Geophysical Research Abstracts, Vol. 8, 05680, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05680

Response timescale of high-latitude ionospheric convection to the IMF southward turning

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Plasma convection is a manifestation of the coupling processes between the solar wind and the magnetosphere-ionosphere system. Studying the temporal and spatial evolving pattern of the global-scale high-latitude ionospheric convection, especially the response to the transient IMF, is of great importance to better understanding of such coupling processes. Numerous statistical studies have shown that IMF carried by the solar wind plays a dominant role in controlling the high-latitude ionospheric convection. The statistical character of the convection pattern for stable IMF conditions has been studied extensively in the past. When IMF changes, the convection pattern will reconfigure to be consistent with the new IMF state. One of the key questions concerning such response is the time scale. There have been a number of studies on this topic in the recent years, but our understanding is still limited and it is difficult to agree on the manner of such response. This can be partly attributed to the difficulties that the observational techniques used in the most of previous studies can not obtain instantaneous convection pattern on a global scale. In the middle of 1980s, Super Dual Auroral Radar Network (SuperDARN) was born and has been expanding since then. SuperDARN can now monitor the high-latitude ionospheric convection almost instantaneously (1-2 minutes) on a global scale, which provides excellent opportunities for us to study the convection response to the transient IMF. In this study, we describe the high-latitude ionospheric convection response to an IMF southward turning, using SuperDARN data and the solar wind data from ACE satellite. For the selected events, besides the sign change, the magnitude of IMF Bz component changes greater than 10 nT within 3 minutes, and to be of relatively stable Bz component at least 30 minutes before and 20 minutes after the southward turning, as well. The initial result shows

that for a southward IMF turning event, the delay of the convection response onset regarding the IMF change is about 3 minutes; the response started around noon and was delayed by increasing amounts away from the noon sector. The response at midnight MLT started the latest with the delay of about 10 minutes, and the delay around dawn and dusk is about 5 minutes. The reconfiguration time of the convection response is about the same for all MLT, which is 10-12 minutes.