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An empirical model for high latitude ULF geomagnetic noise

N. Yagova, V. Pilipenko and **L. Baransky**

Institute of the Physics of the Earth, Moscow, Russia

Narrow-band Pc pulsations occur from time to time in the magnetosphere and on the ground, while the broad-band noise is the ubiquitous manifestation of the geomagnetic activity. The geomagnetic noise has been continuously recorded for several decades at hundreds of ground stations and many satellites. However, noise parameters have not been still analyzed and summarized in a systematic way. In this study we analyze the parameters of the geomagnetic noise and pulsations with in the frequency range 1-4 mHz (Pc5/Pi3) from more than 50 observatories from the polar to middle latitudes and in a wide range of MLT in the following way:

1) spectral parameters are estimated in 2-hour running window at each station;
2) signal is decomposed into an elliptically polarized and randomly polarized components;
3) for each component the spectrum is presented in a log-log scale and expanded over Legendre polynomials;
4) for all the coefficients the diurnal and latitudinal distributions are calculated and factors influencing each of Pi3 parameters in the magnetosphere and in the interplanetary space are analyzed.

It is found that Pi3 amplitude and higher spectral moments are controlled by CGM latitude and MLT. A noticeable difference in diurnal variations for polarized (P) and non-polarized (N) components exist at all latitudes. Signal spectral power and spectral form demonstrate systematic dependence on external factors. On the other hand, spectral slope shows almost no dependence on extra-magnetospheric factors. It is completely controlled by processes inside the magnetosphere and can be considered a sensor of magnetosphere's active response to external forcing.