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First results of the magnetic field measurements on the G0 IV η Boo

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Abstract. Search for a magnetic field on η Boo has been performed over 50 nights in 1999 – 2014. Statistically significant magnetic field has been detected over 5 out of 50 nights. The total range of the longitudinal magnetic field variations is from -15.1 ± 6.4 G to 23.1 ± 9.6 G.

Key words: stars: activity – stars: late-type – stars: magnetic fields – stars: individual: η Boo

1. Introduction

η Boo (HD 121370, HR 5235, Sp G0 IV) is a yellow subgiant with a thin convective envelope containing less than 1% of the total mass of the star (van Belle *et al.*, 2007). Carrier et al. (2005) have obtained $T_{\rm eff} = 6030 \pm 90$ K, $M/{\rm M}_{\odot} = 1.57 \pm 0.07$, and the age $t = 2.67 \pm 0.10$ Gyr for this star. $\log g = 3.817 \pm 0.016$ and $R/{\rm R}_{\odot} = 2.672 \pm 0.028$ have been reported by van Belle *et al.* (2007). The S-index 0.144 ± 0.005 has been estimated by Hempelmann et al. (2016). We present the preliminary result of our study of the magnetic field on η Boo.

2. Results

Spectropolarimetric observations of η Boo have been performed over 50 nights from 1999 to 2014 with the 2.6-m Shajn telescope at the Crimean Astrophysical Observatory using the long-slit spectrograph (45 nights in 1999 – 2013, spectral resolution $R \sim 30000$, spectral range 6200 – 6270 Å) and echelle spectrograph (5 nights in 2014, spectral resolution $R \sim 57000$, spectral range 5200 – 6420 Å). The calculation of the longitudinal magnetic field (LMF) has been performed with the procedure discussed by Butkovskaya & Plachinda (2007).

Figure 1 shows the LMF, $B_{\rm e}$, of η Boo measured from 1999 to 2014. The total range of LMF variations is from -15.1 ± 6.4 G to 23.1 ± 9.6 G. We have detected a statistically significant magnetic field over 5 out of 50 dates (see Table 1). Most of the $B_{\rm e}$ values are in the range from about -5 to 10 G, whereas the average error is $\sim$5 G. Thus, if the magnetic field of η Boo has large-scale and small-scale components as, for example, the magnetic field of β Aql (Butkovskaya

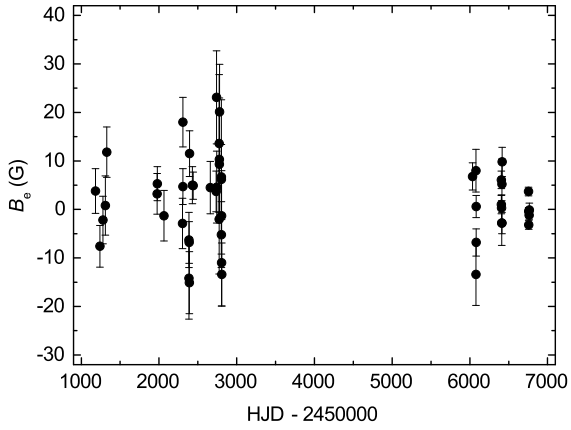

Figure 1. Longitudinal magnetic field of η Boo in 1999 – 2014.

Table 1. Statistically significant magnetic field B_e of η Boo.

HJD	B_e	σ	B_e/σ
2452307.540	18.0	5.1	3.5
2456405.478	6.1	1.8	3.4
2456415.318	9.8	3.0	3.3
2456756.440	3.7	0.9	4.1
2456757.486	−3.2	0.9	3.6

et al., 2017), long-term and more precise measurements are needed to identify both of these components.

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