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Relationship between the PC and AL indices during repetitive bay-like magnetic disturbances in the auroral zone

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To study the relations of the polar cap magnetic activity (characterized by the PC index) to magnetic disturbances in the auroral zone (AL index) the behavior of 62 repetitive bay-like magnetic disturbances has been analyzed. It was found that the PC index, derived as a proxy of the geoeffective interplanetary electric field Em, starts to increase, on average, about 30 minutes ahead of the magnetic disturbance onset. Value of Em and PC $\sim$ 2 mV/m seems to be necessary for development of the repetitive bay-like disturbances with peak AL exceeding 400 nT. Growth phase duration (the time interval between the start of PC increase and AL sudden onset) and intensity of magnetic disturbances in the auroral zone (AL max) highly correlate with the PC growth rate. The growth phase reduces to a few minutes, if the PC index suddenly jumps above $\sim$ 6-8 mV/m. The sharp development of Birkeland current wedge during expansion phase insignificantly influences the polar cap activity: the corresponding PC index increase does not exceed 10-20% of the PC value. It is concluded that the PC index may be considered as a convenient proxy of the solar wind energy input into the magnetosphere.