STELLAR POPULATIONS OF THE DWARF GALAXY UKS 2323—326 IN THE SCULPTOR GROUP

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ABSTRACT

We present deep BVRI CCD photometry of the stars in the dwarf irregular galaxy UKS 2323—326 in the Sculptor Group. The color-magnitude diagrams of the measured stars in UKS 2323—326 show a blue plume that consists mostly of young stellar populations and a well-defined red giant branch (RGB). The tip of the RGB is found to be at \( I_{\text{TRGB}} = 22.65 \pm 0.10 \) mag. From this, the distance to this galaxy is estimated to be \( d = 2.08 \pm 0.12 \) Mpc. The corresponding distance of this galaxy from the center of the Local Group is 1.92 Mpc, showing that it is located outside the Local Group. The large distance, combined with its velocity information, indicates that it is very likely a member of the Sculptor Group. The mean metallicity of the RGB is estimated to be \([\text{Fe/H}] = -1.98 \pm 0.17 \) dex. The total magnitudes of UKS 2323—326 \((<r_H \approx 70''\rangle)\) are derived to be \( B^I = 14.07, V^T = 13.50, R^T = 13.18, \) and \( I^I = 12.83 \) mag, and the corresponding absolute magnitudes are \( M_B = -12.58, M_V = -13.14, M_R = -13.45, \) and \( M_I = -13.79 \) mag. Surface brightness profiles of the central part of UKS 2323—326 are approximately consistent with a King model with a core concentration parameter \( c = \log (r_c/r_t) \approx 1.0, \) and those of the outer part follow an exponential law with a scale length of 21''. The magnitudes and colors of the brightest blue and red stars in UKS 2323—326 \((\text{BSG and RSG})\) are measured to be, respectively, \( \langle V(3) \rangle_{\text{BSG}} = 20.33 \pm 0.25, \langle B - V \rangle(3)_{\text{BSG}} = 0.14 \pm 0.07, \langle V(3) \rangle_{\text{RSG}} = 20.74 \pm 0.18, \) and \( \langle B - V \rangle(3)_{\text{RSG}} = 1.35 \pm 0.08 \) mag. The corresponding absolute magnitudes are derived to be \( \langle M_V(3) \rangle_{\text{BSG}} = -6.31 \) and \( \langle M_V(3) \rangle_{\text{RSG}} = -5.91 \) mag, which are about a half-magnitude fainter than those expected from conventional correlations with galaxy luminosity.

Key words: distance scale — galaxies: evolution — galaxies: individual (UKS 2323—326) — galaxies: irregular — galaxies: photometry — galaxies: stellar content

1. INTRODUCTION

UKS 2323—326 (UGCA 438) is a faint dwarf irregular galaxy in the Sculptor Group discovered by Longmore et al. (1978). In the discovery paper, Longmore et al. estimated the distance to this galaxy from the rough estimate of the magnitude of the brightest stars to be 1.3 Mpc, with a large error of \( \pm 50\% \). Since then, this galaxy has been often considered to be a member of the Local Group (Longmore et al. 1978; Mateo 1998). On the other hand, the velocity of UKS 2323—326 from the center of the Local Group, 82 km s\(^{-1}\) (Longmore et al. 1978), suggests that it may not belong to the Local Group (van den Bergh 1994; Lee 1995a). Accurate measurement of the distance to this galaxy is needed to resolve this problem.

Longmore et al. (1978) measured the H\( \alpha \) flux of 15 \( \pm 3 \) Jy km s\(^{-1}\) at the heliocentric velocity of 62 \( \pm 5 \) km s\(^{-1}\) and derived, using eye estimate with the photographic plates, the magnitude of the brightest blue stars in UKS 2323—326, \( B = 19.3 \pm 0.5 \) mag. After the discovery paper, however, no detailed photometric study has been published for this galaxy.

In this paper we present a study of the stellar populations of UKS 2323—326 based on deep BVRI CCD photometry and show that this galaxy is outside the Local Group and is a member of the Sculptor Group. This paper is composed as follows: Section 2 describes the observations and data reduction, and \( \S \) 3 investigates the morphological structure of UKS 2323—326. Section 4 presents the color-magnitude diagrams of UKS 2323—326; \( \S \) 5 estimates the distance to UKS 2323—326. Section 6 presents the surface photometry of UKS 2323—326, and \( \S \) 7 discusses the group membership, stellar populations, and brightest stars of UKS 2323—326. Finally, a summary and conclusions are given in \( \S \) 8.

