

THE VATICAN EMISSION STAR SURVEY: REVIEW AND COMMENTS

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Eight years ago a program was started at the Vatican Observatory to search for faint emission-line stars close to the galactic plane. Indeed at that time few early type emission stars were known fainter than  $V=12$ . This survey consists in a double program: the search for emission line stars with the Vatican Schmidt using the objective prism and an appropriate combination of plate and filter in order to have a narrow passband around  $H\alpha$  (McCarthy Treanor 1970); and UBVRI photometry at the Mt. Lemmon facilities of the Univ. of Arizona observatories. Five papers have already been published (Coyne et al 1974, 1975, 1978; Wisniewski et al 1976, 1977). Two more will be published later this year. The Vatican Emission Star Survey (VES) resulted in the discovery of about 1000 new emission-line stars; for 700 of those the photometry is finished.

We want to present the results of a part of the VES with  $l^{11}$  between  $55^\circ$  and  $115^\circ$  and  $b^{11}$  from  $-5^\circ$  to  $+5^\circ$ . The Wackerling catalogue (1971) lists for the same region about 675 emission-line stars; the VES added to these about 550 new stars. Table 1 gives the distribution of the Wackerling catalogue and of the VES stars according to galactic longitude.

Table 1. The distribution of emission-line stars.

$l^{11}$	60	65	70	75	80	85	90	95	100	105	110
WAC	40	38	58	93	45	60	40	47	84	98	
VES	52	43	75	63	39	86	45	27	30	42	

It is too early to decide whether the survey succeeded in covering the area in an homogeneous way.

The UBVRI photometry has been finished for 516 stars. Table 2 gives the distribution according to visual magnitude.

Table 2. The distribution of the visual magnitude.

Vis. Mag	8	9	10	11	12	13	14	15	16
VES	3	15	74	189	161	57	12	5	

Figure 1 shows a two color diagram for 500 stars of the VES. The main sequence and an average reddening-line are drawn. The distribution of the stars in this diagram has been divided in four somewhat arbitrary groups. The most numerous group(I) contains all the early type stars on which the regular calibration methods(Heintze 1973) can be applied. About 380 stars belong to this group. Stars of group (II) show very large absorption when calibration and reddening correction are straightforwardly applied; many of these stars are late type stars, like dMe. The other two groups contain stars of which the colors are too red(III) or too blue(IV) to fit the calibration. The Vatican Observatory is now planning an extensive study of the stars belonging to the last three groups. With the Johnson(1966) calibration of the multicolor photometry one can produce an approximate spectral classification of the VES-stars. Table 3 gives the distribution for 380 stars of group (I).

Table 3. The distribution according to spectral type.

Spectral type	O8	O9.5	B0	B1	B2	B3	B5	B7	B8	B9	A0	A1
VES stars	2	2	19	26	29	39	33	52	60	42	31	38

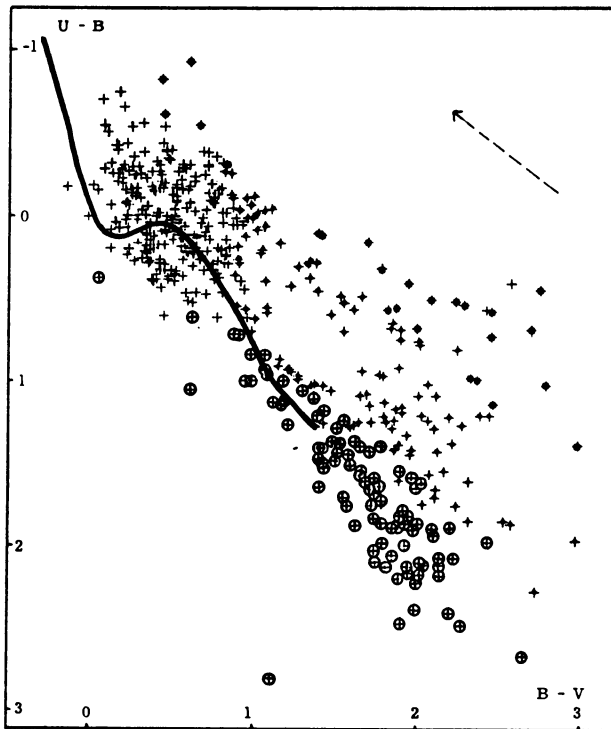


Fig. 1. Two colour diagram of VES stars. Group I : + ;  
Group II : x ; Group III : ⊕ ; Group IV : ⊙ .

Using the Schmidt-Kaler(1964) absolute magnitudes for emission stars, and using a constant  $R=3.1$  value, one can produce a distance estimate for these stars. The results for O to B3 stars are shown on figure 2.

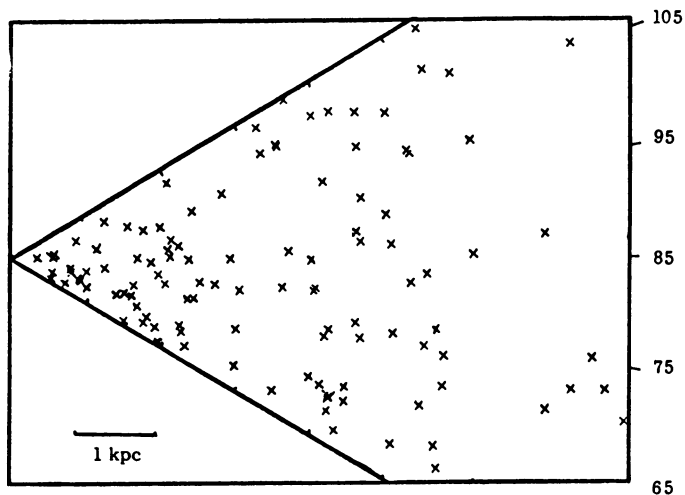


Fig. 2. Spatial distribution of O to B3 stars.

Comparing these results with earlier studies of the galactic spiral structure (Schmidt-Kaler 1964, Humphreys 1979) one can reach two conclusions. The VES is definitely going deeper; 153 stars are farther than 2kpc, of which 74 belong to the O-B3 group. But one should not forget the imprecision inherent in the method and calibration. Accepting these distance estimates, one finds the same spiral structure as previously known of course for these longitudes one is looking along the arms of the galaxy. Later portions of the VES are looking across the arms of the galaxy; this will give more information about the methodology of the VES.

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## DISCUSSION

Bolton: Magnitude limited surveys tend to have supergiants over-represented relative to main-sequence stars. Have you attempted to estimate the contamination of your Be star sample due to this effect?

Cardon: No estimate has been done yet. We hope to use the RI colours to separate the classes.