



Asymmetry of geomagnetic field horizontal components variation connected to field aligned currents appeared at early recovery phase in region of plasmospheric bulges

Oksana Barkhatova (1), Nikolay Barkhatov (1), and Peter Bespalov (2)

(1) Nizhniy Novgorod State Pedagogical University, Nizhniy Novgorod, Russia (nbarkhatov@inbox.ru), (2) Institute of Applied Physics of the Russian Academy of Science, Nizhniy Novgorod, Russia

Studying of ring current dynamics at different phases of geomagnetic storm development assumes consideration of questions connected with its asymmetric part closing. Such closing of asymmetric ring current on ionosphere can be provided with existence of intensive field aligned currents. These currents can arise due to interaction of ring current energetic ions with plasmospheric bulges in day time and evening sectors of magnetosphere. At the same time in regions of plasmospheric bulges develop cyclotron instability. Interaction of ring current energetic ions with cyclotron waves leads to them isotropisation and precipitation in loss-cone therefore intensive field aligned currents are formed. In this work the experimental basis of asymmetric part of geomagnetic field disturbance connection with presence of plasmospheric bulges at early recovery phase of geomagnetic storm is received.

Spectrums of geomagnetic field horizontal component on two meridional chains of ground based stations which correspond to location of day time and evening plasmospheric bulges are investigated. Research was carried out for two cases – when the stations chain is in region of plasmospheric bulge and when it is outside of its boundaries. As a result in spectrums of geomagnetic field horizontal component variations at ground magnetic stations the increase of spectral components amplitudes in geomagnetic pulsations range is observed. It is marked at an entrance of stations in regions corresponding to projections of day time and evening plasmospheric bulges.

Comparison of geomagnetic field horizontal component variations at the stations which are taking place in region of a day time bulge is carried out. It is founded, that at an entrance of stations in this bulge region, evident depression of horizontal components values is observed. At stations which are located outside a bulge, this depression is less significant. In quiet days, when streams of ring current energetic ions are absent, the synchronous course of horizontal component at all stations is observed. It can be an evidence of field aligned current existence on boundaries of day time plasmospheric bulge in geomagnetic disturbed period. It can provide flowing of ring current part along field lines and formation of its asymmetry. Registration of disturbances in a range of geomagnetic pulsations Pc-4 in plasmospheric bulge regions can be an additional evidence of longitudinal currents existence. Such pulsations indeed founded out in dynamic spectrums of horizontal components at the stations which are taking place under bulges.

We are grateful to Sarah Reay (The British Geological Survey) and Patrik Johansson (Geological Survey of Sweden) for granting of geomagnetic field component records in high resolution.

Work is executed at partial support under grants of the RFBR 08-05-12051-OBR and 09-05-00495, and also program Ministry of Education and Science «Development of higher school scientific potential (2009-2010, project N 1623)».