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Annual and UT distribution of frequency of appearance of large geomagnetic disturbances as base for prediction of space weather hazards

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Geomagnetic activity (GA) is well-known to be described by season variation with maxima in vicinity of the equinoxes and minima near the solstices. Cause of this annual variation is still a matter of contraversy. Besides, Clua de Gonzales et al (2001) using monthly averages of geomagnetic indices found peak in July for ranges of high levels of geomagnetic activity that is outside of the known seasonal profile of GA. It is very important to study regularities of behavior of GA for large intensities to increase our predictive capability for space weather. The purpose of our study was to obtain annual and UT variation of geomagnetic activity for different levels according to intensity stressed on the highest level. The other aim was to detect a day (in July or not) inside a month of the highest geomagnetic activity. For our study we used 3-hour geomagnetic indices Kp (1932-2004) and aa (1868-2004), hour indices Dst (1957-2004). We obtained for all the geomagnetic indices that as the level of intensity increases, additional peaks appear on the classical season variation. For strong disturbances in range of Kp=8-9 we obtained clear non-classical season variation with absolute maximum on March-April and two comparable peak on July and September-October. We see the same positions of peaks and their intensity for level aa$>$200: absolute maximum on March-April and less intensive maxima in July and September-October. Behavior of reaching the peaks in equinoxes differ from the summer solstice peak: gradual increasing of geomagnetic activity before maximum at the equinoxes and sharp rise of geomagnetic activity in July from low geomagnetic activity to its highest level that lasts for approximately 2 weeks. Annual variation of numbers of intervals with Dst$<$ - 200 nT shows two clear comparable peak on April and November

and less intensive peaks in July and September. Our analysis showed that UT variation of all discussed indices for the high level of geomagnetic activity (Kp$>$8, aa$>$200, Dst$<$ - 200 nT) have clear additional maxima at $\sim$6UT (absolute maximum in the UT distribution) and $\sim$18 UT on the usual statistical profile of the UT variations of the indeces. Our study based on spaced measurements of the solar wind at the Earth's showed that the IMF lies at the ecliptic plane only in vicinity of equinoxes, maximal deviations of the IMF are observed on July and November that points to presence of maximal transversal (to ecpitic plane) Bz component. Besides, the solar wind velocity has maximal deviations from the Sun-Earth line on July and November too. At last we attract for explanation of our results our model of the solar wind-magnetosphare interaction based on variation of mutual orientation of electric field of the solar wind relative to geomagnetic moment during orbital and daily motions of the Earth. The fact that large geomagnetic disturbances are observed during narrow intervals of UT during a year allows to hope to improve our predictive capability for space weather hazards in the next future.