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# CA II TRIPLET METALLICITIES IN THE SMC - STAR CLUSTERS VS. FIELD STARS

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**We summarize the most important results of the study of the chemical evolution of the Small Magellanic Cloud that our group has been developing for several years.**

Using the FORS2 instrument on the Very Large Telescope, we obtained infrared spectra in the region of the CaII triplet (CaT) lines of more that 900 red giants belonging to 29 SMC star clusters and their surrounding fields. We also obtained images in the $V$ and $I$ bands for the 29 star clusters. We derived mean metallicities to 0.05 dex for clusters (Parisi et al. 2009, 2015) and their surrounding red giants stars (Parisi et al. 2010, 2016) following the procedures described in detail in Grocholski et al. (2006) and Parisi et al. (2009). Also we derived the ages of 15 clusters of our sample (Parisi et al. 2014) from the morphological age index $\delta$V (Carraro & Chiosi 1994). Our 29 clusters are so far the largest SMC cluster sample homogeneously studied with very accurate metallicity determinations. Also clusters and field stars have been observed with the same instrument and analyzed following the same procedures, so the chemical properties of both populations can be directly compared. We found several surprising differences between the chemical properties of clusters and field stars:

(1) While several studies suggest that there is a unique age-metallicity relation for field stars, independent of the position in the galaxy (Cignoni et al. 2013; Carrera et al. 2008), our cluster age-metallicity relation presents, at any given age, a considerable metallicity dispersion of about 0.5 dex, probably suggesting that there is not a single cluster age-metalicity relation in the SMC. (2) Our cluster metallicity distribution suggests the existence of bimodality with possible peaks at about [Fe/H] = -1.1 and -0.8, respectively. We found more than a 80% probability that the distribution is indeed bimodal (Gaussian Mixture Model, Muratov & Gnedin 2010). However, in the case of field stars, the metallicity distribution is clearly unimodal, peaking at -1, in excellent agreement with that found by Dobbie et al. (2014) from a considerably larger sample, also studied with CaT. (3) While we find no indication that there is an age gradient in our cluster sample, Piatti (2012) found a tendency of younger field stars to be concentrated toward the center of the galaxy. (4) In the inner region (within a distance of 4° from the center of the galaxy), the mean metallicity of the fields shows a metallicity dispersion considerably smaller than that of the clusters. In the same part of the galaxy, clusters do not show a clear tendency of metallicity to decrease with distance, but field stars show a strong negative metallicity gradient, in agreement with the metallicity gradient found by Dobbie et al. (2014). The scenario is different in the outer region of the galaxy, where both populations show a similar metallicity dispersion, but the metallicity gradient appears to reverse sign, which is an unexpected and difficult to explain behavior.

Any explanation about the possible processes suffered by this galaxy, must be able to explain not only the positive gradient in the outer region, but also the differences between the chemical properties of clusters and field stars. It is indispensable to increase our sample of clusters and fields with accurate spectroscopic metallicity measurement.

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