# Polarimetric Outbursts in Young Herbig Ae/Be Stars and in Peculiar B[e] Stars

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## 1 Observations

Quasi-simultaneous optical and IR photometric ($BVRIJHK$) and optical polarimetric ($BVRI$) observations were carried out at the 1 m telescope of Assy Observatory (Institute of Astrophysics of the Kazakhstan Academy of Sciences). The photometer-polarimeter of the Pulkovo Observatory (Bergner et al. 1988) was used for the study. All our measurements were done with apertures of 26″ and 52″.

## 2 Results

**HDE 259431.** Our data show a strong polarimetric variability $\Delta p = 2\% - 3\%$ and $\Delta\Theta = 30^\circ$ (especially in UV and optical region). Although the general nature of polarization is connected with the dust disk around the star (Dzhakusheva et al. 1988), the polarimetric variability probably has an another origin. This is due to the fact that we have observed a strong polarimetric variability on a time-scale of up to several hours (Dzhakusheva et al. 1988). Incidentally, this rapid polarimetric variability has no correspondence in photometry.

**MWC 137.** Optical polarimetric observations (9 $R$-band measurements) were obtained for the first time. A very large polarization degree (up to 9%), together with a large variability ($\Delta p = 4\%$) was detected. It is unusual that the increase of the degree of polarization is accompanied by an increase of the brightness in the UV.

**MWC 342.** In our data, a periodic photometric and polarimetric variability was detected. The period of photometric variability in the optical spectral region is 132 days, but the period of the polarimetric variability is only half this value (about 66 days). Moreover, the maximum of the degree of intrinsic polarization falls on phases 0.2 and 0.8 of the photometric period. According to theoretical calculations (Dolginov et al. 1979), such a conformity between the

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photometric and polarimetric periods is predicted for binary systems having a compact X-ray source. This effect may be explained by the existence of a hot spot on the surface of the Be star which is connected with the conversion of X-rays from the compact component. Using the data from Amnuel et al. (1979), we have found an X-ray source near MWC 342. The coordinates of the X-ray source ($\alpha = 20^h19^m00^s$, $\delta = +39°30'00''$). almost coincide (within the error bars) with those of MWC 342 ($\alpha_{1950} = 20^h21^m14^s.6$, $\delta_{1950} = +39°20'09''$)

**Z CMa.** *UBVRIJHK* photometry and *BVRI* polarimetry were obtained in 1985–1990. During the optical photometric outburst in 1986–1987 a significant increase of the polarization degree (up to 5%) was detected. We explain the polarization behaviour during the outburst in terms of the increase of the orientation degree of nonspherical dust grains in polar "lobes". This model is discussed in more detail by Miroshnishenko & Yudin (1993).

**MWC 349.** We obtained 27 polarimetric measurements (mainly in the $R$-band). During the observations reported here, both the degree of polarization and the position angle are variable ($\Delta p = 8\%$ and $\Delta\Theta = 15°$). The typical time-scale of variability is about 1–2 days. During 12–13.09.90 five polarization observations were made and a variation of the degree of polarization by 3% during 7 hours was detected. No correlations were found between the degree of polarization and the brightness in all photometric bands.

Some of our observational results are as follows:
- Some objects from our program show a synchronous increase of polarization degree and brightness (for example MWC 137 and Z CMa).
- Typically, polarimetric variability is observed on a time-scale of days or less.

## 3 Conclusions

The difference in the polarimetric properties for some Herbig Ae/Be stars and B[e] stars is connected with different physical conditions in their circumstellar shells. This can be specifically connected with the different evolutionary stages of their circumstellar shells.

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