Stellar Populations as Building Blocks of Galaxies
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The Magellanic Clouds Chemical Enrichment History via Ca II Triplet Spectroscopy

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Abstract. We report the results of our project devoted to study the chemical enrichment history of the field population in the Magellanic Clouds using Ca II triplet spectroscopy.

Keywords. galaxies: abundances; galaxies: individual (LMC, SMC)

1. Large Magellanic Cloud

The evolution of the abundance of metals with time in the LMC has been investigated from its cluster population (e.g. Dirsch *et al.* 2000) which suffers a lack of objects with ages between 10 and 4 Gyr, from its planetary nebula (Dopita *et al.* 1997), and from red giant branch stars in the Bar (Cole *et al.* 2005). In all cases, the chemical evolution shows a first important chemical enrichment at the beginning of the galaxy life. After this, it was paused until about 4 Gyr ago, when again the metallicity increased significantly. The last period of chemical enrichment is not observed in the Bar red giant field population.

But, what about the chemical enrichment history of the disk red giant branch population? To address this question, we have observed about 500 stars in four $36' \times 36'$ fields situated at 3°, 5°, 6° and 8° at the North of the Bar. These stars were selected in the upper part of the RGB, and their metallicities were obtained from the infrared Ca II triplet lines following the procedure described by Carrera *et al.* (2007).

Figure 1 shows the age-metallicity relationships observed in our four fields. The age of each star has been estimated from its position in the CMD, taken into account the metallicity obtained from the Ca II triplet. The metallicity evolution with time in the four fields can be described as follows: a initial epoch of prompt chemical enrichment was followed by a plateau at intermediate ages (10-5 Gyr ago) and by a final gradual increase of the metallicity of almost 1 dex during the last 5 Gyr. This behaviour is similar to the one observed in the clusters. Inset panels show the age distribution of each field. The outermost field is a factor of two more metal-poor than the other fields due to the lack of the youngest stars, which are also the most metal-rich. The age-metallicity relationships observed in the disk differ from the one observed in the bar (Cole *et al.* 2005) where the metallicity has not increased in the last few Gyr.

2. The Small Magellanic Clouds

Following the same procedure, we have obtained the age-metallicity relationship in 13 $8\farcm85 \times 8\farcm85$ fields of the SMC body. See the color–magnitude diagrams of these fields by N. Noël in this volume. Figure 2 shows the age-metallicity relation for the Southern fields.

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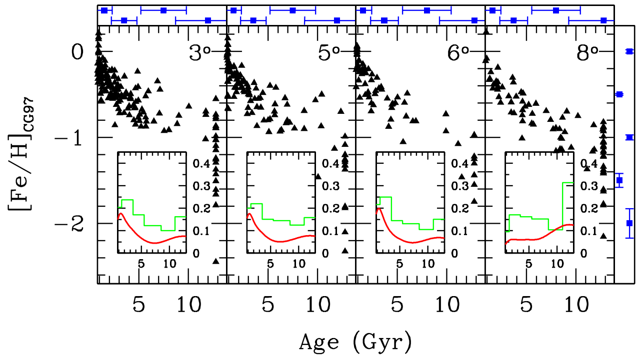

Figure 1. Age–metallicity relationships for the four LMC fields in our sample. Inset panels show the age distribution computed taking into account the age determination uncertainties (dark line) and without taking them into account (clear line). Top panel show the age error in each interval. Left panels show the metallicity uncertainty in each bin.

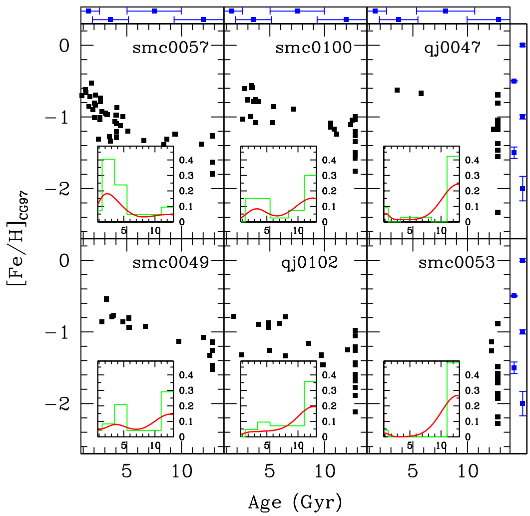

Figure 2. As Figure 1 for the Southern fields of the SMC (see N. Noël, this volume). From left to right and from top to bottom, the fields are displayed in order of increasing galactocentric distance.

In spite of the irregular appearance of this galaxy, an in particular the differences between the young populations at the East, facing the LMC, and at the West, in the opposite direction, both fields show a similar age-metallicity relationship. In the case of Southern fields, we have found a population gradient in the sense that the younger stars, which are also more metal-rich, are concentrated in the central regions of the SMC. The number of stars in the most Southern fields makes it difficult to trace the behaviour of the age-metallicity relationship. However, in the most populated field, smc0057 we can notice a behaviour relatively similar to the LMC fields, though running at lower metallicity.

References

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