atmosphere

MDPI

Supplementary Materials:

Auroral Ionosphere Model with PC Index as an Input

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Introduction

Movie S1 shows the spatial distribution of electron concentration in the maximum of E-layer, calculated with the numerical AIM-E (PC) model in the course of magnetospheric substorm between 23:00 UT on May 19 and 04:00 UT on May 20, 2019. The moderately disturbed geomagnetic conditions have been observed during the considered period: AE index increased up to 1000 nT, PC up to 4 mV/m, the planetary geomagnetic index Kp did not exceed 3+. This is an important note for the OVATION-Prime calculations since the accuracy of the precipitation model degrades at Kp>5.

The empirical EUV and OVATION-Prime (PC) models were used to provide the input photon and electron fluxes at the top of the ionosphere. The calculations were carried out for the northern hemisphere, MLAT = 50°–90°N, on a discrete grid MLT × MLAT = 0.25h × 0.25 in a solar-magnetic coordinate system (SM). For each grid point, the altitude profile of the electron density was calculated from 90 to 140 km with the 1 km altitude step.

Three red dots show the disposition of vertical sounding observations at two arctic stations Gorkovskaya (GRK) and Lovozero (LOZ) and oblique sounding observations in the central point of their radio path Gorkovskaya – Lovozero (GRK–LOZ). Movie S1 demonstrates that during the active phase of substorm the LOZ station was inside the zone of strong magnetospheric electron precipitation, while the GRK station was outside. At the same time the central point GRK–LOZ moved along the edge of active precipitation zone.

Movie S1.

Top panel: the spatial distribution of calculated electron concentration in the maximum of E-layer in the course of magnetospheric substorm between 23:00 UT on May 19 and 04:00 UT on May 20, 2019. Red marks denote the disposition of vertical sounding points at Gorkovskaya (GRK) and Lovozero (LOZ) arctic stations and oblique sounding point in the centre of their radio path GRK–LOZ. Geographic coordinates of observational points (lat, lon):

GRK: (60.27, 29.38);
GRK–LOZ: (64.16, 31.81);
LOZ: (68.00, 35.02).

Bottom panel: the corresponding AE and PC indices.