CCD SURFACE PHOTOMETRY OF SOUTHERN GALAXIES IN BVRI

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RESUMO: Foram obtidos frames CCD em B: V: R e I para as galáxias do Hemisferio Sul NGC 5757 e IC 1091. Os frames foram analisados para derivar parâmetros fotométricos e geométricos como magnitudes e cores integradas, dimensões inclinação. Perfis radiais de luminosidade foram calculados para várias direções, sendo posteriormente combinados para dar um perfil radial médio. Os perfis radiais médios foram ajustados na parte interna com uma lei $r^{1/4}$. São mostrados os perfis de luminosidade ao longo da barra e perpendicular a ela, assim como os perfis de cor ao longo da barra.

ABSTRACT: B, V, R, and I CCD frames were obtained for the Southern Galaxies NGC 5757, and IC 1091. The frames were analysed to derive standard photometric and geometric parameters such as integrated magnitudes and colors, dimensions and inclination. Radial luminosity profiles along several directions were calculated and combined to give one mean radial profile. The mean radial profiles were fitted in the inner part with an $r^{1/4}$ law. The luminosity profiles along the bar and perpendicular to it are shown, as well as color profiles along the bar.

Key words: GALAXIES-PHOTOMETRY -- GALAXIES-STRUCTURE

INTRODUCTION

As part of a study of luminosity distributions in southern spirals galaxies, we observed the galaxies NGC 5757 and IC 1091, which presents the similarity of being both of type Sb, barred and nearly face-on. NGC 5757 has been classified in the Second Reference Catalogue of Bright Galaxies (de Vaucouleurs et al. 1976 = RC2), as (R)SB(r)b. Its total magnitude given in the RC2 is B_T = 12.6 and its distance, given by Grosbol (1985), is 52 Mpc. IC 1091 has been classified in the RC2 as SB(s)b? and has no determined magnitude and distance. Figures 1 and 2 shows the images of NGC 5757 and IC 1091, respectively, in B light.

2. OBSERVATIONS AND REDUCTIONS

We obtained the CCD frames on the 91 cm telescope at the Cerro Tololo Interamerican Observatory during a run in June 1987. The detector we used was the 800x800 TI#1 chip automatically rebinned into 2x2 pixels, with a final scale of 0.496 arcsec/pixel. We have corrected the frames for nonuniformity and defects of CCD using the dome flat fields and the standard computer programs at CTIO.

Data analysis was performed with the Image Reduction Analysis Facilities (IRAF) from the National Optical Astronomy Observatories (NOAO) on our MV8000 Eclipse computer, using the APPHOT package and other Fortran programs.

The sky background was removed by subtracting a constant computed

rom selected blanck regions around the galaxies. Uncertanties in the sky rightness value was typically 0.5%.

The photometric calibration was made through standard stars of the - Regions (Graham 1982) observed in the same night as the galaxies.

. ISOPHOTE MAPS, GEOMETRIC AND PHOTOMETRIC PARAMETERS

Isophote maps of NGC 5757 and IC 1091 are presented in Figures 3 and , respectively. For NGC 5757 we present two B maps, with different ranges of sophotal levels, in order to point out the outer ring of the galaxy (first ap). In the second map it is noticeable the strong bar and the bright blue oot at the south side of the bar. The distortion of the isophote near the enter seems indicate the presence of dust. The nuclear isophotes are very ounded.

The isophotes of IC 1091, shown in the V map, are very regular, lliptically shaped, excepted for the two short spiral arms seen at the ends f the weak bar.

The position angle, axial size, and axial ratio of the isophotes are determined by fitting ellipses by least squares to the contour levels. nen the inclinations were obtained according to the Hubble relation '(de aucouleurs 1962), $\cos^2 i = (q-q_0^2)/(1-q_0^2)$, where q is the apparent axial atio, and q_0 is the intrinsic axial ratio, which we took as 0.25 (Sandage et l. 1970).

The integrated B magnitude and B-V, V-R and R-I colors were alculated within circles of radius R = 72" for NGC 5757 and R = 45" for IC 091. They were corrected by galactic and internal absorption according the C2, using, for the colors, R = .3 (Allen 1973), E(R-I)/E(V-R) = 0.96 and (V-R)/E(B-V) = 0.79 (Lahulla 1987). The diameters, inclination, magnitudes nd colors of the galaxies are shown in Table 1, together with others eometric and photometric parameters.

