Daytime high-latitude geomagnetic pulsation response to the front edge of the magnetic clouds

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The interaction of the interplanetary magnetic cloud with the Earth's magnetosphere, which produced the strong magnetic storm, has been analysed by using the ground-based data during three strong magnetic storms (February 21, 1994; January 10, 1997, and May 15, 1997). We focus on the first few hours of the events after ssc, correspondent to the passage of the compression region of the magnetic cloud, located between the shock and the cloud leading edge. The analysis of the IMAGE data has shown that the strongest amplitudes of the Pc5-6 (1-3 mHz) geomagnetic pulsations, associated with the impact of the front edge of the magnetic cloud, were observed only at the polar cap latitudes. These waves propagate eastward at the speed about of 7-8 km/s. After the passage of the leading edge of the magnetic cloud the maximum of pulsations shifted to the lower (auroral) latitudes, that is, in the closed magnetosphere. These pulsations showed the properties of the field line resonance. In that time the geomagnetic activity in the polar cap was absent.

The morning-daytime polar cap magnetic pulsations can be originated in the ionosphere near the polar cusp foot print due to the oscillations in the ionosphere conductivity, caused by the fluctuations of field aligned currents. The second possible source of the high-latitude geomagnetic pulsations could be a direct wave penetration from the solar wind.