

Resolved RSG and Bright AGB Stars in NGC 1313

Emanuela Pompei, S. Brilliant, G. Marconi, L. Vanzi

*European Southern Observatory, Alonso de Cordova 3107 Casilla 19001,
Santiago de Chile, Chile*

Abstract. Red supergiants and bright AGB stars have been detected in NGC 1313, a galaxy outside of the Local Group, using NIR data obtained at ESO-NTT in La Silla Observatory. The derived color-magnitude diagram (CMD) compared with synthetic CMD strongly support the existence of an intermediate age stellar population.

1. Introduction

NGC 1313 is a galaxy whose morphological type is intermediate between a late spiral and a Magellanic type object, with a reddening corrected distance modulus of 27.8 (Tully, 1980). Its spiral arms are asymmetric, the northern one being much more prominent and showing a strong region of star formation of integrated V magnitude 9; other regions of star formations are visible nearby. A pronounced bar is also clearly visible in the optical images. The determination of chemical abundances in HII regions along the axis of the bar has shown a very shallow oxygen gradient consistent with the presence of the bar (Walsh & Roy, 1997). The oxygen abundance in the disk is very low, $12 + \log[O/H] = 8.4$, close to the average value for Blue Compact Dwarf Galaxies (BCDGs).

HI observations have revealed the presence of a huge HI supershell whose mass is about 20% of the total HI galaxy content, but also have shown that NGC 1313 has a very regular rotation curve at variance with the double nuclei presence and the irregular morphology, which are usually interpreted as evidence for a merging event (Ryder, 1995). From IUE observations and line ratios an important intermediate age ($\tau \sim 1.2$ Gyr) component has been detected, which contributes about 40% of the mass (Bonatto et al., 1999). A slightly older component is found by Storchi Bergmann et al. (1994), who estimate an age of 5.7 Gyr. $H\alpha$ observations have revealed ongoing star formation both in the center ($70 M_{\odot} \text{pc}^{-2} \text{Gyr}^{-1}$) and in the outer part of the galaxy ($15.2 M_{\odot} \text{pc}^{-2} \text{Gyr}^{-1}$) (Ryder et al., 1994). The nuclear star formation is likely to be caused by gas inflow along the bar. Comparing the general star formation rate measured for NGC 1313 with those of the other galaxies from the Ryder et al. paper we find that all the objects with similar SFR have a companion; this however has not been found yet for NGC 1313.

More detailed information on the star formation history of the galaxy can be obtained with the observation of its resolved stellar population coupled with modeling of the CMD. We have followed this approach using NIR data; in the fol-

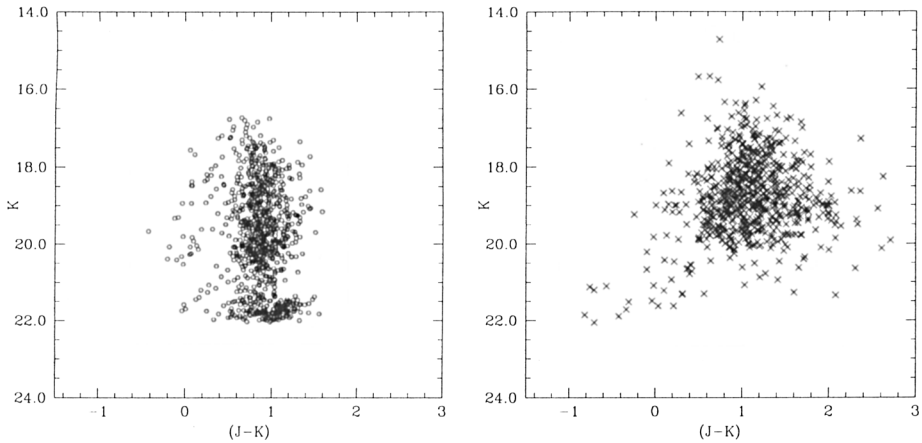


Figure 1. Left panel: synthetic CMD of NGC 1313; right panel: observed colour magnitude diagram. The fraction of stars at $K \sim 22$ in the synthetic CMD is due to an overestimation of the completeness.

lowing section we will describe the observations, the data reduction and present a preliminary analysis. In the last section we draw our conclusions.

