Studying the stellar field component of NGC 1316

C. Escudero[1,2], L. Sesto[1,2] & F. Faifer[1,2]

[1] *Instituto de Astrofísica de La Plata, CONICET–UNLP, La Plata, Argentina*
[2] *Facultad de Ciencias Astronómicas y Geofísicas, UNLP, La Plata, Argentina*

Contact / cgescudero@fcaglp.unlp.edu.ar

Resumen / Utilizamos la técnica de cinemática estelar a través de múltiples ranuras sobre datos espectroscópicos profundos Gemini/GMOS, a fin de calcular la cinemática y los valores de poblaciones estelares de la luz difusa de la galaxia NGC 1316 en diversas regiones. Así mismo, obtuvimos los parámetros estelares para cuatro cúmulos globulares asociados a dicha galaxia mediante la técnica de ajuste espectral completo.

Abstract / We used the Stellar Kinematics from Multiple Slits technique on deep Gemini/GMOS spectroscopic observations, in order to obtain the kinematics and stellar population values of the diffuse light of the galaxy NGC 1316 in different regions. We also obtained the stellar parameter values of four globular clusters associated with the galaxy using the full spectral fitting technique.

Keywords / galaxies: elliptical and lenticular, cD — galaxies: kinematics and dynamics

1. Introduction

The assembly history of the galaxies can be studied by mapping stellar populations at large galactocentric distances. The chemical and dynamic properties originated by accretion events that have suffered throughout its history should be preserved in these regions. In this sense, one of the tools used to study the ages and metal abundances at such distances is long-slit spectroscopy. However, the information obtained with this method is limited to the slit position. On the other hand, the low surface brightness of galaxies out to large galactocentric radii makes spectroscopic measurements difficult. In this context, we present preliminary results of using the Stellar Kinematics from Multiple Slits (SKiMS) technique (e.g., Norris et al., 2008) to map out the kinematics and stellar populations of the diffuse light of the galaxy NGC 1316.

NGC 1316 (α_{J2000} = $3^h22^m41.7^s$, δ_{J2000} = $-37°12'30''$), located on the outskirts of the Fornax cluster ($\sim$ 20 Mpc), is a radio galaxy cataloged as a remnant of an intermediate-age merger ($\sim$ 2-3 Gyr), with a complex globular clusters (GC) system showing a dominant subpopulation of young clusters (Sesto et al., 2018).

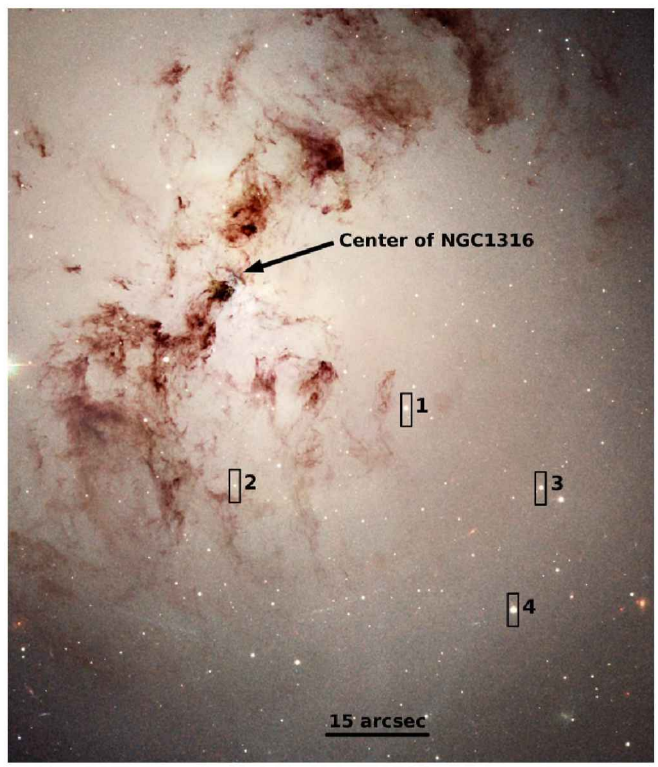

Figure 1: Hubble Space Telescope image of the central region of NGC 1316. The different rectangles indicate the slits where the spectra of the diffuse component of the galaxy and the associated GC were extracted.

2. Stellar Populations

Using the GMOS-S instrument of the Gemini Observatory, a MOS mask was obtained to observe the GC associated with NGC 1316 (GS-2013B-Q-24; PI: Sesto, L.). The flux incident on each MOS slitlet contains information of the observed GC, the sky background and the contribution from the diffuse light of the galaxy. Using a similar procedure as described by Norris et al. (2008), we extracted spectra from a small region (Fig. 1) of NGC 1316 ($V_{\rm helio}$=1760±10 km s^{-1}) corresponding to its stellar component.

