CALCIUM FEATURES IN IN THE "FEATURELESS" CONTINUUM OF SEYFERT NUCLEI: EVIDENCE FOR A YOUNG STELLAR POPULATION?

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We have obtained intermediate resolution spectra for about 30 galaxies, normal and active, in the near infrared region covering the CaII triplet ($\lambda\lambda$ 7800-9300 Å). The data were obtained with the INT at the Roque de los Muchachos Observatory in La Palma, Spain using the Intermediate Dispersion Spectrograph and a GEC CCD detector. Details of these observations are given elsewhere (Terlevich *et al.* 1988). Our data show that active (Seyfert galaxies and LINERS) and normal galaxies have comparable nuclear CaII strengths and line widths.

Figure 1 shows the distribution of the strength of the CaII lines ($\lambda\lambda$ 8542+8662 Å) versus galactic nuclear types. It can be seen from this diagram that galaxies with active nuclei have CaII triplet lines which are as strong as (and in some cases stronger than) those observed in normal spirals and ellipticals.

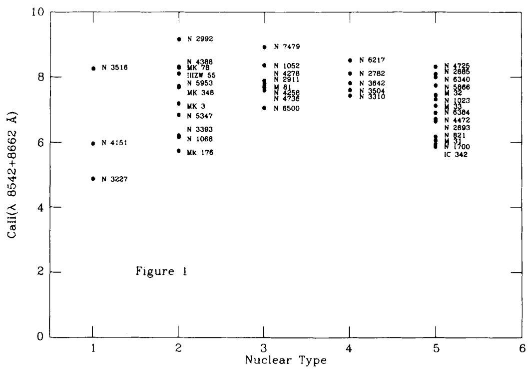

Figure 1. Strength of the CaII lines ($\lambda\lambda$ 8542+8662 Å) as a function of nuclear type: 1= Seyfert type 1; 2= Seyfert type 2; 3= LINER; 4= Starburst galaxy; 5= Normal galaxy.

For a sample of Seyfert galaxies, Malkan & Filippenko (1983) find that fractions of the total light at λ 5400 Å between 20 percent and 85 percent coming from a featureless continuum can account for the observed dilution of the optical absorption lines. This continuum originates in an unresolved point-like source. Applying Malkan & Filippenko's methods we find that, for all the Seyfert galaxies in our sample, a considerable fraction of the IR light inside a 4 arcsec aperture comes as well from an unresolved nuclear component. This can be seen in Figure 2 where radial brightness profiles, as deduced from our long-slit observations, are plotted at 6300 Å (R) and 8500 Å (IR) for NGC 3227 for which we have complementary data in the wavelength range $\lambda\lambda$ 6000-7500 Å. Also shown is the seeing profile as deduced from stellar observations. For the galaxy both profiles are similar and show a spatially unresolved nuclear component above the extrapolated disc light distribution

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represented by the straight line. This unresolved component effectively dominates the nuclear light. The MgIb line is substantially diluted (see Dahari & de Robertis 1988). Yet no dilution in the IR CaII lines is observed.

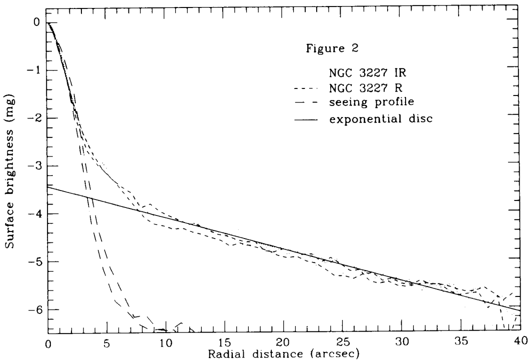

Figure 2. Radial brightness profiles at 6300 Å (R) and 8500 Å (IR) for NGC 3227. The seeing profile is shown for comparison. The straight line corresponds to an exponential disc. The profiles are normalized to the same maximum value.

The lack of dilution of the CaII absorption lines in the nuclear spectra, already mentioned by Malkan & Filippenko for NGC 1068, leads naturally to the suggestion that *the supposedly featureless continuum is not totally featureless but rather shows the presence of CaII absorption lines* , since the light is clearly dominated by the point-like component. Other possibilities like a contribution from interstellar gas and the presence of a super metal rich stellar population can be ruled out, the first due to the high excitation potential of CaII; the second due to the low sensitivity of the CaII triplet to metallicity (Jones *et al.* 1984; Díaz, *et al.* 1988) and the absence of a very strong Mg2 index, a good metallicity indicator for galaxies.

This gives support to the suggestion that the blue "featureless" continuum corresponds to a young star cluster as proposed by Terlevich & Melnick (1985). In that case dilution is expected in the CaIIK line, the 4000 Å break, the G-band, the MgIb line and the NaI doublets, since these features are weak or absent in early type stars. This is not the case for the near IR CaII triplet which is strongest in red supergiants due to its high sensitivity to surface gravity (Jones *et al.* 1984; Díaz *et al.* 1988). Therefore, in the starburst scenario, the IR CaII lines could be undiluted or even stronger than in an old stellar population. Based on the behaviour of the CaII triplet we conclude that in all our normal nuclei the IR light seems to be dominated by giants in agreement with previous work. According to this and our previous discussion, the only interpretation of the large equivalent widths of the IR CaII lines found in our sample Seyfert nuclei implies the presence of young red supergiant stars contributing heavely to the unresolved nuclear light at IR wavelengths.

References

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