Stellar Populations as Building Blocks of Galaxies
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The Star Formation History in a SMC field: IAC-star/IAC-pop at work

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Abstract. We present a progress report of a project to study the quantitative star formation history (SFH) in different parts of the Small Magellanic Cloud (SMC). We use the information in [(B-R), R] color-magnitude diagrams (CMDs), which reach down to the oldest main-sequence turnoffs and allow us to retrieve the SFH in detail. We show the first results of the SFH in a SMC field located in the Southern direction (at ∼1 kpc from the SMC center). This field is particularly interesting because in spite of being located in a place in which the HI column density is very low, it still presents a recent enhancement of star formation.

Keywords. local group galaxies: individual (SMC) — galaxies: star formation history

1. Method

Our study of the SFH is based on the method by Aparicio & Hidalgo (2007, submitted). In short, once we obtained the CMD of our SMC field (Noël *et al.* 2007), we prepared a synthetic CMD which reproduce the magnitudes, ages, and metallicities of the stars of a given SFH. This CMD, constructed using IAC-star (Aparicio & Gallart 2004), contains the range of ages from 0 to 13 Gyr and metallicities from 0.0001 to 0.008, an IMF from Kroupa *et al.* (2003) and 30% of binary stars. In the analysis presented here, we used the BaSTI stellar evolution models (Pietrinferni *et al.* 2004). The observational errors were simulated in the synthetic CMD following Gallart *et al.* (1999), to obtain the so-called model CMD. This model CMD was divided in simple populations of limited age and metallicity ranges. We choped the observed and model CMDs into "boxes" using an *à le carte* parameterization (see Aparicio 2007 *et al.*, this conference) to see how these simple and observed populations are distributed. The distribution of stars in the defined boxes was calculated for any model SFH as a linear combination of the simple stellar populations. Those areas of the CMD where the age-metallicity degeneracy is not significantly problematic and where the stars of different ages are more separated (MS), are better sampled than those with more mixed populations. Using the algorithm IAC-pop (see Aparicio *et al.* 2007, this conference), we compared the model and synthetic CMDs and we found a suitable SFH.

2. Preliminary Results

According to our solution (see Figure 1), this area of the SMC has been forming stars from ancient times until very recently, though some epochs were more active than others. A significant fraction of all the stars were formed before 7 Gyr ago. There is a

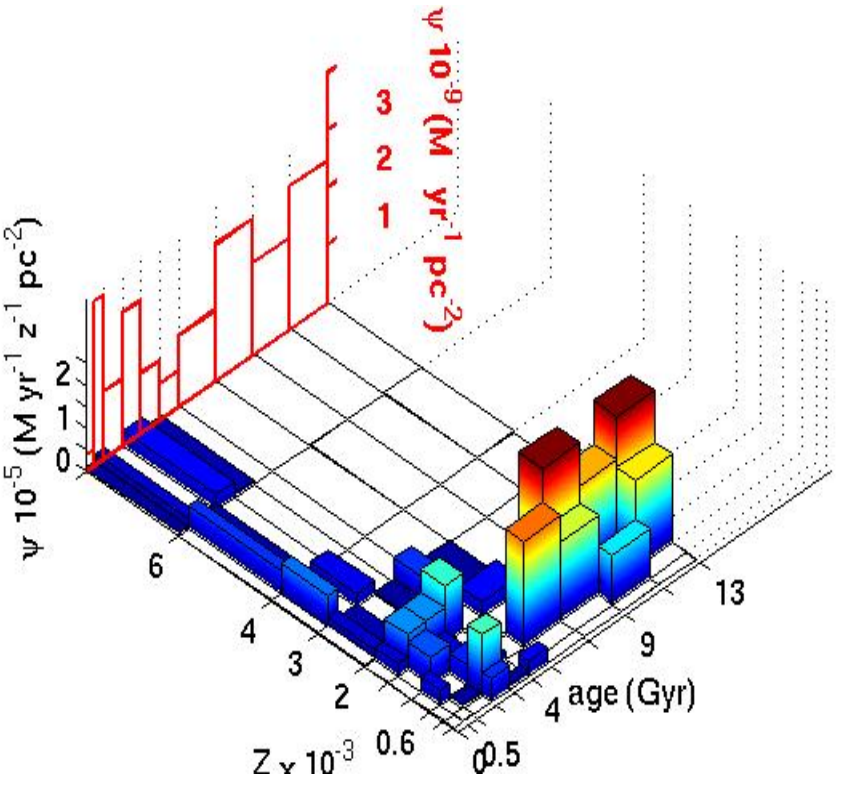

Figure 1. SFH of SMC field smc0057 using the BaSTI library and *à le carte* parameterization. The x-axis represents the age in Gyr and y-axis the metallicity. The star formation rate, ψ, in units of solar masses per year, metallicity and area is given in the vertical axis. The SFH is given by the height of the bar emerging from the XY plane. The volume of this bar represents the number of stars formed in each interval of age and metallicity. In the vertical x-axis the SFH is represented as a function of the age of the stars (integrated over the whole metallicity range). Error bars were omitted for clarity.

recent enhancement of star formation, with some 5% of stars younger than 0.5 Gyr. It is important to remark that the HI structure of the SMC (Stanimirović *et al.* 1999) shows that the HI column density is very low in this part of the galaxy. The stars in this field cover the range in metallicity from Z=0.0001-0.008. The chemical enrichment is slow until ∼4 Gyr ago, and then it speeds up, in agreement with that found by Carrera (PhD Thesis) for this SMC field using the CaII triplet (see Noël *et al.* 2007, this conference).

References

Aparicio, A., & Gallart, C. 2004, *AJ* 128, 1465
Gallart, C., Freedman, W. L., Aparicio, A., Bertelli, G., & Chiosi, C. 1999, *AJ* 118, 2245
Kroupa, P, & Weidner, C. 2003, *ApJ* 598, 1076
Noël, N. E. D., Gallart, G., Costa, E., & Méndez, R. A. 2007, *AJ* in press
Pietrinferni, A., Cassisi, S., Salaris, M., & Castelli, F. 2004, *ApJ* 612, 168
Stanimirović, S., Staveley-Smith, L., Dickey, J. M., Sault, R. J., & Snowden, S. L. 1999, *MNRAS* 302, 417

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