UV-OBSERVATIONS OF YOUNG POPULOUS CLUSTERS IN THE LARGE MAGELLANIC CLOUD

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INTRODUCTION

The young populous star clusters give evidence for the 'explosive' star formation in the Magellanic Clouds which took place in the time interval $5 \cdot 10^6$ yrs to < 10^8 yrs agoe. They are also key objects for the understanding of the formation of massive stellar clusters, because they are still situated close to their 'birthplace' in the parent galaxy and are dynamically not relaxed (Geyer et al. 1979). Their HRD-morphology shows most of the member stars in the upper Main Sequence range with only a few massive yellow and red supergiants. The lower massive stars are still in the pre-main-sequence evolution phase ('T-Tauri state'), which cannot be observed at the MC's distances. Thus in the uv-spectral range the blue stars with (B-V) < 0.1 on the upper MS contribute to the uv-fluxes. In the optical spectral regions the bright 'blue' globular clusters seem not be embedded in remanent interstellar matter, though neighbouring loose stellar aggregates of similar age are in many cases surrounded by dense HII-regions. This rises the questions wether the starformation process in such massive clusters was so efficient that no remanent matter was left over, or was this material blown away by the uv-radiation of the numerous OB-member stars?

OBSERVATIONS AND RESULTS

In the last two years we have obtained low resolution uv-spectra of the central parts of the four young LMC-globular clusters NGC 1818;1866; 2004 and 2100 with the International Ultraviolet Explorer. From star counts on ESO-Schmidt plates we estimate that on the average about 150 stars per cluster contribute to the integrated spectra through the large entrance aperture (10 x 20 arc sec^2) used with the IUE-spectrometer.

The clusters NGC 1818 and NGC 1866 are situated about $3\overset{\circ}{.}5$ northwest of the LMC Bar center where no dust lanes can be traced on direct plates. NGC 2004 is situated in the very young Shapley III-constellation with faint dust patches visible, and the position of NGC 2100 is on the east outskirts of the 30 Dor complex with dust patches in its vincinity.

The observed integrated uv-spectra reveal the young character of the stellar content of the clusters according the absorption line features and the energy distribution:

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To the absorption line features of these low resolution spectra contribute the cluster stars and the interstellar medium (i.m.) of the galactic foreground and the LMC. These are the lines with the low excitation potential about zero (e.g. OI, MgI, CII, SII, AlII, MgII and FeII). Strong resonance line features of SiIV, CIV and Al III as seen in NGC 2004 and 2100 get gradually weaker in NGC 1818 and 1866. As this finding is correlated with spectral gradients, these lines are more cluster intrinsic than to originate from the ISM. Actually, high resolution IUE spectra of NGC 2004, taken recently by one of us (Cassatella et al. 1983), show that the SiIV and CIV contribution from the i.m. is marginal.

The interstellar λλ220nm dust extinction is strong in the spectra of NGC 2100, weak in those of NGC 2004 getting marginal in NGC 1818 and 1866. Thus individual cluster reddening in the LMC must be taken into account.

The observed uv-fluxes were de-reddened by a trial and error method for the adoption of a constant galactic foreground-absorption and the individual cluster reddening in the LMC making use of the different extinction laws for the Galaxy and the LMC.

The relevant extinction laws for the Galaxy and the LMC where taken from Seaton (1979) and Nandy et al. (1981), respectively. The accuracy of the corrected fluxes depends mainly on the relevant extinction law curves beeing of the order of 15 to 20%.

For the determination of the unknown E^{G}_{B-V} and E^{LMC}_{B-V} we first adopted reasonable values and changed them until the λλ220nm depression was "ironed out". As this cannot be done without ambiguity, we made use of a 'uv-two spectral gradient' $\Delta\Phi_{\lambda 1}$, $\Delta\Phi_{\lambda 2}$-diagram. This t.s.g.-diagram was calibrated according to the uv-spectral gradients of unreddened B2 to A0 MS stars derived from published IUE-spectra (Silko et al. 1981). With the two methods we finally arrived at consistent results for the E_{B-V}. The de-reddened $\Delta\Phi^{o}$ for the four clusters show a perfect linear correlation with the reddening free colour index differences Q (Searle et al., 1980).

Furthermore, the $\Delta\Phi^{o}$-spectraltype correlation for MC-stars allows to determine 'effective' integrated spectral types for the clusters. As these i.s.t. are a measure for the luminosity functions of the upper MS of the individual clusters, and therefore also for their evolutionary state, a relative age-sequence for the clusters can be established:

$$7\cdot 10^{6} \text{ yrs} \sim t_{2004} < t_{2100} < t_{1818} < t_{1866} \sim 8\cdot 10^{7} \text{ yrs.}$$

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