SOME RESULTS OF MAGNETIC FIELD MEASUREMENTS IN YOUNG STARS.

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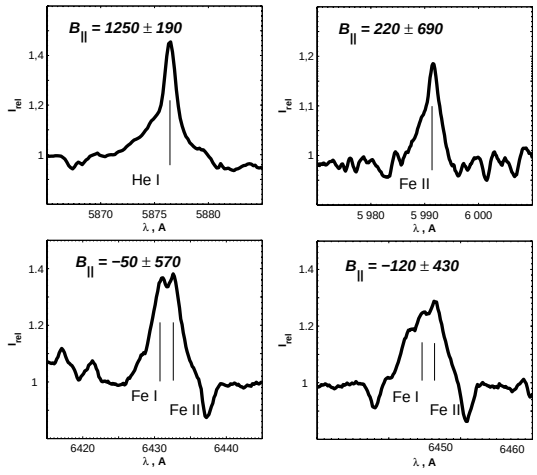
RW Aur

RW Aur is an active classical T Tauri star ($H_\alpha \simeq 80$ Å; Herbig (1998)) and therefore its activity is due to magnetically controlled disk accretion. We observed magnetic field of the star on January 10, 12, 13, and February 17, 19, 2006, with the Main Stellar Spectrograph equipped with a circular polarisation analyzer attached to the 6-m Special Astrophysical Observatory telescope. This equippment provided a spectral resolution of $R \simeq 15000$ in the wavelength about 6000 Å.

He I 5876 emission line as well as some emission lines of Fe I and Fe II were observed, i.e. we measured magnetic field in the lines formation regions. To test and calibrate our measurements we also observed the zero-field giant HD 33256 and well-known magnetic star 53 Cam (Hill et al., 1998).

The results of individual measurements are presented in the Figure. The average $B_{||}$-value for Fe I and Fe II lines is $+51 \pm 330$ G, what means that (with probability $> 99\,\%$) $B_{||}$ values are different in regions where He I and Fe lines originate. This conclusion is in agreement with different profiles of He I 5876 line and Fe II 5991 (unblended) line – see upper panels of the Figure (Smirnov et al.,2007).



BP Tau

Based on our observations and on the $B_{||}$ measurements available to date (Chuntonov et al., 2007), we argue that, at least in the He I 5876 line formation region, the magnetic field of the star is not stationary and can be restructured in a time of the order of several hours. Non-stationary small-scale fields of active regions on the stellar surface and/or magnetospheric field line reconnection due to the twisting of these lines as the star rotates could be responsible for the short-term variability of the magnetic field. Moreover, we believe that there are no strictly periodic variations in brightness and emission line profiles in BP Tau due to the irregular restructuring of the stellar magnetic field.

This conclusion is in agreement with observations of magnetic field measurents in T Tau (Smirnov et al., 2004): at two times separated by an interval of one month, but occuring practiccally at the same rotating phase, the significant difference in the He I 5876 line profile shapes was accompanied by a change in $B_{||}$ by approximately a factor of 3.

References

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