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# Relation of PC index to magnetic disturbances developing under conditions of northward IMF

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Substorms and storms occurring under conditions of northward IMF (BZN) are commonly examined as "extraordinary events" since they are developed when the efficiency of the interplanetary electric field EY = vBZS (Reiff and Luhmann, 1986) falls to zero. Examination of these events demonstrates that all of them occur, like to ordinary substorms and storms, under conditions that are necessary and sufficient for development of substorms (PC $\geq$ 1.5 mV/m) and storms ( >2 mV/m). The specified values of the PC index testify that the magnetosphere is affected by the intense interplanetary electric field EKL=vBTsin2$\theta$/2 (Kan and Lee, 1979), where BT is the IMF tangential component and $\theta$ is an angle between BT component and the geomagnetic Z-axis. The principal difference between coupling functions EY and EKL lies in the fact that EKL function includes the IMF azimuthal (BY) component. As BY increases relative to BZ, the difference between electric fields EY and EKL quickly grows, and the value of EKL field can be as large as 5-10 mV/m even under conditions of northward IMF orientation, when EY reaches to zero.
The same situation is valid for substorms triggered by sharp northward turning of the IMF BZ component following the prolonged period of southward IMF influence. Examination of these substorms demonstrates that they are initiated by increase of coupling function EKL and that the substorm sudden onsets were preceded by the PC index growth. Consistency between the IMF northward turning and substorm sudden onset in these cases is coincidence that explains why substorm are only occasionally initiated by the IMF northward turning. Thus, the "extraordinary" storms and substorms occurring under conditions of ineffective northward IMF component turned out to be events nothing out of the ordinary, if examining them in relation to proper coupling function (EKL) and monitoring them by the PC index.