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14. Abstract/Notes

The southern Seyfert galaxies IC 5063, IC 5135 and NGC 2992 were observed with 0.55 Å resolution at Hα. After deblending the [NII] lines, a broad Hα component is seen in the spectra of IC 5063 and IC 5135. In the first case, the broad component, with FWZI = 3000 km/s has 40% of the total Hα flux. In the second case, the broad component has FWZI = 3800 km/s and 60% of the flux. In NGC 2992, contrary to previous reports that found a broad Hα that is similar in intensity to the narrow component, we found that it is, at least, 5 times weaker. This difference is probably due to the different instrumental resolution.

15. Remarks

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"PROFILES OF EMISSION LINES IN AGN. PART III: ON THE BROAD Hα COMPONENT OF IC 5063, IC 5135 AND NGC 2992"

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ABSTRACT: The southern Seyfert galaxies IC 5063, IC 5135 and NCG 2992 were observed with 0.55 Å resolution at Hα . After deblending the [NII] lines, a broad Hα component is seen in the spectra of IC 5063 and IC 5135. In the first case, the broad component, with FWZI = 3000 km/s has 40% of the total Hα flux. In the second case, the broad component has FWZI = 3800 km/s and 60% of the flux. In NGC 2992, contrary to previous reports that found a broad Hα that is similar in intensity to the narrow component, we found that it is, at least, 5 times weaker. This difference is probably due to the different instrumental resolution.

1 - Introduction

As part of a high resolution (0.55 Å) spectroscopic survey of southern Seyfert galaxies, we observed a number of objects in the Hβ /[OIII] region (Paper I and II) and in the Hα region (Paper IV). The main goal of this survey is to study the profiles of the narrow lines in Seyfert 1 and Seyfert 2 galaxies. As a by-product, one can search for and analyse weak broad components in Hα that sometimes show up when Seyfert 2 galaxies are observed with high resolution and high signal to noise. Such objects are usually classified as Seyfert 1.8 or 1.9. The search and detailed study of these objects is of great importance for characterizing the weak end of the luminosity function of active galactic nuclei (AGN).

2 - Observations

The observations were made with a two channel intensified Reticon at the Coudé spectrograph of the 1.6m telescope at the Laboratório Nacional de Astrofísica (CNPq/LNA). The resolution was 0.55 Å at Hα . Average position angles and integration times are listed in table I.

TABLE I

Object	Date	Integration time	Position angle
IC 5063	7/17/84	120 min	130^{o}
IC 5135	5/14 + 8/4/85	96 + 44 min	155^{o}+ 107^{o}
NGC 2992	3/13/85	95 min	102^{o}

The object and sky slits were 1.2" x 5" in size and separated by 15".

Reduction of the observations followed standard procedures by fitting a 7nd order polinomial through a set of 40-60 arc lines of Th-Ar in the spectral region covered by the detector.

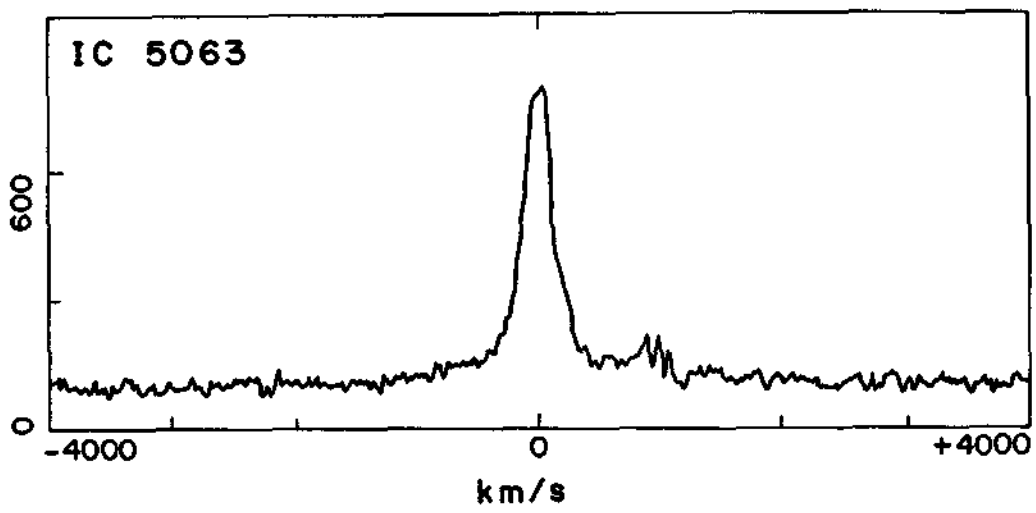

Figure 1. The Hα spectrum of IC 5063, after subtracting the [NII] matched by the [OIII] λ 5007 line.

3 - Deblending

The deblending procedure was as follows: [O III] λ 5007 was taken in velocity space and scaled to the intensity of the [N II] lines by an arbitrary factor so its subtraction from the [N II] lines left a "smooth continuum". The [N II] line intensities were constrained to have a ratio of 2.8.

In the case of the galaxy IC 5135, the profile of the [O III] λ 5007 was clearly and significantly different from that of the [N II] lines. Therefore , for this galaxy, we used H β as the matching profile. Figures 1 e 2 show the deblended spectra of the galaxies.

