The Interplay among Black Holes, Stars and ISM in Galactic Nuclei
Proceedings IAU Symposium No. 222, 2004
T. Storchi-Bergmann, L. C. Ho & H. R. Schmitt, eds.

DOI: 10.1017/S1743921304002042

The elliptical galaxy NGC 5044: Stellar population and ionized gas

M. G. Rickes[1], M. G. Pastoriza[1] and Ch. Bonato[1]

[1]Instituto de Física, UFRGS, C.P. 15051, CEP91501-970, Porto Alegre, RS, Brazil
email:maurogr@if.ufrgs.br, mgp@if.ufrgs.br, charles@if.ufrgs.br

Abstract. In this work we investigate the stellar population, metallicity distribution and ionized gas in the elliptical galaxy NGC 5044, using long-slit spectroscopy and a stellar population synthesis method. We found differences in the slope of FeI and Mg2 lines gradients, which suggests an enhancement of α elements, particularly towards the central region. The stellar population synthesis shows that the contribution, at λ 5870, of the most metallic and old stellar population ($Z/Z_{\odot} \sim 0.0$ and 10^{10}*year*) is dominant in NGC 5044. The presence of a non-thermal ionization source, such as a low-luminosity AGN and/or shock ionization, is implied by the large values of the ratio [NII]/Hα observed in all sampled regions. However, the emission lines observed in the external regions indicate the presence of an additional ionization source, probably hot, post-AGB stars.

1. Introduction

NGC 5044 is the central and brightest member of a rich group that contains many dE dwarf members and a few Im and Sm dwarf candidates. This galaxy presents very bright ionized gas emission in the form of extended filaments up to 40" from the center, being larger in the southern part of the galaxy (Macchetto et al. 1996). The galaxy also show extended dust filaments (Ferrari et al. 1999).

2. Metallicity gradient

The radial distributions of the $Mg2$ index and those of the EWs of FeI_{5270}, FeI_{5335}, FeI_{5406}, FeI_{5709} and FeI_{5782}, corrected for velocity dispersion, are shown in Fig. 1. The corrected $Mg2$ index (panel a) presents an enhancement of the gradient, which decreases from 0.42 *mag* in the center to $\sim$ 0.32 *mag* in the external regions of the galaxy. On the other hand, the corrected EW of FeI_{5270} (panel b) increases from 2.30 Å in the center to $\sim$3.57 Å in the external regions. This result is in reasonable agreement with Carollo et al. (1993) who found no correlation of the $Mg2$ index with either FeI_{5270} and FeI_{5335}.

3. Stellar population synthesis and ionized gas

In this paper we employ the stellar population synthesis method developed by Bica (1988) which is based on integrated spectra of star clusters and HII regions, characterized by different ages and metallicities. In the present case, due to the small number of observational constraints (EWs and continuum points), we use three old components with different metallicities, in order to minimize the degeneracy between age and metallicity. These components (templates) are: $G1 \rightarrow [Z/Z_{\odot}] \sim 0.0$, $G2 \rightarrow [Z/Z_{\odot}] \sim -0.4$ and $G3 \rightarrow [Z/Z_{\odot}] \sim -1.1$, the three with age 10^{10} years. The stellar population synthesis showed that the component with $[Z/Z_{\odot}] \sim 0.0$ dominates the λ5870 Å light in the

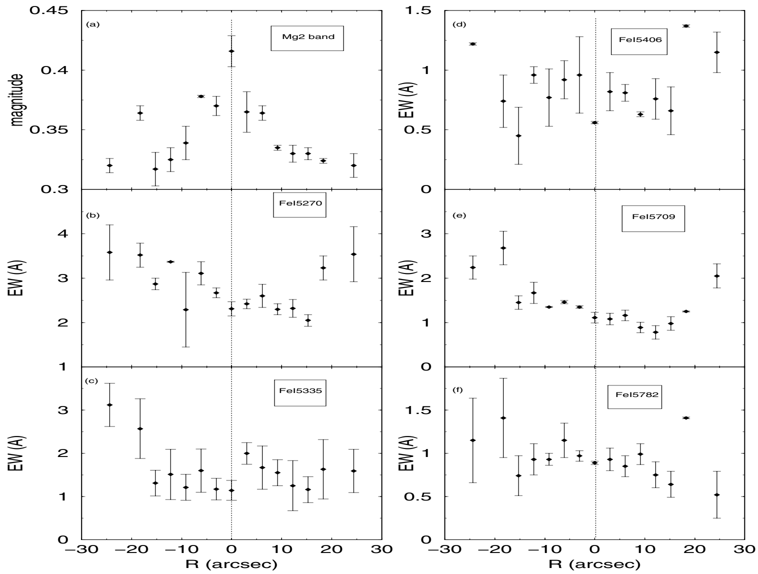

Figure 1. Spatial variation of absorption features in NGC 5044.

central region of NGC 5044, contributing $\sim$ 42% to the total flux, while in the external regions the contribution decreases to $\sim$ 8.0%.

The presence of a non-thermal ionization source, such as a low-luminosity AGN and/or shock ionization, is implied by the large values of the ratio [NII]/Hα, observed in all sampled regions. However, the emission lines observed in the external regions indicate the presence of an additional ionization source, probably hot, post-AGB stars.

4. Conclusion

The difference in slopes may be accounted for by an enhancement of α-elements in general, Mg in particular. The $Mg2$ gradient slope, compared with the mass of NGC 5044, indicates a monolitic collapse. The stellar population synthesis gives that most metallic component ($[Z/Z_\odot] \sim 0.0$) dominates the λ5870 Å flux in the central region of NGC 5044. The metal-poor component ($[Z/Z_\odot] \sim -1.1$) contributes to $\sim$ 26 % in the central region, and $\sim$ 37 % in the external regions. The large values of the ratio [NII]/Hα, observed in all sampled regions, characterizes the presence of a non-thermal ionization source, such as a low-luminosity AGN and/or shock ionization. However, in the external regions an additional ionization source is necessary to explain the emission lines, which might be hot, post-AGB stars.

References

Bica, E. 1988, A&A, 195, 79

Faber, S. M., Friel, E. D., Burstein, D., & Gaskell, C. M. 1985, ApJS, 57, 711

Ferguson, H., & Sandage, A. 1990, AJ, 100, 1

Ferrari, F., Pastoriza, M. G., Macchetto, F. D., Bonatto, C., Panagia, N., & Sparks, W. B. 2002, A&A, 389, 355

Macchetto, F., Pastoriza, M., Caon, N., Sparks, W. B., Giavalisco, M., Bender, R., & Capaccioli, M. 1996, A&A, 120, 463

Worthey, G. 1994, ApJS, 95, 107

Worthey, G., Faber S. M., Gonzáles, J. J., & Burstein, D. 1994, ApJS, 94, 687