2. OBSERVATIONS AND DATA REDUCTION

BVRI CCD images of UKS 2323—326 were obtained on the photometric night of 1994 October 7 (UT) using the University of Hawaii 2.2 m telescope at Mauna Kea. Table 1 lists the journal of the observations of UKS 2323—326. A gray-scale map of the \( V \)-band CCD image of UKS 2323—326 is displayed in Figure 1. The size of the field of view is 7.5 \( \times \) 7.5, and the (2 \( \times \) 2 binned) pixel scale of the CCD is 0.44 pixel\(^{-1}\).

For the analysis of the data, we have divided the field covered by our CCD images into three regions, as shown in Figure 1: the C region, which covers the central region \((r < 44''\rangle) \) of UKS 2323—326, the I region, which covers the outer region \((44'' < r < 77''\rangle) \) of the galaxy, and the F region, which represents a control field with the same area of the C region plus the I region.

Instrumental magnitudes of the stars in the CCD images were derived using DoPHOT (Schechter, Mateo, & Saha 1993). These magnitudes were transformed onto the standard system using the standard stars observed during two nights including the same night (Landolt 1992). The trans-
formation equations we derived from the photometry of the standard stars are

\[ V = v - 0.075(b - v) - 0.118X + \text{constant}, \]

\[ B - V = 1.130(b - v) - 0.111X + \text{constant}, \]

\[ V - R = 0.970(v - r) - 0.030X + \text{constant}, \]

and

\[ I = i + 0.050(v - i) - 0.082X + \text{constant}, \]

where upper cases and lower cases represent, respectively, the standard and instrumental systems. \( X \) represents the air mass. The rms scatter of the solutions is 0.01–0.02 mag. The total number of stars that were measured at \( V \), and at least one other color in the CCD image is \( \sim 2000 \). Table 2 lists \( BVRI \) photometry of the measured bright stars with \( V < 22.5 \) mag in the field of UKS 2323–326. The coordinates \( X \) and \( Y \) in Table 2 are given in units of pixel (=0.44) and increase to the east and to the south, respectively.

### Table 1

| Filters | \( T_{\text{exp}} \) (s) | Air Mass | FWHM | UT (Start) |
|---------|-----------------|---------|------|-----------|
| \( B \)  | 300             | 1.68    | 1'1  | 1994 Oct 7 09:41 |
| \( V \)  | 3 × 700         | 1.66    | 1'0  | 1994 Oct 7 09:00 |
| \( R \)  | 3 × 500         | 1.63    | 1'0  | 1994 Oct 7 08:27 |
| \( I \)  | 4 × 400         | 1.66    | 0'9  | 1994 Oct 7 07:48 |

3. MORPHOLOGICAL STRUCTURE

Unfortunately, there is a very bright star 20" southeast of the center of UKS 2323–326, as shown in Figure 1. It is a foreground star of about 14 mag (Longmore et al. 1978) and is saturated in all our CCD images. Figure 1 shows that there are several tens of bright stars concentrated in the central region of UKS 2323–326. These stars are con-

![Fig. 1.—Gray-scale map of the \( V \)-band CCD image of UKS 2323–326. North is at the top and east is to the left. The size of the field is 7.5 \( \times \) 7.5. Regions labeled as C, I, and F represent, respectively, the central region \( (r < 44") \), the intermediate region \( (44" < r < 77") \), and the control field region \( (r < 77") \).](image-url)
3. Note that the area of the C region, and 89 measured stars in the F region in Figures 2 and 3. The brightest end of the blue plume extends up to \( V \approx 20.0 \) mag and \( B - V \approx -0.1 \). These stars are mostly massive stars that were formed recently. Stars in the I region are all fainter than \( V = 23 \) mag (open circles), much fainter than those bright stars in the C region. This shows that there was little star formation in the outer part of UKS 2323 – 326 recently.

Second, there are five red bright stars with \( 20.0 < V < 21.5 \) mag and \( 1.2 < B - V < 1.5 \) in the C region in Figure 2. This area of the F region color-magnitude diagram is devoid of stars. Therefore, these stars are probably the members of UKS 2323 – 326. These stars are considered to be red supergiant stars that were formed recently.

Third, Figure 3 shows that there is a strong concentration of red stars fainter than \( I \approx 21.5 \) mag in the C + I region. Most of these stars are probably old red giant branch (RGB) stars of UKS 2323 – 326.

