Project Details

ROSES ID: NNH06ZDA001N
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Program Element: Independent Investigation

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

Project Title:
Empirical Determination of Effective Heat Flux and Temperature using Semi-Empirical 2D MHD Model of the Solar Corona and the Solar Wind

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Summary:
Under the LWS TR&T Tools and Methods section, we are proposing to develop empirical models of the effective heat flux and temperature (wave pressure terms) using our semi-empirical modeling of the Sun s corona at both the MHD level and the kinetic level. Our empirical estimates of the effective heat flux and temperature would replace the ad hoc functions now used in present funded 3D modeling efforts of the Sun s corona and solar wind. At present this modeling has concentrated its efforts on the Sun s corona during solar minimum when the corona and solar wind are relatively simple to model, azimuthal symmetry is a good approximation and the corona is in a quasi-steady state configuration. This modeling effort has been focused around the semi-empirical model originally presented by Sittler and Guhathakurta (1999a, 2002) and more recently by Guhathakurta, Sittler and Ofman (2006). Our modeling effort would use SOHO, Ulysses, WIND and ACE observations, and incorporate the usage of magnetogram data to improve the fidelity of our magnetic field model. The effort is presently 2D MHD and steady state and we will eventually generalize to 3D. During solar maximum the boundary conditions are more complex and will require observations of sufficient precision that may not be available at this time. STEREO, Solar-B and SDO may allow this to be done with some success. Present 3D MHD codes are unable to provide realistic solutions of the coronal plasma and magnetic field without resorting to ad-hoc source terms in the momentum, and energy equations. It is our scientific opinion that such approach is flawed, and the empirically determined wave pressure terms and heat input terms of the proposed study would provide more realistic solutions.

Publication References:

no references