Contribution ID: **197** Type: **not specified**

Magnetic field buoyancy in accretion disks of young stars

Thursday 17 March 2016 14:20 (10 minutes)

We investigate fossil magnetic field of accretion disks of young stars. It is assumed that Parker instability leads to the formation of the flux tubes of the toroidal magnetic field in regions of the effective generation of the magnetic field. We modify our magneto-gas-dynamic model of accretion disks [1] in order to take into account buoyancy of the toroidal magnetic field. Stationary solution of the induction equation is written in the form in which buoyancy can be treated as the additional mechanism of the magnetic flux escape.

We calculated intensity of the fossil magnetic field of accretion disks of young T Tauri stars using the modified model. We consider cases when cross-section radius a of the magnetic flux tubes is 0.1H, 0.5 H or 1H, where H is the accretion disk scale height. Calculations show that buoyancy limits magnetic field intensity at the level comparable with the intensity of the vertical magnetic field component for the case a=0.1H. Applications of the results to the activity of young stellar objects are discussed.

Acknowledgements. This work is supported by Russian Science Foundation (project 15-12-10017).

References

1. Dudorov A.E., Khaibrakhmanov S.A. Fossil magnetic field of accretion disks of young stars // Astrophys. Space. Sci. –2014. –V. 352. –Iss. 1. –P. 103-121.

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Session Classification: AYSS 2016 competition