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Summary. ALBUM is a general-purpose tool to visualize and screen large amounts of slitless spectra. It was developed for a search for emission-line stars in SMC and LMC clusters. The observations were obtained with ESO's Wide Field Imager (WFI) and comprise ∼8 million low-resolution spectra. The tool as well as the results of its application to the SMC part of the database are presented. The inferred frequency of Be stars is compared to the one in the higher-metallicity environment of the Milky Way.

1 Data reduction

Observations (see Fig. 1) covering much of the Small Magellanic Cloud (SMC) have been obtained in September 2002 with the WFI attached to the 2.2-m MPG Telescope at La Silla. The instrument was used in its slitless spectroscopic mode. To reduce crowding, the length of the spectra was limited by means of a filter with a bandpass of 7.4 nm centered on Hα. Unfortunately, a large part of the fields suffers from substantial non-homogeneous defocusing, which severely reduces the contrast between stars with and without line emission at Hα.

The basic reduction of the CCD images was performed with the MSCRED IRAF tasks except for the astrometry, for which the ASTROM package ([8]) was applied to the extracted 1st-order spectra. The achieved accuracy was 0.5-1" rms. The extraction in 2-D of the spectra was accomplished by means of the SExtractor software ([1]). All in all, about 1 million of the 3 million spectra available in the SMC part of the survey proved usable.

To recognize and distinguish emission-line stars (Em**) from other objects, we created the ALBUM package in idl. Its strategy is based on the assumption that the 2-D point-spread function (PSF) is only slowly varying

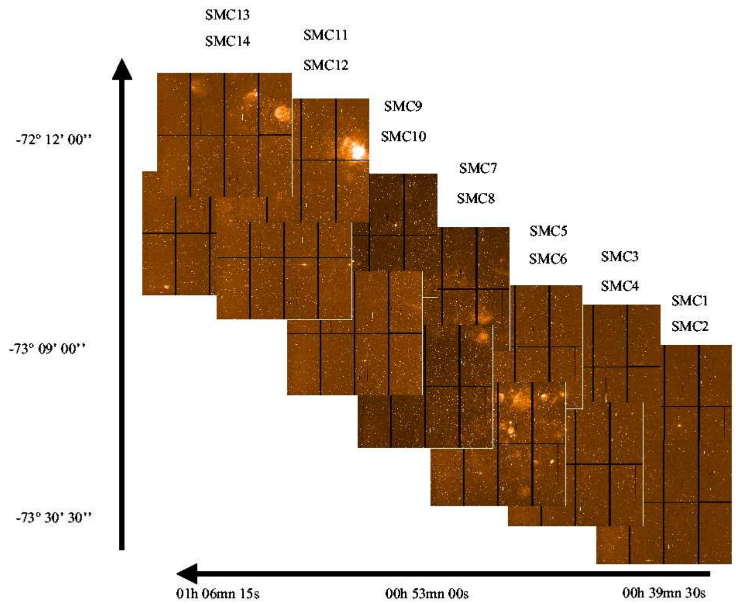

Fig. 1. The Small Magellanic Cloud as projected on the WFI frames used in this study.

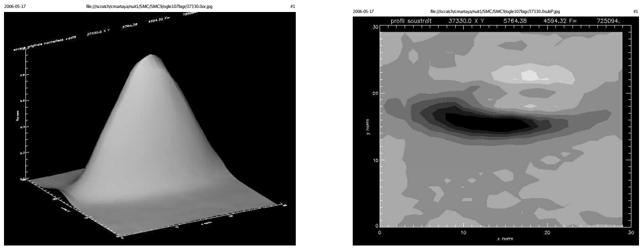

Fig. 2. Non Emission line star. Left panel: original source. Right panel: projection of the residual of the subtraction of the mean profile

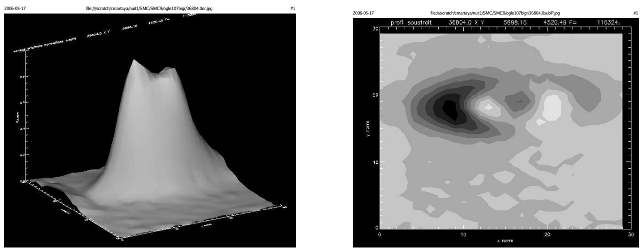

Fig. 3. Emission line star. Left panel: original source. Right panel: projection of the residual of the subtraction of the mean profile, due to the emission in Hα and the defocus a ring structure with 2 peaks is observed.

