Magnetic field of the star Epsilon UMa = HD 112185

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Abstract. One of the brightest stars in the sky, ε UMa = HD 112185, has long been known as chemically peculiar (Guthnick, 1934). The search for its magnetic field was started by Babcock (1958) and continued by Landstreet et al. (1975), Borra and Landstreet (1980), Glagolevskij et al. (1982; 1983), Hubrig, (1988), Donati et al. (1990), Bohlender and Landstreet (1990). The star is a rapid rotator, the lines in the spectrum are broadened to 1 Å, therefore the measurements are impeded to such an extent that it is even impossible to consider the question of existence of magnetic field in ε UMa finally settled. A weak (100-200 G) field was found by Donati et al. (1990) and Bohlender and Landstreet (1990).

In 1990-1995 estimates of the magnetic field longitudinal component of the star were obtained at the 6 m telescope. The measurements were performed with the hydrogen-line magnetometer (Bychkov et al., 1988; Shtol', 1991) using a standard procedure in the wings of the H_β and H_γ lines, with slits of 4.5 Å. The results of the measurements are listed in Table 1, where B^e is the longitudinal component of the magnetic field, σB is the root-mean-square error of the average B^e value, ϕ is the phase for the epoch JD = 2434131.124 + 5.0887E, days.

Our presented measurements with the hydrogen-line magnetometer confirm the result of Bohlender and Landstreet (1990), which was obtained from hydrogen lines and they are in contradiction with large field, measured from the metallic lines (Glagolevskij et al., 1982; 1983) and Hubrig (1988).

For the sake of clearness our results in Fig.1 are given together with the results of previous magnetic measurements of hydrogen lines. Since the measurements of Borra et al. (1980) =(B1) (five measurements from the H_β line), Bohlender and Landstreet (1990) =(B2) (nine measurements from the H_β line), SAO (five measurements from the lines H_β and H_γ) were made from hydrogen lines and had close error values, we considered it possible to combine the measurements and average them over the phases with an interval of 0.1 P. In Table 2 and Fig.2 are presented the averaging results of all these measurements, where: ϕ is the mean

Table 1: Magnetic measurements with the 6 m telescope

2440000+	ϕ	B_e,G	σB_e, G
8137.570	0.460	-43	67
8293.646	0.132	+80	68
8467.189	0.235	+43	58
8643.650	0.912	+75	84
9971.219	0.798	+36	42

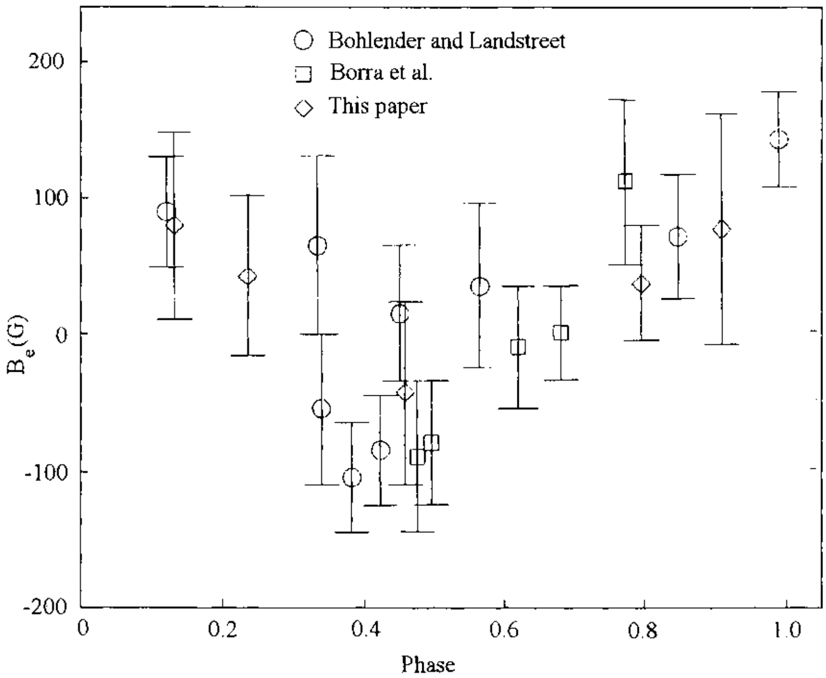

Figure 1:

of the values of the phases at which averaging was done (or phase in the case of 1 observation); B_e is the mean value of the longitudinal component of the star's magnetic field, Gauss, σB_e is its root-mean-square error, Gauss, in the next 3 columns are given the data on the number of measurements used: Bl, B2, and SAO, respectively.