We adopted the full spectral fitting technique implemented within the ULySS code (Koleva et al., 2009), in order to derive the kinematics and the simple stellar population-equivalent (SSP-equivalent) ages, total metallicities ([Z/H]), and α-element abundances

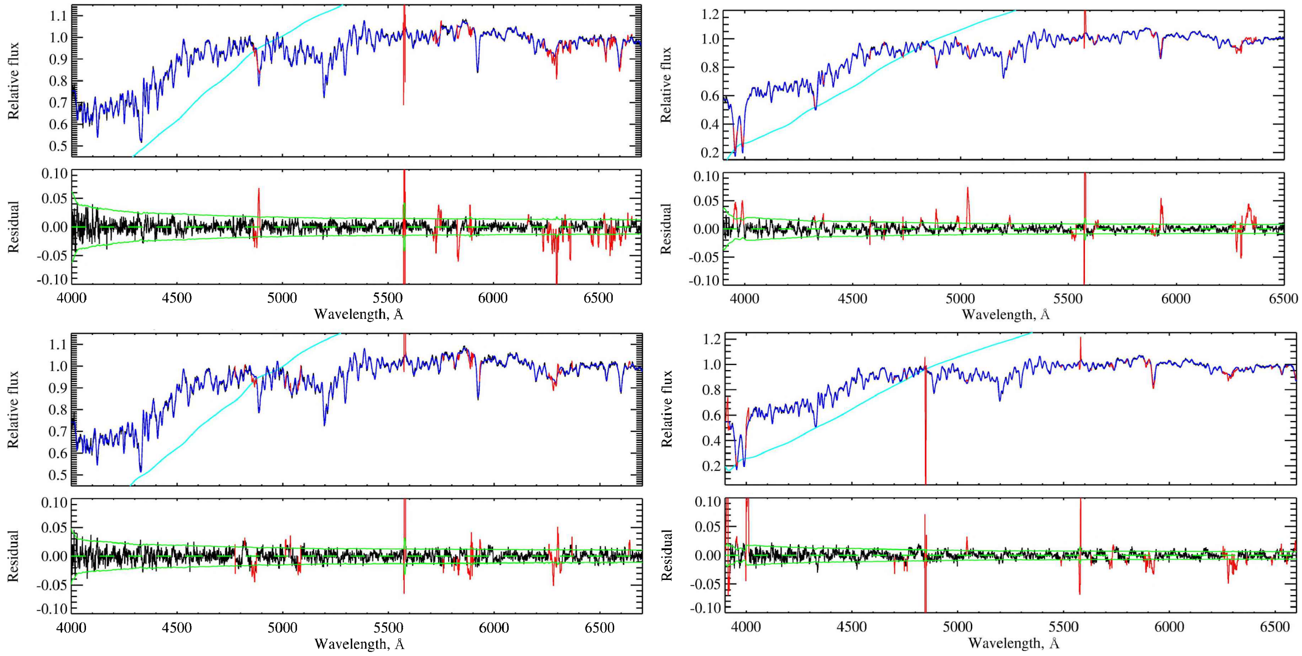

Figure 2: Representative diffuse-light spectra for NGC 1316 with the best fit obtained by ULySS (blue lines). The light blue line indicates the multiplicative polynomial. Red lines indicate the discarded lines during the fit. The residue obtained are displayed below each spectrum, where the green lines indicate the 1-σ deviation.

Table 1: Stellar population parameters obtained for the spectra of the galaxy and for the GC located in the same slitlet.

Object	V_r km s^{-1}	σ km s^{-1}	Age Gyr	[Z/H] dex	[α/Fe] dex
NGC1316(1)	1655±3	248±4	3.3±0.4	0.15±0.02	0.10±0.02
GC(1)	1265±20	—	1.7±0.5	0.20±0.20	0.15±0.05
NGC1316(2)	1687±5	252±4	4.6±0.3	0.03±0.01	0.10±0.03
GC(2)	1856±40	—	12.8±1.2	-1.1±0.17	-0.20±0.10
NGC1316(3)	1638±5	226±5	3.7±0.4	0.03±0.02	0.10±0.03
GC(3)	1640±22	—	1.8±0.5	0.11±0.20	0.05±0.05
NGC1316(4)	1621±5	213±6	4.1±0.2	0.02±0.01	0.07±0.03
GC(4)	1472±22	—	1.8±0.4	0.28±0.15	0.01±0.05

([α/Fe]) of the diffuse light of NGC 1316. For this, we use the PegaseHR models (Le Borgne et al., 2004) with ELODIE library, which span a range in age and [Z/H] of 1 to 20000 Myr and -2.3 to $+0.69$ dex, respectively. Fig. 2 shows the spectra for the diffuse light of the galaxy and the fit obtained by ULySS.

Table 1 lists the stellar parameter values derived for the spectra of the galaxy and for the GC located in the same slitlet.

3. Conclusions

We derive SSP-equivalent ages, metallicities and [α/Fe] ratios for the diffuse light of NGC 1316 in different regions, and compared them to those found for the GC population at the same projected radii. We find that the former presented slightly older ages (∼3-4 Gyr) than the young clusters (∼2.1 Gyr; Sesto et al., 2018), possibly as a consequence of a mixture between the young population formed during the main merger event and the oldest populations of the galaxy. On the other hand, the values of metallicity and α-element abundance between both samples are similar ([Z/H]∼0.0 dex and [α/Fe]∼0.1 dex).

We show the utility of the SKiMS method for investigating the kinematics and stellar populations in a small region of NGC 1316. As future work, all slitlets in our MOS mask will be used to study these properties and the star formation history at different galactocentric distances in the galaxy.

References

Koleva M., et al., 2009, A&A, 501, 1269
Le Borgne D., et al., 2004, A&A, 425, 881
Norris M.A., et al., 2008, MNRAS, 385, 40
Sesto L.A., et al., 2018, MNRAS, 479, 478