Project Details

ROSES ID: NNH06ZDA001N
Selection Year: 2007
Program Element: Independent Investigation

Topic: Investigate the Global Distribution, Sources and Effects of Large Electron Density Gradients at Middle and Low Latitudes

Project Title:
Distribution and dynamics of the solar magnetic flux in the photosphere and heliosphere

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Summary:
This proposal is being written in response to a request by the TRT focus team on "Solar and Heliospheric Magnetic Field" led by T.H. Zurbuchen, University of Michigan. The team, and especially its lead, have encouraged to propose for a third year of funding to allow a successful completion of the focus team work.

The need for this proposal arises from two reasons. First, our initial proposal extended only over two years. We are well on the way to achieving the statements of work (SOW) for this initially proposed research. Second, in response to team-objectives, we have adjusted our SOW to be of maximum help to the focus team and our work is now well connected to other parts of the team-work.

During the first year of our collaboration we have analyzed dynamics of emergence of new dipoles inside coronal holes and in adjacent quiet-Sun areas. We have shown for the first time that the dipole emergence rate of the magnetic flux inside coronal holes is suppressed as compared to the quiet sun areas. This finding agrees with the idea that coronal holes are formed at location where the dipole emergence rate is low and therefore open magnetic flux can be accumulated at these places (theory of the coronal holes formation and solar wind acceleration, Fisk 2005). This theory suggests that reconnection between open magnetic flux and closed magnetic loops is an essential diffusion mechanism for open filed lines.

We are currently improving and modifying our existing algorithms and numerical codes to calculate power spectra of magnetic field fluctuations (both spatial and temporal) as well as high statistical structure functions, which would allow us to derive flatness functions and filling factor and estimate intermittency of the magnetic field both in the photosphere and in the solar wind. This analysis will then be compared to the results of other team members (both observational and theoretical). Our funding is likely to run out before the completion of this collaboration, which is an important part of the work by the focus team.

During the third year, we will study magnetic flux distribution in the photosphere both inside and outside of coronal holes. We intend to apply our techniques to photospheric and solar wind measurements. Conclusions and parameters obtained from the study will be used as input date and/or constrain the models of coronal hole formation and solar wind acceleration developed by our focus team.

Publication References:

Summary: no summary

Reference: Abramenko, Valentyna; Yurchyshyn, Vasyl; Wang, Haimin; (2008), Intermittency in the Photosphere and Corona above an Active Region, The Astrophysical Journal, Volume 681, Issue 2, article id. 1669-1676, pp, doi: 10.1086/588426