4. COLOR-MAGNITUDE DIAGRAMS

UKS 2323 – 326 is located 71” below the Galactic plane in the sky so that the foreground reddening for UKS 2323 – 326 is expected to be very low. We adopt in this study the foreground reddening value of \( E(B - V) = 0.014 \) mag for UKS 2323 – 326 given by Schlegel, Finkbeiner, & Davis (1998).

We display \( V(B - V) \) and \( I(V - I) \) diagrams of 520 measured stars in the C region, 280 measured stars in the I region, and 89 measured stars in the F region in Figures 2 and 3. Note that the area of the C + I region in the field is the same as that of the F region, so that we can estimate the contamination due to foreground stars by directly comparing the diagrams of each region.

Several distinguishable features of the stars in UKS 2323 – 326 are seen in Figures 2 and 3. First, there is a blue plume of bright stars with \( B - V < 0.4 \) in the C region (filled circles). Comparison of the C and F regions in Figure 2 shows that these bright blue stars are mostly members of UKS 2323 – 326. The brightest end of the blue plume extends up to \( V \approx 20.0 \) mag and \( B - V \approx -0.1 \). These stars are mostly massive stars that were formed recently.

Stars in the I region are all fainter than \( V = 23 \) mag (open circles), much fainter than those bright stars in the C region. This shows that there was little star formation in the outer part of UKS 2323 – 326 recently.

Third, Figure 3 shows that there is a strong concentration of red stars fainter than \( I \approx 21.5 \) mag in the C + I region. Most of these stars are probably old red giant branch (RGB) stars of UKS 2323 – 326.

5. DISTANCE AND METALLICITY

We estimate the distance to UKS 2323 – 326 using the \( I \) magnitude of the tip of the RGB (TRGB), as described in Da Costa & Armandroff (1990) and Lee et al. (1993). The \( I \) magnitude of the TRGB is estimated using the \( I(V - I) \) diagram in Figure 3 and the luminosity function of red giant stars. Figure 4 shows the \( I \)-band luminosity function.
Fig. 2.—(a) $V-(B-V)$ diagram of the measured stars in the C + I region of UKS 2323–326. Filled circles and open circles represent the stars in the C and I regions, respectively. (b) $V-(B-V)$ diagram of the measured stars in the F region.

Fig. 3.—(a) $I-(V-I)$ diagram of the measured stars in the C + I region of UKS 2323–326. Filled circles and open circles represent the stars in the C and I regions, respectively. (b) $I-(V-I)$ diagram of the measured stars in the F region.

Fig. 4.—$I$-band luminosity function of the RGB stars in the C and I regions. The tip of the red giant branch is labeled as TRGB. The thick solid line, dotted line, and dashed lines represent the luminosity functions of the I, C, and F regions, respectively. The contribution due to field stars was subtracted from the luminosity functions of the C and I regions.
UKS 2323−326 is obtained: $(m - M)_0 = 26.59 \pm 0.12$ mag (corresponding to a distance of 2.08 \pm 0.12 Mpc) for an adopted extinction of $A_I = 0.03$ mag.

We have estimated the mean metallicity of the RGB stars in UKS 2323−326 using the $V - I$ color of the stars 0.5 mag fainter than the TRGB, $(V - I)_{3.5}$. This color is measured from the median value of the colors of 17 RGB stars with $I = 23.10 \pm 0.10$ mag to be $(V - I)_{3.5} = 1.29 \pm 0.04$. From this value we estimate the mean metallicity to be $[\text{Fe/H}] = -1.98 \pm 0.17$ dex. In Figure 5 we overlaid the loci of the RGBs of Galactic globular clusters M15, M2, and NGC 1851, shifted according to the distance and reddening of UKS 2323−326. The metallicities of M15, M2, and NGC 1851 are $[\text{Fe/H}] = -2.17$, $-1.58$, and $-1.29$ dex, respectively. Figure 5 shows that the bright part of the RGB of UKS 2323−326 is located well between those of M15 and M2. The broadening of the faint part of the RGB is mostly due to the photometric errors, as shown by the error bars in Figure 5. Thus the mean metallicity of the RGB stars in UKS 2323−326 is very low and is close to the lowest end in the metallicity of dwarf irregular galaxies (Lee et al. 1993, 1999; Lee 1995a, 1995b; Mateo 1998).

