Geomagnetic storms and PC index

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Relationships between the geoeffective interplanetary electric field $E_m$, the polar cap magnetic activity index $PC$, and the magnetic storm index $Dst$ have been studied for the time intervals ($N=54$) with the electric field $Em > 2\text{ mV/m}$ lasting over 12 hours. It has been found for 1998-2004 that all intervals with $Em > 2\text{ mV/m}$ (and, correspondingly, with $PC > 2\text{ mV/m}$) are characterized by magnetic storms with magnitude in the range from -30 to -370 nT, dependent on level of $Em$. It is shown that the storm magnitude (minimal value of $Dst$ index) is linearly connected with the $Em$ and $PC$ quantities, averaged for the time interval from the storm beginning to the storm maximum. The moment of the firm descent of the $Em$ and $PC$ quantities below the threshold level $\sim 2\text{ mV/m}$ is consistent with time of transition from the storm main phase to the recovery phase. At the same time, the storm dynamics correlate better with value and changes of the $PC$ index than with those of $Em$ field. The similar peculiarity has been revealed for substorms [Troshichev and Janzhura, 2009]: behavior of AL index is better controlled by the $PC$ changes than by $Em$ variations. Based on these results, the conclusion is made that the $PC$ index is a reliable proxy, characterizing the solar wind energy input in the magnetosphere. In this quality the $PC$ index can be used to monitor the magnetospheric ring current dynamics.