Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04782, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04782
EGU General Assembly 2008

Modelling the interplay of IMF BY and season on polar cap electrodynamics

R. Lukianova (1), A. Kozlovsky (2), F. Christiansen (3), . Turunen (2)

(1) Arctic and Antarctic Research Institute (renata@aari.nw.ru/+7 812 3522688), (2) Sodankyla Geophysical Observatory, (3) Danish Technology University

Using joint modelling of field-aligned currents (FAC) and ionospheric electric fields we have investigated the effect of IMF BY for different seasons. By subtracting the BY- pattern from BY+ pattern the differential diagrams are obtained, which highlight the pure BY-related perturbations and identify the specific features associated with the interplay of two factors. Three types of FAC structure are identified: (1) two antiparallel sheets in the daytime cusp region are characteristics of summer and equinox, when BZ-; (2) one circular up(down)ward near-pole current located at the noon meridian is obtained for summer and equinox, when BZ+; (3) in winter, one circular near-noon-near-pole current and oppositely directed crescent current on the dawn-side is revealed for both BZ- and BZ+. Two types of convection systems are revealed: the intense round-pole vortex is developed, when the FAC is (1) or (2) and the two-cell spiral-like convection pattern is seen, when the FAC is (3). The results show that the qualitatively different FAC and convection patterns can coexist in the opposite hemispheres during solstice months. The relationship between the near-pole voltage Up and the magnitude of By is obtained. When Bz is southward, Up=7*|BY| for all seasons. When Bz is northward, Up=5*|BY| for winter/equinox and Up=7.5*|BY| for summer. To interpret the BY-related seasonal features, the qualitative models of solar wind electric field penetration into the magnetosphere are suggested.

The study was supported by the Academy of Finland, RFBR (grant 06-05-64311-a) and INTAS (grant 06-1000013-8823).