TABLE 1. Geometric and Photometric Parameters

	NGC 5757	IC 1091
Position angle of the major axis	25∘	113∘
Mean axis ratio	0.88	0.80
Inclination	27∘	37∘
Position angle of the bar	173∘	158∘
Bar diameter (arcsec)	36	28
(Kpc)	9.07	−
Major diameters (at u_B=25)	120	64
(Kpc)	30.2	−
Integrated magnitude B	12.7	14.5
Corrected integrated magnitude B^0	12.3	14.0
Corrected integrated colors:		
$(B-V)_0$	0.60	0.90
$(V-R)_0$	0.39	0.50
$(R-I)_0$	0.43	0.52

. LUMINOSITY PROFILES

The luminosity profiles were calculated by a two dimensional nterpolation of the luminosity distribution through the center of the galaxy, n selected directions.

Figure 5 shows the B (a) and I (b) luminosity profiles of ·NGC 5757 long the bar and perpendicular to it. The bar forms a plateau in the region ith r =±20". The bright spot seen in the isophotes appears in the profile as strong hump at 22 arcsec south of the center, and has increasing intensity rom I to B.
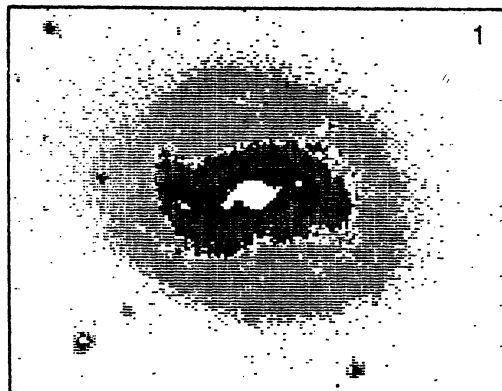
Fig. 1.- Image of NGC 5757
in B light.

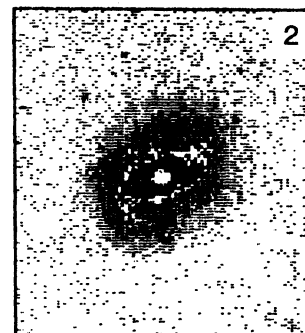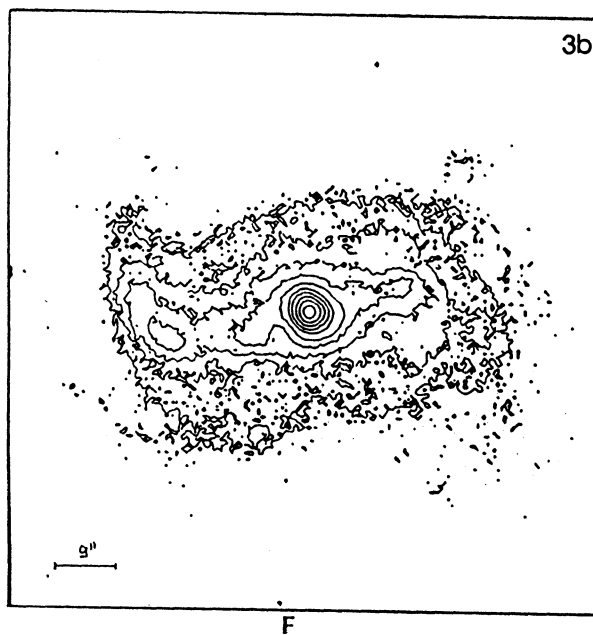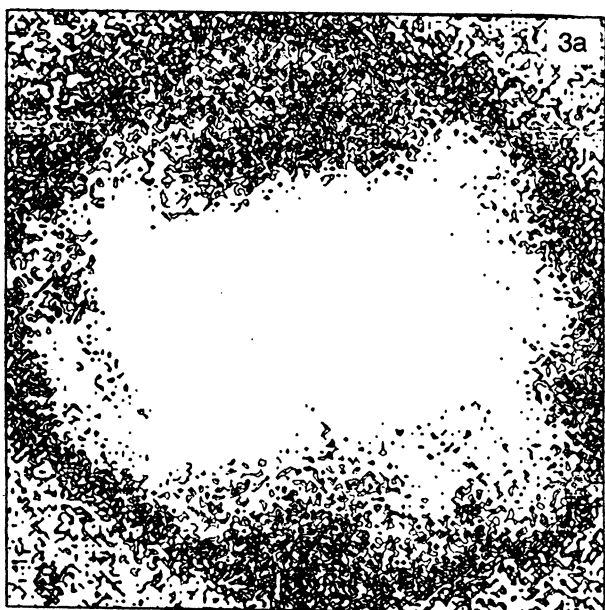Figure 2.- Image of IC 1091
in B light.