with position in the frame and only insignificantly falsified by the inclusion of emission-line objects in the calculation of the mean local PSF. Typically, 50-250 spectra were aligned (by cross correlation), co-added, and normalized. This local template spectrum was subtracted (after cross correlation and shift) from each normalized 2-D spectrum (see Fig. 2) to be checked for Hα line emission. In the case of Em*, the 2-D spectra show a secondary peak (see Fig. 3). But after subtraction of the mean PSF the resulting difference images display a more characteristic and conspicuous ring-like structure, which is due to the large defocus (see Fig. 3). Since this peculiar structure is more readily and reliably recognized by the human eye than by software, the identification of the Em* was done by visual inspection of the album of PSF-subtracted 2-D spectra.

2 Results: frequency of Be stars vs. metallicity

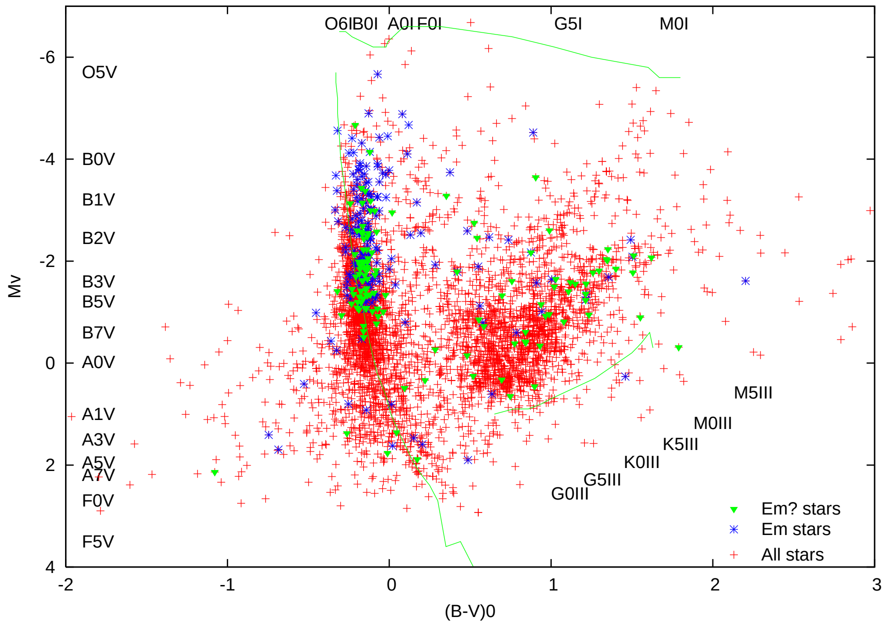

Fig. 4. (Mv,(B-V)$_O$ diagram for the stars cross-correlated in OGLE database. The calibration in spectral types comes from [2]. Red '+' are for the non-Emission line stars, Blue '*' for the Emission line stars, and the green triangles are for the candidate Emission line stars.

We have investigated 85 clusters in the SMC with log(age) between 7 and 9 and E[B-V] available from the OGLE survey ([6]). For a total of 7741

stars, V, B, and I magnitudes were obtained from the OGLE database ([6], [7]). Fig. 4 displays the combined HR diagram of all clusters with the Em** marked. The results can be compared to the relative frequencies of Be stars (Be/(B+Be)) in Milky Way clusters ([5]) in order to search for any effect of the metallicity on the proportion of Be stars and on the still unknown reason for the development of disks around these extremely rapidly rotating stars. The fractions range from 0 to 46% in the SMC and from 0 to 24% in the Milky Way (MW), depending on the parent cluster. There seems to be a trend in that the lower the metallicity, the higher the proportion of Be stars is. This could be explained by higher rotational velocities in the SMC than in the MW ([3], [4]).

3 Conclusions

- A new method and software package for the reduction and analysis of slitless spectra was developed.
- It was applied to WFI data. Catalogues of Be stars in 85 SMC clusters were obtained.
- Metallicity seems to influence the relative proportion of Be stars among all B-type stars: The fraction of Be stars is larger in the SMC than in the MW.
- The equivalent study of the LMC is in progress (additional 5 million spectra).
- The combination of a large field and slitless spectroscopy is very powerful for surveys for objects with distinct spectral properties.

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