SOLAR FLARE AND CME PREDICTION FROM PHOTOSPHERIC MAGNETIC FIELD MEASUREMENTS

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The possibilities to predict explosive events in the Sun that can produce powerful magnetospheric disturbances are considered. The predictions are based on photospheric magnetic measurements, which can be used as boundary conditions for calculations above the active region. The energy storage in the current sheet in the corona is shown for following conditions: 1) The current sheet creation above an active region due to photospheric disturbances focusing in the vicinity of a neutral line. 2) Current sheet creation at emergence a new magnetic tube, and its interaction with the old magnetic field of opposite direction. It is shown the possibility of vertical current sheet creation. The scenario of this current sheet decay is compared with typical development of an observed solar flare. The numerical 3D MHD models for prediction of CME and flares are proposed. The energy release occurs in the corona due to current sheet decay. Two scenario of CME development are numerically simulated: 1) A strong post flare creation because of local chromospheric evaporation. The energy is transferred from the current sheet to the photosphere by fast electrons accelerated in field-aligned currents. High beta plasma flow along field lines can not be confined by the magnetic field on the top of a magnetic loop, and the plasma stream escapes from the corona. 2) Plasma upward acceleration by the jxB/c force in the vertical current sheet during a solar flare. The results of calculation are in agreement with observational data. The new version of the PERSVET code is developed for solving equations in regions of strong gradients near the photosphere. Plasma resistivity and anisotropy of the thermal conductivity are taken into account.
The work is supported by RBRF (grant 00-01-00091).