Fig. 3.- Isophote B maps of NGC 5757. Isophota
levels are from 23.46 to 24.96 (top). and from
17.96 to 22.46 (bottom). The interval between
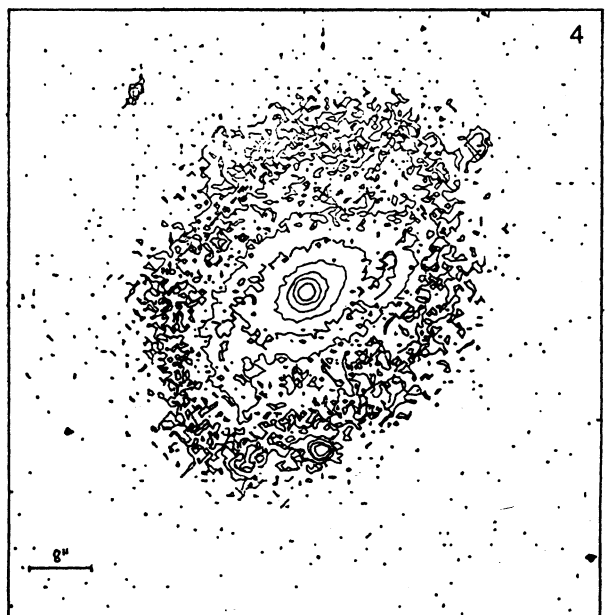consecutive levels is 0.5 magnitudes.

Fig. 4.- Isophote V map of IC 1091, isophotal
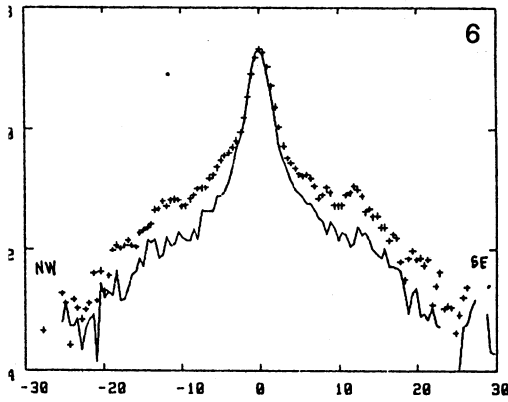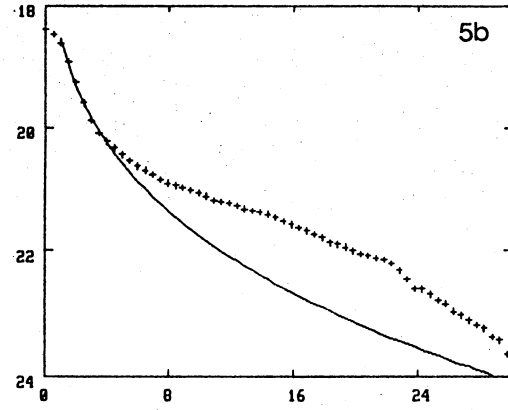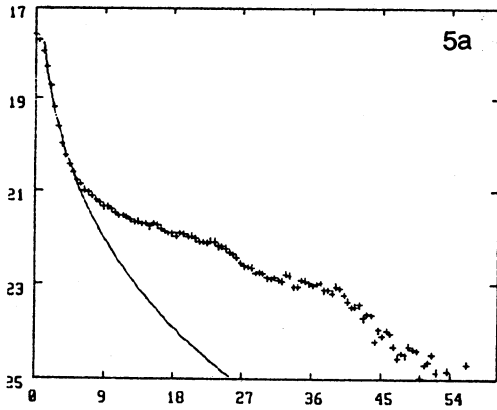levels from 19.61 to 22.61, 0.5 magnitudes
spaced.

Fig. 5. Luminosity profiles along the bar (+) and perpendicular to it (−) for NGC 5757, in B (a), and in I (b). The abscissas are mag/arcsec^2.

Fig. 6. Same as Fig. 5 for IC 1091 in V.

Fig. 7. Elliptically averaged B profile for NGC 5757 (+), from twelve profiles equally spaced. The absissas are mag/arcsec^2. The line is a de Vaucouleurs law fittted to points 3 to 12. b) Same in V for IC 1091; the line is fitted to points 3 to 9.