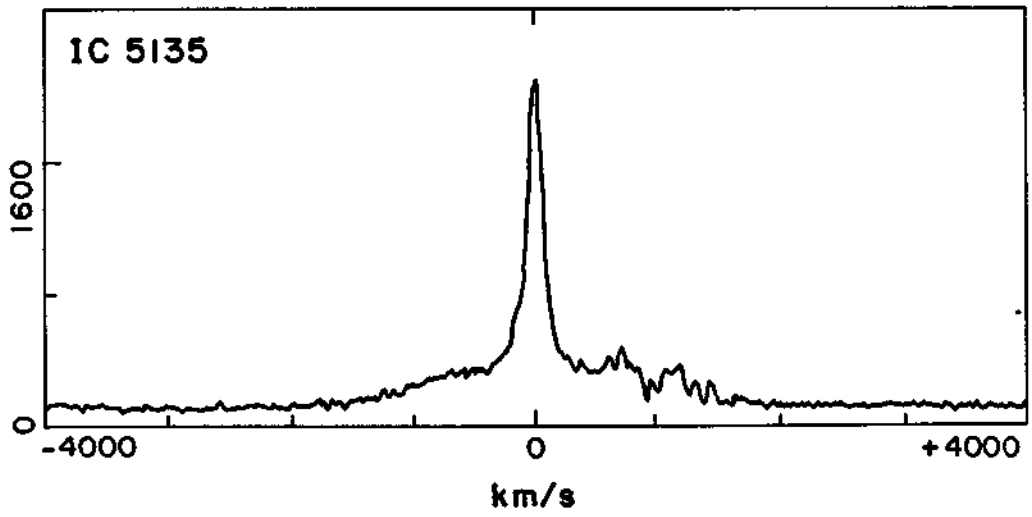

Figure 2. The Hα spectrum of IC 5135, after subtracting the [NII] lines, matched by Hβ.

4 - Conclusion

From the deblended spectra we have estimated the equivalent width of both narrow and broad components of Hα as listed in Table II.

TABLE II

Galaxy	W_n (Å)	W_b(Å)	b/n	FWZI(km/s)
IC 5063	54	39	0.72	3,000
IC 5135	72	125	1.74	3,800
NGC 2992	35	7	0.2	3,200?

The galaxy IC 5063 was studied in detail by Caldwell and Phillips (1981) and by Bergeron et al. (1983). Caldwell and Phillips did not find any evidence for broad Hα component, while Bergeron et al. found a broad component with a flux of 0.7 relative to the narrow component, similar to our measurements (those authors found FWHM = 3,200 km/s while we find FWZI = 3,000 km/s).
Previous measurements of NGC 2992 were reported with a much stronger broad Hα component (Shuder 1980, Ward et al. 1980, Véron et al. 1980)). Shuder reports a ratio of broad-to-narrow-line flux of 0.9 while the other authors found an even stronger broad emission. The forbidden line widths are also significantly narrower in our observations than in previous reports (Paper I). What is the reason for

such a discrepancy? One could argue that the difference in flux is real, perhaps caused by a variability of the broad component or perhaps due to slightly different locations of the slit during the observations. There is a third possibility, which is probably the most plausible explanation for the observed discrepancy: the previous authors used a much poorer resolution than we did. As the lines are quite asymmetric, the deblending with poor resolution (5 Å) is a delicate task. To show the effect of such a resolution on the result of the deblending, we degraded numerically our original spectrum to 4.7 Å resolution. After this we applied the previous deblending procedure. The result can be seen in Figure 3. By evaluating the narrow and broad components we get a ratio b/n ~1, (like the previous authors did) about 5 times larger than the ratio obtained with full resolution. This shows that to study the profile of narrow emission lines and the weak broad Hα components in AGN, high resolution (~1Å) spectra are required.

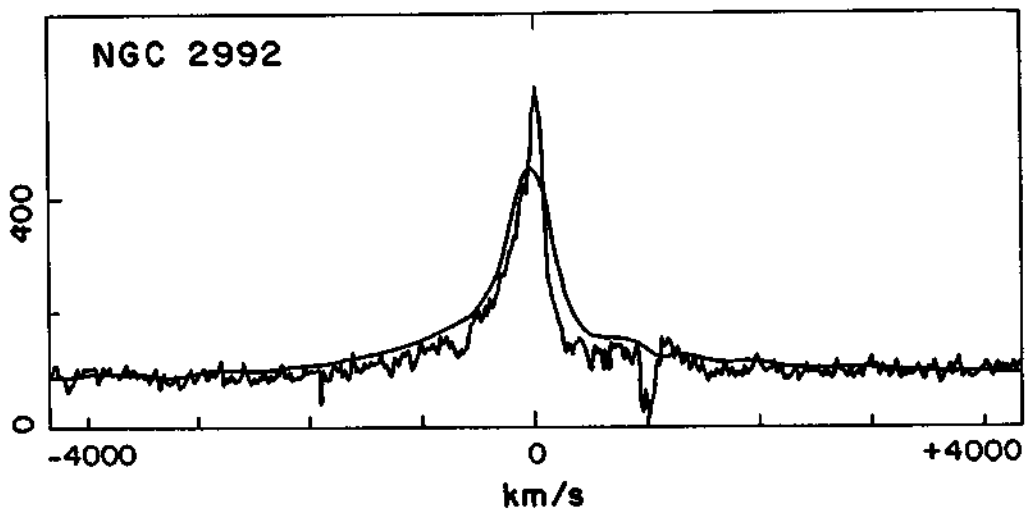

Figure 3. The Hα spectrum of NGC 2992, after subtracting the [NII] lines with the original resolution of 0.55Å and after degrading the resolution numerically to 4.7 Å.

Acknowledgments. The observations reported in this paper were obtained at Laboratório Nacional de Astrofísica (CNPq/LNA). J.E. Steiner is on leave from Instituto Astronômico e Geofísico da Universidade de São Paulo.

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