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A new solar wind-geomagnetic activity coupling function and its application to forecasting the major Geospace parameters

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We obtained a new solar wind-geomagnetic activity coupling function which provides the best fit with geomagnetic activity indices and other events. This coupling function is accounting for the saturation effect in geomagnetic activity and other disturbances as well as for a non-linear character of the interaction between the solar wind and magnetosphere. The latter includes the dependence of the size of the region of open (reconnected) magnetic field at the ionosphere level on the magnitude and direction of the interplanetary magnetic field vector.

We applied this coupling function to forecasting the major ionospheric and magnetospheric parameters such as cross-polar cap potential drop, Joule heating, Dst variation, relativistic electrons at geosynchronous orbit, and others. We found that using this new coupling function improve significantly the reliability of monitoring and forecasting the key ionospheric and magnetospheric parameters. The correlation coefficient between forecasted and actual values of most parameters increases to $\sim$0.9 and more, which significantly improve the reliability of forecasting many Space Weather events.