2. Observations, data reduction and analysis

The galaxy was observed in J, H, Ks filters using NTT+SOFI at La Silla Observatory in March 2000. The use of NIR wavelengths has numerous advantages: the contrast between bright, cool stars and fainter unresolved objects is enhanced, and it is possible to overcome the effect of line blanketing. Also the effect of galactic extinction along the direction of the galaxy is negligible (Burstein & Heiles, 1982). Preprocessing and image combining was done in the standard way using IRAF routines and jitter software. The stars were detected using standard PSF fitting in DAOPHOT. The NIR color magnitude diagram has been modeled using a code developed at Bologna Astronomical Observatory (Tosi, M. et al., 1991; Greggio L. et al., 1998), which was adapted to ground based NIR observations using the photometric conversion tables for the SOFI filter set created for this purpose by L. Origlia (private communication, 2001). In the left panel of Fig. 1 a preliminary result from the first run is shown: we have assumed the age of the oldest star to be 5×10^9 yr, a constant SFR, a metallicity $Z = 0.004$, a Salpeter IMF and the Padova group theoretical isochrones. The choice of Padova tracks against the Geneva ones is due to a better modeling of the red supergiant phase in the first set. The observed CMD is shown in the right hand side of Fig.1. In Fig.2 we show the observed luminosity function (LF) in K and the one derived from the model. The extension of the model LF toward fainter magnitudes is due to a problem with the estimated completeness of the sample, which will be revised.