Bohlender and Landstreet (1990) found an approximately dipolar field with magnetic extrema +128 G and -64 G.

The analysis of all the observations available shows that the star ε UMa possesses a weak magnetic field whose longitudinal component varies by a sinusoidal law with parameters: $\phi(0)$ = 0.73; ϕ(max) = 0.98; ϕ (min) = 0.48; B_e(max) = 117 G $\pm$ 23 G, B_e (min) =-65 G :$\pm$ 23 G. Surface magnetic field value (B_s), calculated from the simple Stibbs relation is 245 G. Our new measurements are in a good agreement with previous Balmer-line observations of the magnetic field of ε UMa (Bl and B2). This confirm a weak dipole magnetic field of ε UMa. High-resolution Zeeman spectroscopy of metalic lines is needed for clearing a question of possible large (~ 1 kG) field of complex structure.

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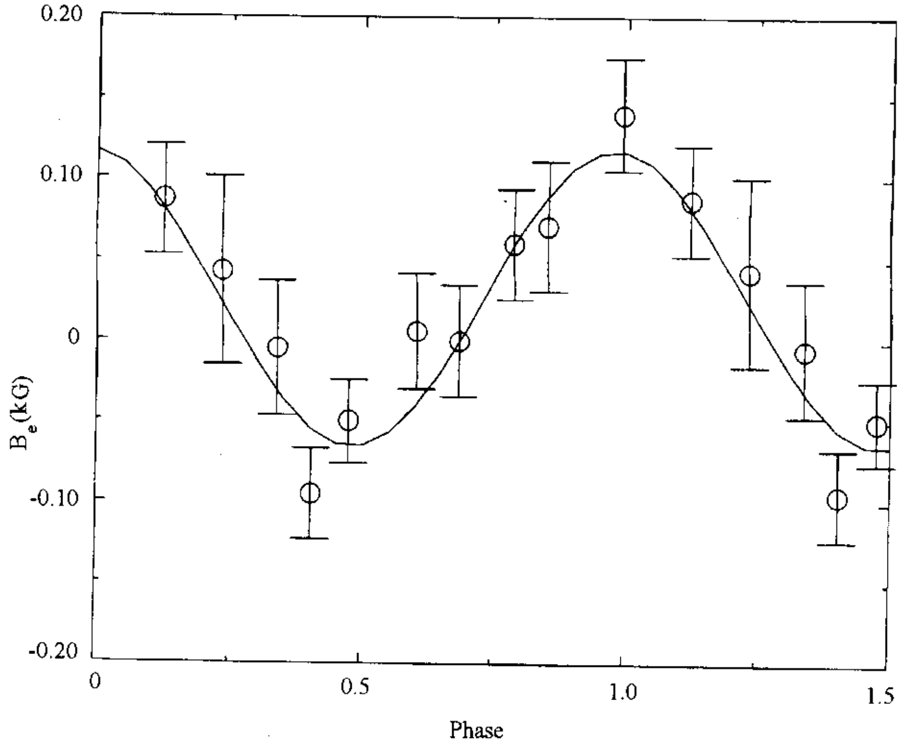

Figure 2:

Table 2: All measurements using hydrogen lines

ϕ	Be, G	σB_e, G	B1	B2	SAO
0.993	+140	35	-	1	-
0.124	+ 87	34	-	1	1
0.235	+ 43	58	-	-	1
0.338	- 5	42	-	2	-
0.403	- 95	28	-	2	-
0.474	- 50	26	2	1	1
0.602	+ 6	36	1	1	-
0.683	0	35	1	-	-
0.790	+ 60	34	1	-	1
0.854	+ 71	40	-	1	1

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