METALLICITIES OF YOUNG POPULOUS CLUSTERS IN THE MAGELLANIC CLOUDS

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INTRODUCTION

We present metallicities for the young LMC clusters NGC 1818, 1866 2157, 2136 and 2214. This sample is increased by taking over additional values from literature, so for NGC 1850, 1994, 2004, 2100 from the list of Hodge (1981). The intention is to compare these values with metallicities found in a field population of comparable age. Such a population may be represented by bright Cepheids, for which metallicities based on Washington photometry (Harris 1983) are available.
The only young SMC cluster, for which we could estimate a metallicity, is NGC 330. Therefore, a comparison with SMC Cepheids, whose metallicities are also quoted by Harris (1981), can lead to uncertain statements only, until further observations of young SMC clusters will have been made.

OBSERVATIONS

Strömgren photometry has been obtained for stars in the Magellanic Cloud clusters mentioned above. Furthermore, stars in the galactic clusters M 67, 47 Tuc, M 79 and NGC 288 were observed to build up a reference frame of metallicities, in which the Magellanic Cloud stars can be inserted. The observations were performed with the ESO 1m telescope, single channel photometer and ESO standard filters.

In addition, IDS-spectra have been obtained from stars in NGC 1866 and NGC 330 as well as for 6 late type SMC supergiants and from stars in the above mentioned galactic clusters. Instruments were the ESO 3.6m and 1.5m telescopes. From these spectra, abundance indicators were synthesized following Canterna et al. (1982).

As a second photometric approach, stars in NGC 1818, 2004, 2100, 2157, 2214 and in NGC 330 have been observed in the Walraven system. The measurements were made with the Walraven photometer at the Dutch 91cm telescope on La Silla.

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RESULTS

The metallicities we derived in the Strömgren system for the LMC clusters NGC 1818, 1866, 2157, 2136 are -1.6, -1.2, -0.6, -1.2, -0.4 dex respectively. The internal mean error is about 0.2 dex. The spectroscopic value for NGC 1866 is in agreement with the photometric metallicity, although the calibration of the metallicity indicators must be considered as preliminary. For the clusters NGC 1818, 2004, 2100, 2157, 2214 the Walraven data yield -0.5, -1.3, -1.4, -0.9, -1.0 dex, respectively. But the calibration is somewhat unsatisfying (perhaps due to a strong luminosity effect) so we rely on the Strömgren data alone.

A comparison with the metallicity distribution of the LMC Cepheids leads to the result, that only one cluster from the whole sample (NGC 1994 with -0.2 dex) falls in the metallicity range covered by the Cepheids. All other clusters are less abundant (also in the Walraven system). Beside all the uncertainties due to questionable cluster membership, errors in the calibration, inhomogeneous observational material etc. it seems surprising, that there is so little overlapping.
One may conclude, that young populous clusters in the LMC are preferably formed from low enriched material. In this sense a possible condition for the existence of these clusters lies in the low metal content of regions of active star formation.

The situation in the SMC remains unclear. For NGC 330 the Strömgren system yields a metallicity of -1.8 dex. This is supported by the spectroscopic method (although the Walraven data give -0.9 dex). The 6 supergiants seem to have metallicities between -1.2 and -1.5 dex. But they still lie in the range of the SMC Cepheids. Since there are much more low abundant Cepheids than in the LMC (Harris (1981) has found his most metal poor objects at about -1.5 dex) one cannot decide wether there are systematic metallicity differences between the cluster and field population until further data about young SMC clusters will become available. However, NGC 330 may be taken as a hint, that such an effect is present in the SMC too.

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