

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 3413

Konkoly Observatory
Budapest
3 January 1990
HU ISSN 0374 - 0676

VARIABLE POLARIZATION IN A COMPARISON STAR OF V3885 Sgr

In 1983 polarimetric measurements of the novalike system V3885 Sgr were performed at the European Southern Observatory (Metz, 1989). In order to determine the interstellar polarization of the system (Haefner, Metz, 1982) the linear as well as the circular polarization of several comparison stars neighbouring V3885 Sgr was determined several times. Whereas V3885 Sgr did not show any indication of intrinsic polarization (Metz, 1989), one of the measured comparison stars proved to be variable in both, its linear and circular polarization. The star (with the internal designation 11 on the finding chart, used during the observation) is separated by roughly 10 arcminutes from V3885 Sgr (the coordinates of the latter are: $\alpha_{2000} = 19^{\text{h}} 47^{\text{m}} 40^{\text{s}}$, $\delta_{2000} = -42^{\circ} 00' 10''$). Star No. 11 was also measured by Bond (1978) and is described in the literature as "Bond's star" with a brightness of $m = 10.6$ and a spectral type of F2. Its position can be seen from the finding chart of V3885 Sgr (Fig. 1). After eliminating all erroneous measurements - caused above all by a heavy snow storm at La Silla - altogether 43 linear and 33 circular polarization determinations of the comparison star No. 11 remained for evaluation.

The result of the determination of the linear polarization is:

Mean intensity in arbitrary units $I = 60026$, $\text{SDV}(I) = 3972$ (SDV is the standard deviation for a single measurement)

$$\bar{P}_x = -0.0041, \quad \text{SDV}(\bar{P}_x) = 0.0010$$

$$\bar{P}_y = -0.0038, \quad \text{SDV}(\bar{P}_y) = 0.0012$$

$$\bar{P} = 0.0057 \quad \text{SDV}(\bar{P}) = 0.0011$$

(\bar{P}_x , \bar{P}_y , \bar{P} are the means of 43 single determinations of P_x , P_y , P)

The result of the 33 circular polarization measurements is:

Mean intensity $I = 57917$, $\text{SDV}(I) = 3621$

$$\bar{P}_v = -0.0002, \quad \text{SDV}(P_v) = 0.0018.$$

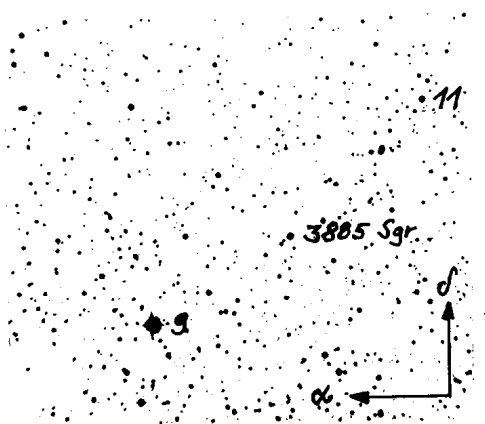


Figure 1. The finding chart used for V3885 Sgr and its comparison stars

Since each single measurement was the result of 16 rotation steps of the phase plates used in the old double beam ESO polarimeter and since the integration lasted 10 sec for each of the steps the error of a single measurement caused only by photon statistics was of the order of 0.0007. This is about a factor of 15 smaller than the derived standard deviations of the measurements.

The measurements of V3885 Sgr and its comparison stars lasted for 33 days and were interrupted two times by a break of more than a week. Therefore it was clear that the number of measurements of star No. 11 would not be sufficient to carry out a precise periodogram analysis or to make further reductions. However one thing was striking immediately after a short inspection of the data:

Completely in contradiction to V3885 Sgr and all other comparison stars the polarimetric errors of star No. 11 were much higher than derived from the photon statistics. The high standard deviations in both the linear and the circular polarizations indicated that star No. 11 was variable. Though the quantity of data was rather small to make any further statements concerning the comparison star, which had only occasionally been measured, a periodogram was performed in order to find (with all precautions described above!) any periodicity in the observed variations of the polarization. To detect most of the pseudo periodicities necessarily caused by numerous observational gaps, above all in observing the comparison stars,

the polarization values were replaced by random numbers with the same standard deviation as registered for the star No. 11 and analysed in the same way. The instantaneous linear polarization degree P and the circular polarization degree P_V were inspected in the range $1^h - 120^h$ with time intervals of one hour. The reason for selecting this time interval for the periodogram was that a preliminary plot gave indications that, if at all, a periodic variation should lie in that interval. For the original as well as the artificial data a Fourier analysis was made and gave the following result for comparison star No. 11:

In the linear polarization a period of 86 hours was present whereas the circular polarization varied with a period of 87^h . With respect to the selected time resolution and considering further the small quantity of data the results seem to be identical. Quite evidently this result has to be checked by a sufficient number of further measurements.

KLAUS METZ
Universitäts-Sternwarte
Scheinerstr. 1
D-8000 München 80
Germany

References:

- Bond, H.E.: 1978, Publ. Astron. Soc. Pacific 90, 216.
Haefner, R., Metz, K.: 1982, Astron. Astrophys. 109, 171.
Metz, K.: 1989, IBVS No.3385.