusard et al. (1999).

2. Observations

The observations of the ESO2.2 sample were carried out on April 7th, 8th and 9th 1997 with the ESO/MPI 2.2m telescope at La Silla during photometric conditions. The infrared imaging camera IRAC-2b was equipped with a 256x256 NICMOS-3 array with a pixel size of 0.507″. We also get J and K′ frames of 13 active or non-active galaxies from Friedli et al. (1996), as well as J and K frames of 7 active galaxies from Alonso-Herrero et al. (1998). So, we have a near-IR sample of 26 objects for which IRAS fluxes are also available (see Sect. 3).

3. Results

Among the ESO2.2 sample, at least 8 galaxies show evidences of embedded structures (Greusard et al. 1999). For instance the Seyfert ESO 215-G031 ex-

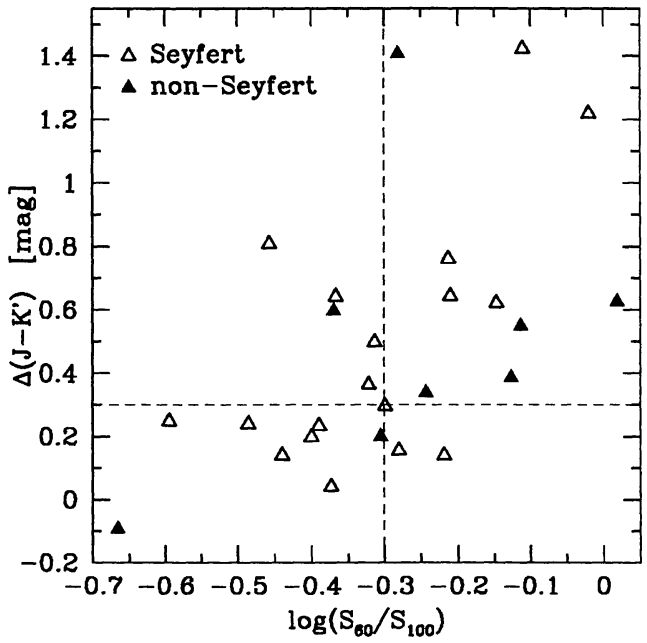

Figure 1. Central J-K′ profile behavior versus $\log(S_{60}/S_{100})$. Nuclear starburst galaxies seems to be preferentially located in the upper right corner.

hibits a parallel double-bar and a nuclear ring. Another example is the starburst galaxy NGC 5135 which has a nuclear spiral feature nested in the primary bar.

We wonder whether the activity of a galaxy could affect its J–K′ color. As this activity generally concerns the central region, we have characterized the central J–K′ profile behavior by the parameter Δ(J–K′); it is the difference between the central J–K′ color within a fitted ellipse with 1.5″semi–major axis, and the outer J–K′ color computed between $0.1\,D_{25}$ and $0.12\,D_{25}$ (D_{25} is the major axis at the 25.0 B-mag/$''^2$ isophote).

For the 26 selected objects, we plot Δ(J–K′) versus the IRAS color $\log(S_{60}/S_{100})$, which is a possible tracer of enhanced star formation if larger than ≈ -0.30 (e.g. Helou 1986). In fact we observe a trend for galaxies with $\log(S_{60}/S_{100}) \gtrsim -0.30$ to have a $\Delta(\text{J–K}') \gtrsim 0.3$. These galaxies might be the site of a nuclear starburst. The figure suggests that Δ(J–K′) could be used as a complementary indicator of nuclear star formation. On the contrary, it does not seem to be particularly linked with the Seyfert activity.

References

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