ABOUT CLIMATOLOGY OF AURORAL GEOMAGNETIC VARIATIONS IN 1983-2008

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Digital recordings with the dense IMAGE magnetometer network in the auroral region in northern Europe have been performed since 1983, so the timeseries covers more than two sunspot cycles. We use this dataset as the basis to investigate dynamics of magnetic field variations, quantified by the time derivative dH/dt of the horizontal field vector H. With a specific interest in large events, we require that dH/dt exceeds 60 nT/min (1 nT/s), which is fulfilled by roughly 1% of all data. We also apply an indicator DB, which simply expresses the daily number of large dH/dt values in a given area. Most of the large dH/dt values occur during the nighttime together with auroras. So it is natural to compare the dH/dt activity to substorm activity. An automatic objective method is used to detect substorms from magnetometer data. As the basic indicator, we use the number of substorms in a certain time interval (substorm number). Another relevant measure is the substorm size, which is the peak amplitude as determined from the envelope of IMAGE magnetometer measurements. These tailored indicators (DB and substorm number) reveal several features which are also known from conventional magnetic indices. For example, equinoxes are statistically more active than solstices, and ascending/descending phases of sunspot cycles are more active than the sunspot maximum itself. On the other hand, dH/dt and substorm number show features, which are invisible to traditional indices. The substorm number and directional distribution of dH/dt have diurnal, seasonal and solar cycle variations whose understanding requires more quantitative analysis of ionospheric and solar wind conditions.

Ionosphere, solar wind, substorms

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