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Polar substorms and solar activity

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The “polar” substorms include the evening substorms observed at geomagnetic latitudes above 70° MLAT in the absence of simultaneous negative magnetic bays at lower latitudes of given meridian. The purpose of this work is to continue the study of the morphological characteristics of “polar” substorms, to obtain their dependence on the the season of the year, different solar wind streams and the solar cycle phase. We selected above 1200 events of the “polar” substorms, recorded at the Scandinavian IMAGE magnetometer chain in the period of 2008-2020, i.e. during total 24-th solar cycle. Our analysis based on the ground-level data from the IMAGE network magnetometers. By analyzing this large array of cases, the diurnal, seasonal and annual distributions of polar substorms were obtained. It was shown that the most number of the “polar” substorm onsets were observed in the 17-23 MLT sector; the “polar” substorm onsets are observed in the larger evening-ward area than the occurrence of the “normal” substorm onsets. We found that the annual cycle of polar substorm occurrence: the winter maximum and the summer minimum. It turned out that the “polar” substorm behavior was opposite to the Wolf numbers behavior. This is consistent with previous results that “polar” substorm occur mainly at the end of the high-speed streams from coronal holes, which registered mainly during solar cycle minimum and on the decline phase of the solar cycle