APPLYING OF THE DISCRETE MATHEMATICAL ANALYSIS TO STUDY THE PI2 GEOMAGNETIC PULSATIONS AT INTERMAGNET STATIONS

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The methods of DMA (discrete mathematical analysis) have been applied to study the irregular Pi2 (f=8-25 mHz) geomagnetic pulsation characteristics and the obtained results are presented here. The Pi2 pulsations are typical for magnetospheric substorms. The original row magnetic data were filtered by using the sixth order Butterworth filter. Spectral characteristics of Pi2 pulsation bursts, due to their irregular structure, were examined by the wavelet analysis. To correlate the simultaneous Pi2 bursts at observatories, located at different latitudes, the general dispersion of the signal eigenvalues was calculated. The temporal dynamics of the Pi2 wave polarization properties have been studied by applying the calculated covariance matrices. The algorithm of fuzzy (inexplicit) faces was also used in our analysis.

The spatial properties of Pi2 geomagnetic pulsations, associated with special type of substorms, which are observed only at geomagnetic latitudes Φ>70º (which are termed as "polar substorms"), were studied by applying DMA methods. The spatial dynamics of the ionosphere currents (electrojets) location during the considered polar substorms was investigated by using the numerical model simulations. For the first time, the analysis of the simultaneous magnetic records has been curried out for the geomagnetic latitudes from the polar cap to the equator, based on the observations at the Scandinavian IMAGE (Φ=56-76º) profile with 10 s sampling as well as at the equatorial- and mid-latitudes INTERMAGNET stations with 1 s sampling. It was established, that during polar substorms, the maximal Pi2 amplitudes were observed near the polar cap boundary. It was shown that the studied Pi2 bursts have a global character. However, their temporal dynamics was different at different latitudes. We suppose that there could take place different pulsation generation mechanisms at various places in the magnetosphere.