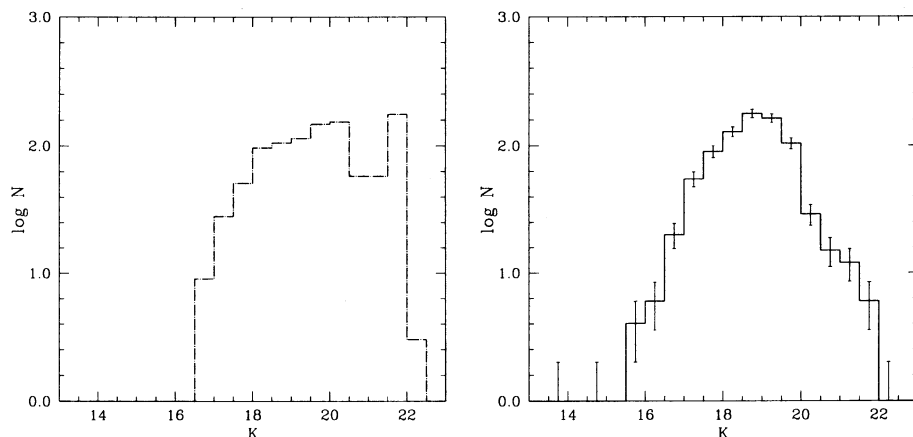


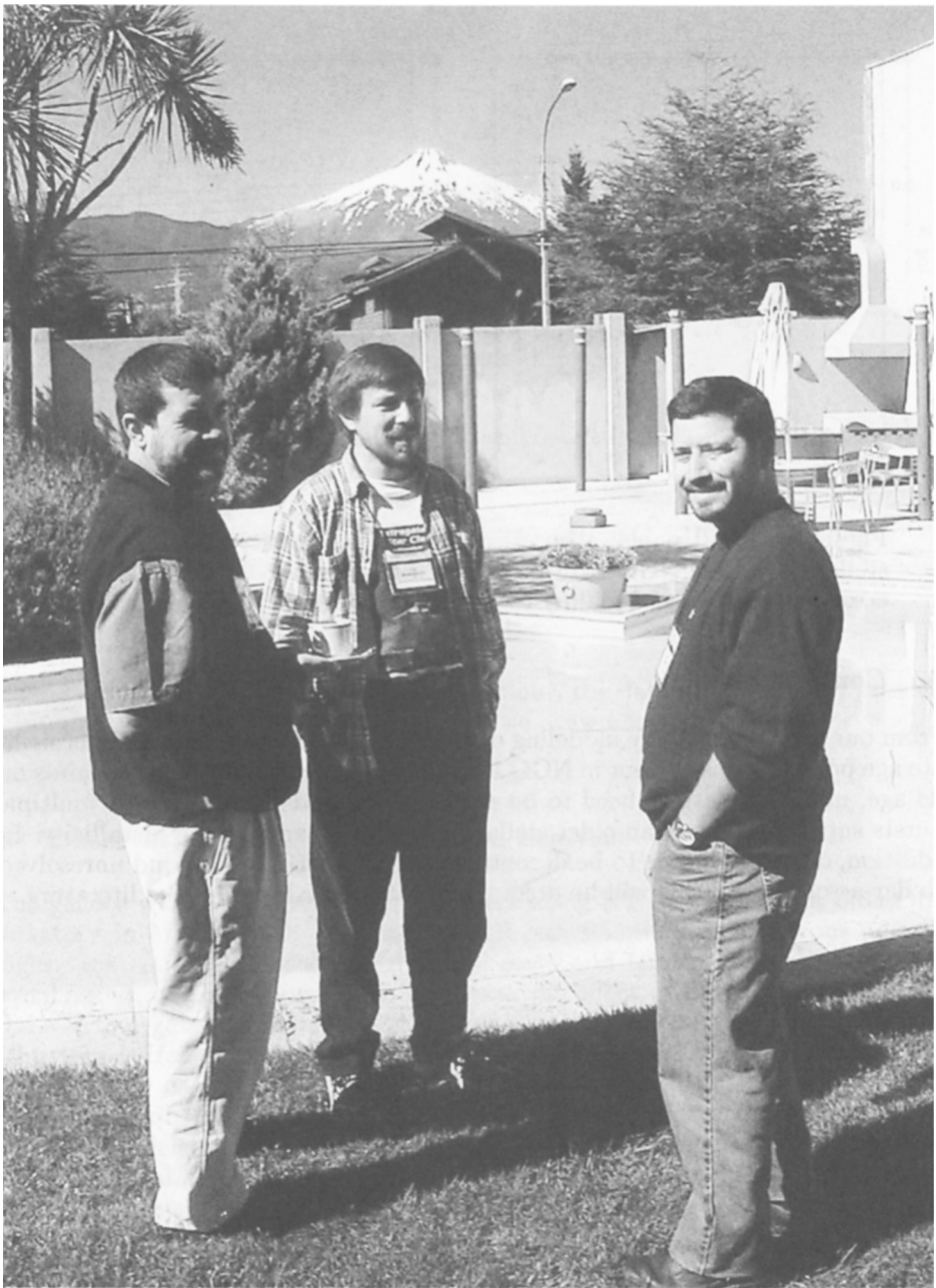
Figure 2. Left panel: theoretical K band luminosity function of the stellar objects in NGC 1313 (solid line); right panel observed LF. The error bars correspond mainly to uncertainty in the completeness.

3. Conclusions

From our very preliminary modeling of the CMD we confirm that an intermediate age population is present in NGC 1313; however, to put strong constraints on its age, more simulations need to be executed, changing the SFH, i.e. multiple bursts superimposed on an older stellar population, and also the metallicity. In addition, our CMD needs to be decontaminated from HII region and unresolved stellar associations: this will be done using data available from the literature.

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Leopoldo Infante (left (or is it right?)) looks at Hector Cuevas (right?) as Erich Wenderoth wonders if he's seeing double and there's too much pisco sour in the coffee.