Fig. 8. a) Color profiles along the bar of NGC 5757. The (V−R), (R−I), and (V−I) profiles are offset by −1.0, −2.5, and −4.0 mags respectively. The right side of the figure indicates the correct scale. The arrow marks the bright spot in the isophote map. b) The same, for IC 1091.
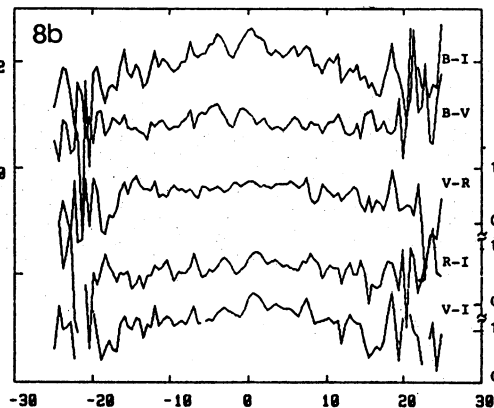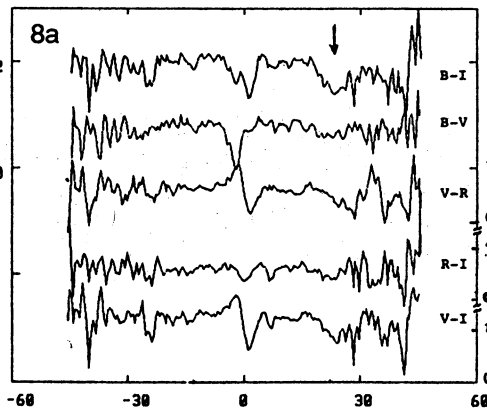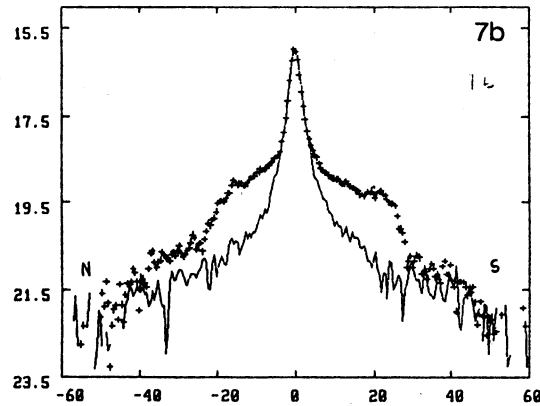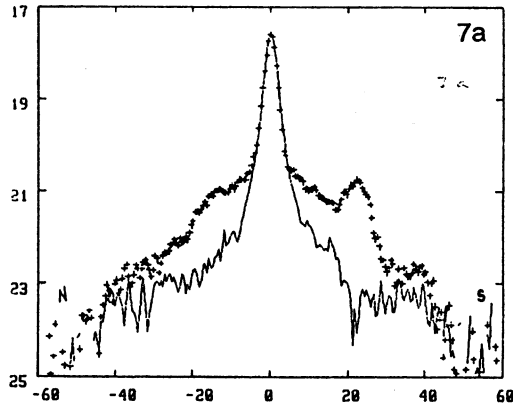
Figure 6 presents the luminosity profiles along the bar and perpendicular to it for IC 1091. The two humps symmetrically placed at the ends of the bar, coincide with the position of the spiral arms. The surface brightness of IC 1091 is very low compared with that of NGC 5757.

Elliptically averaged profiles (Boroson 1981) were determined from 12 radial profiles 30° apart in angle in the case of NGC 5757 and from 36 radial profiles 10° apart in the case of IC 1091. A linear least squares fit to these profiles shows that, for both galaxies, the bulge is well fitted with a $r^{1/4}$ (de Vaucouleurs 1962). For NGC 5757 the parameters of the fitting are $I_e(B) = 20.36 \pm 0.29$, $r_e(B) = 4.36 \pm 0.68$, and for IC 1091 the parameter of the fitting are $I_e(V) = 20.31 \pm 0.11$, $r_e(V) = 5.97 \pm 0.41$. The elliptically avaraged profiles and the fitted functions are shown in Figure 7, for the two galaxies. No attempt for fitting a disc was made, since the outer regions of the galaxies are underexposed.

The (B-I), (B-V), (V-R), (R-I) and (V-I) color profiles of NGC 5757 and IC 1091 were obtained along the direction of the bar, and are shown in Figure 8. Only the inner region is shown, because the noise is very large in the outer ones. For NGC 5757, the profile presents an asymmetry at the center, suggesting the existence of a very blue structure near the nucleus. The bright spot seen as a hump in the B luminosity profiles appears as a very marked dip (blue) in the B-I profile. For IC 1091, the color profiles are very smooth, showing a slight blueness in direction to the outer regions.

5. CONCLUSIONS

NGC 5757 and IC 1091 are two SBb galaxies with integrated magnitudes $B_T^0 = 12.3$ and 14.0, respectively. Despite they have the same morphological type, NGC 5757 is much bluer $((B-V)^0 = 0.6)$ than IC 1091 $((B-V)^0 = 0.9)$.

The luminosity profiles along the bar are similar in shape for both galaxies, but NGC 5757 has a verv conspicuous hump in B, south of the bar, characteristic of a stellar formation region.

The color profiles along the bar shows that IC 1091 gets bluer to the outside, while NGC 5757 is bluest in the nuclear region, probably due to the existence of another site of stellar formation near the nucleus. Both galaxies follows a $r^{1/4}$ law in the inner region, but the parameters of the fits show that the spheroidal component is much flatter for IC 1091 than for NGC 5757.

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