6. SURFACE PHOTOMETRY

It is very difficult to reliably derive the surface photometry of UKS 2323−326 because of the presence of very bright foreground star close to the center of the galaxy. We have obtained the surface photometry of UKS 2323−326 as follows: First, we removed in the original CCD images the images of very bright foreground star and several other bright stars that were obviously considered to be foreground stars in the area of UKS 2323−326 using IMEDIT in IRAF. Then we performed aperture photometry of UKS 2323−326 using the circular annular aperture. The value of the sky background was estimated from the mean intensity of the F region. Subtraction of the very bright 14 mag star from the image of the galaxy is very difficult. The error due to this problem is not easy to quantify but may be significant in the photometry of the galaxy. Therefore, the surface photometry of the galaxy derived in this study is only approximate.

The results of surface photometry of UKS 2323−326 are listed in Table 3 and displayed in Figure 6. In Table 3, $r_{\text{eff}}$ presents the mean major radius of an annular aperture, and $r_{\text{out}}$ represents the outer radius of an annular aperture. Figure 6a shows that the surface brightness profiles are almost flat in the central region of the galaxy ($r < 20''$) and follow approximately the exponential law in the outer part ($r > 20''$). We fitted the $V$ surface brightness profile of the inner region of UKS 2323−326 with the single-mass isotropic King models (King 1966) and that of the outer region with the exponential law in Figure 7. Figure 7 shows that the surface brightness profile of the inner region is roughly fitted by a King model with a core concentration parameter $c = \log (r_c/r_t) \approx 1.0$, where $r_c$ and $r_t$ represent the core radius and tidal radius, respectively. The surface brightness profiles of the outer region are fitted roughly by an exponential law with a scale length of $r = 21'' = 210$ pc. Figure 6b illustrates the surface color profiles for the region at $r < 40''$. The colors profiles are plotted only for the region at $r < 40''$, beyond which the errors of the colors are too large. The color profiles are almost constant and become slowly redder outward from the center to $r \approx 40''$. The rapid

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**Fig. 5.** $I$ $(V-I)$ diagram of the measured stars in the I (open circles) and C regions (filled circles) of UKS 2323−326 in comparison with the RGBs of Galactic globular clusters. The solid curved lines show, from left to right, the loci of the giant branches of M15, M2, and NGC 1851, the metallicities of which are $[\text{Fe/H}] = -2.17$, $-1.58$, and $-1.29$ dex, respectively. The mean errors for the magnitudes and colors are illustrated by the error bars at the right.

**Fig. 6.** Surface photometry of UKS 2323−326. (a) Surface brightness profiles vs. radius along the major axis. B, V, R, and I magnitudes are represented by the open squares, filled circles, open triangles, and crosses. (b) Differential colors vs. radius along the major axis.
change of the color profiles close to the center is due to a bright star in the central region. The properties of the surface brightness and color profiles of UKS 2323–326 are similar to those of other dwarf galaxies (Kormendy & Djorgovski 1989; Mateo 1998).

From the data of the surface photometry we have derived several basic parameters of UKS 2323–326 as follows: The standard and Holmberg radii of UKS 2323–326 are measured to be \(r_{25} = 46' = 460\) pc and \(r_H = 70' = 700\) pc, respectively. These radii are similar, respectively, to the radii of the C and I regions shown in Figure 1. Note that our value for the Holmberg radius is much larger than the value Longmore et al. (1978) derived roughly from their photographic plate, \(r_H = 45'\).

The central surface brightness of UKS 2323–326 is measured to be \(\mu_B(0) = 23.4, \mu_V(0) = 22.9, \mu_R(0) = 22.6,\) and \(\mu_I(0) = 22.2\) mag arcsec\(^{-2}\). The total magnitudes of UKS 2323–326 within \(r_H\) are derived to be \(B_T = 14.07, V_T = 13.50, R_T = 13.18,\) and \(I_T = 12.83\) mag, and the corresponding absolute magnitudes are \(M_B = -12.58, M_V = -13.14, M_R = -13.45,\) and \(M_I = -13.79\) mag. The total magnitude of UKS 2323–326 derived in this study, \(B_T = 14.07\) mag, is about 1 mag brighter than that given by Longmore et al. (1978), \(B_T = 15.2\) mag.

