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The magnetosphere-ionosphere convection in the solar wind without magnetic fields

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We investigate the magnetosphere-ionosphere convection when merging between the interplanetary magnetic field (IMF) and the magnetospheric one is not effective. To perform the simulation in this condition, we assign the IMF with extremely small intensity. The simulation reveals that the magnetosphere has long magnetotail unlike the closed magnetosphere proposed by Axford and Hines [1961]; this means traditional viscous interaction may not play an important role. It is also obtained that the ionospheric convection exhibits a 2-cell pattern like the magnetosphere-ionosphere convection system for the southward IMF condition. It is revealed that the magnetosphere-ionosphere convection is associated with the R1 field-aligned current generated in the cusp-mantle region where the convection plasma flow traverses the cusp region with enhanced plasma pressure. The traversing plasma flow in the cusp region is fed by the magnetosheath flow which enters into the cusp region along the magnetic field lines. Thus, the magnetosphere-ionosphere stationary convection is performed without the merging.

Keywords: Extreme space weather, solar wind-magnetosphere interaction, magnetosphere-ionosphere convection, MHD simulation, compound system, viscous interaction