High-latitude geomagnetic pulsation (T~5-15 min) during a magnetic storm initial phase

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The purpose of this study is to show that there is significant solar wind energy transfer to the magnetosphere-ionosphere system during the storm initial phases, which demonstrated as long period high latitude geomagnetic pulsation generation. Analyzing several strong magnetic storms produced by the passage of the interplanetary magnetic cloud to the Earth's magnetosphere we focused on the global distribution of geomagnetic pulsations with the periods 5-15 min (Pi3/Pc5-6) during the magnetic storm initial phase. The analysis showed that strong IMF and ion density variations on the front edge of a magnetic cloud often trigger an early morning magnetic substorm and long period pulsations at the polar cap near the footprint of the open/closed field lines border. However, inside the magnetosphere pulsation activity remained poor. We have found that at equatorial and polar cap latitudes the wave dynamic spectral structure was similar. That fact can be primarily interpreted in term of direct penetration of the fluctuating polar electric fields into the low and equatorial latitudes. The source of the polar fluctuations can be attributed to compressional waves in the solar wind, which modulates the intensity of the high latitude field aligned electric currents (FAC). Another possibility can be attributed to the ionosphere conductivity oscillations caused by substorm electron precipitation. A cloud leading edge arrival and magnetic storm main phase onset shifted the geomagnetic pulsation activity into the inner magnetosphere.