7. DISCUSSION

7.1. The Group Membership of UKS 2323–326

We have measured the distance to UKS 2323–326 to be \(d = 2.08 \pm 0.12\) Mpc from the \(I\)-band magnitude of the TRGB, which is an accurate distance indicator for resolved galaxies (Lee et al. 1993; Salaris & Cassisi 1998). Our value is 1.6 times larger and much more accurate than the value Longmore et al. (1978) suggested from the eye estimate of the magnitude of the blue brightest stars, \(d = 1.3\) Mpc with an error of \(\pm 50\%\). Our result shows that UKS 2323–326 is obviously outside the Local Group. The mean distance of the Sculptor Group is 2.5 Mpc, and its radius is \(\sim 1.1\) Mpc (Puche & Carignan 1988; Côte et al. 1997; Jerjen, Freeman, & Binggeli 1998). UKS 2323–326 is located in the western boundary of the Sculptor Group in the sky (see the map of the Sculptor Group members given in Fig. 4 of Côte et al. 1997). Therefore, UKS 2323–326 is definitely considered to be a member of the Sculptor Group.

This conclusion is consistent with the measured velocity of UKS 2323–326. From the measured heliocentric velocity of this galaxy, \(v = 62 \pm 5\) km s\(^{-1}\), the velocity of UKS 2323–326 from the center of the Local Group is calculated
The error bars at the right.

The metallicity of theoretical isochrones. The solid lines represent the Padova isochrones for diagram of UKS 2323 II no Hlicity of $Z$ isochrones. In Figure 8, we overlay, in the stellar populations seen in Figure 2 using the theoretical part of the luminosity function (21.4 $< V < 23$ mag, $-4.2 < M_V < -3.6$ mag) is approximately fitted by a line with a logarithmic slope of 0.52 $\pm$ 0.12, which is similar to those of other irregular and spiral galaxies (Freedman 1986; Hoessel 1986).

The integrated H I flux of this galaxy was measured to be $15 \pm 3$ Jy km s$^{-1}$ (Longmore et al. 1978, 1982), and Longmore et al. (1978) pointed out that the ratio of the H I mass to B luminosity of this galaxy they derived, $M_{HI}/L_B = 2.7 M_{\odot}/L_{\odot}$, is rather large for normal irregular galaxies. With better data for the distance and the luminosity obtained in this study, we derive an H I mass, $M_{HI} = 1.5 \times 10^7 M_{\odot}$, a B luminosity, $L_B = 1.67 \times 10^7 L_{\odot}$, and a ratio of $M_{HI}/L_B = 0.9 M_{\odot}/L_{\odot}$, which is much lower than the value given by Longmore et al. (1978). Our value for the ratio of the H I mass to B luminosity is typical for dwarf irregular galaxies (Mateo 1998).

7.3. The Brightest Blue and Red Stars in UKS 2323 — 326

Longmore et al. (1978) estimated roughly from the survey plate the magnitude of the brightest blue stars in UKS 2323 — 326 to be $B = 19.3 \pm 0.5$ mag and used this result to derive the distance to this galaxy, obtaining a value of 1.3 Mpc. With our photometry we can investigate in detail the properties of the brightest stars in this galaxy.

In the $V$-($B$-$V$) diagram of the C region of UKS 2323 — 326 (filled circles) shown in Figure 2, it is obvious which stars are the three brightest blue and red stars in UKS 2323 — 326. The three brightest blue stars (BSGs) are 1055, 1002, and 1116, and three brightest red stars (RSGs) are 956, 1058, and 821, as listed in Table 2. There is one very blue star (1140) as bright as 1116, but the color is too blue,

totic giant-branch (AGB) stars above the TRGB were probably formed a few Gyr ago.

Figure 9 displays the $V$ luminosity function of the main-sequence stars with $B-V < 0.4$ in UKS 2323 — 326. The luminosity function we derived is incomplete for the faint end, but is reasonably complete for $V < 23$ mag. The bright part of the luminosity function $(21.4 < V < 23$ mag, $-4.2 < M_V < -3.6$ mag) is approximately fitted by a line with a logarithmic slope of 0.52 $\pm$ 0.12, which is similar to those of other irregular and spiral galaxies (Freedman 1986; Hoessel 1986).

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B − V = −0.49, to be a normal star. Inspection of the image of this object shows that the image is slightly asymmetric, so that the point-spread function fitting photometry of this object may not be as good as that of other normal stars. Therefore, we did not include it in the sample of the three brightest blue stars. The mean magnitudes and colors of these three brightest blue and red stars in UKS 2323−326 are derived to be, respectively, \( \langle V(3) \rangle_{\text{BSG}} = 20.33 \pm 0.25 \) and \( \langle B − V(3) \rangle_{\text{BSG}} = 0.14 \pm 0.07 \) mag and \( \langle V(3) \rangle_{\text{RSG}} = 20.74 \pm 0.18 \) and \( \langle B − V(3) \rangle_{\text{RSG}} = 1.35 \pm 0.08 \) mag. (If 1116 is replaced by 1140, the mean values will be slightly changed: \( \langle V(3) \rangle_{\text{BSG}} = 20.32 \pm 0.28 \) and \( \langle B − V(3) \rangle_{\text{BSG}} = 0.04 \pm 0.32 \) mag.) The corresponding absolute magnitudes and colors are \( \langle M_V(3) \rangle_{\text{BSG}} = −6.31 \pm 0.25 \), \( \langle (B − V)(3) \rangle_{\text{BSG},0} = 0.14 \pm 0.07 \), \( \langle M_V(3) \rangle_{\text{RSG}} = −5.91 \pm 0.18 \), and \( \langle (B − V)(3) \rangle_{\text{RSG},0} = 1.34 \pm 0.08 \) mag, respectively.

The luminosity of the brightest stars in galaxies is known to be correlated with the luminosity of the parent galaxies. Recently, Lyo & Lee (1997) presented, from the analysis of 17 galaxies (with \( M_B < −14 \) mag) for which Cepheid distances are available, calibrations for the relation between the magnitudes of the brightest stars and the magnitudes of the parent galaxies: \( \langle M_V(3) \rangle_{\text{BSG}} = 0.30 M_B(\text{gal}) − 3.02 \) with \( \sigma = 0.55 \) mag and \( \langle M_V(3) \rangle_{\text{RSG}} = 0.21 M_B(\text{gal}) − 3.84 \) with \( \sigma = 0.47 \) mag. Using these relations, we derive \( \langle M_V(3) \rangle_{\text{BSG}} = −6.79 \) and \( \langle M_V(3) \rangle_{\text{RSG}} = −6.48 \) mag for the absolute magnitude of UKS 2323−326, as derived in the previous section. Thus the magnitudes of the brightest stars in UKS 2323−326 are 0.5−0.6 mag fainter than those expected from the relation for the bright galaxies.

8. SUMMARY AND CONCLUSIONS

We have presented a study of the stellar populations in the dwarf irregular galaxy UKS 2323−326 based on deep BVRI CCD photometry. The primary results obtained in this study are summarized as follows, and the basic information of UKS 2323−326 is listed in Table 4.

1. BVRI color-magnitude diagrams of the stars in the 7′5 × 7′5 area of UKS 2323−326 have been presented. These color-magnitude diagrams exhibit a blue plume, a well-defined RGB, and a small number of AGB stars with intermediate age.

2. The tip of the RGB is found to be at \( I = 22.65 \pm 0.10 \) mag, and \( V − I = 1.43 \pm 0.05 \) mag. From this value, we derive a distance modulus of UKS 2323−326 of \( (m − M)_0 = 26.59 \pm 0.12 \) mag and a distance of 2.08 \pm 0.12 Mpc. The corresponding distance of UKS 2323−326 from the center of the Local Group is derived to be 1.92 Mpc. From this result and the systemic velocity of UKS 2323−326 (\( v = 62 \) km s\(^{-1}\)), we conclude that UKS 2323−326 is outside the Local Group and is a member of the Sculptor Group.

3. The mean color of the RGB at \( M_I = −3.5 \) mag is \( V − I = 1.29 \pm 0.04 \) mag. From this value we obtain a mean metallicity of the RGB: [Fe/H] = −1.98 ± 0.17 dex. The metallicity of the RGB in UKS 2323−326 is close to the lowest end in the metallicity of dwarf irregular galaxies.

4. The total magnitudes of UKS 2323−326 within \( r_h \) are derived to be \( M_B = −12.58 \), \( M_R = −13.14 \), \( M_I = −13.45 \), and \( M_J = −13.79 \) mag. The central surface brightness is measured to be \( \mu_B(0) = 23.4 \) and \( \mu_V(0) = 22.9 \) mag arcsec\(^{-2}\). Surface brightness profiles of the central part of UKS 2323−326 are approximately consistent with a King model with a core concentration parameter \( c = \log (r_c/r_s) \approx 1.0 \), and those of the outer part follow an exponential law.

5. The magnitudes of three brightest blue and red stars in UKS 2323−326 are derived: \( \langle M_V(3) \rangle_{\text{BSG}} = −6.31 \pm 0.25 \) and \( \langle M_V(3) \rangle_{\text{RSG}} = −5.91 \pm 0.18 \) mag, which are about a half-magnitude fainter than those expected from conventional correlations with galaxy luminosity.

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