Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM027-P07 Room:Convention Hall Time:May 25 10:30-13:00

Reciprocal ionospheric convection cells during northward interplanetary magnetic field periods

Masakazu Watanabe[1*], Suzuna Ikeda[2], Shigeru Fujita[3], Hiroyuki Shinagawa[4], Takashi Tanaka[5]

[1]Faculty of Sciences, Kyushu University, [2]Graduate School of Sciences, Kyushu Univ, [3]Meteorological College, JMA, [4]NICT, [5]SERC, Kyushu University

It is known that the dayside ionospheric convection at small interplanetary magnetic field (IMF) clock angles (less than or equivalent to 30 degrees) exhibits twin reverse cells in both hemispheres. Traditionally, this convection pattern has been interpreted in terms of lobe cells circulating in the open field line region of the ionosphere. Recently, the lead author has shown a flaw of this conventional view and suggested the existence of a new magnetic flux circulation mode that involves reconnection between open and closed field lines. This circulation mode is termed the interchange cycle. A consequence of the interchange cycle is the appearance of a reverse cell circulating in the closed field line region. This convection cell is called reciprocal cells. The reciprocal is unique to the interchange cycle and can be used as an identifier of the circulation mode. The lead author has also shown a ”proof of existence” of the ionospheric situation that is expected for the interchange cycle. However, an observational approach is always subject to various limitations. For example, determining the open-closed field line boundary is suggestive but not definitive. The purpose of this paper is to check whether global magnetohydrodynamic (MHD) simulations can reproduce reciprocal cells as observed, to further support the existence of the interchange cycle. For this purpose, we performed several simulation runs, changing IMF clock angles. We found that MHD simulations could reproduce reciprocal cells qualitatively, but the reproduction was not perfect quantitatively. For example, the reciprocal cell intensity (potential drop) was much smaller than the observations. In this paper, we compare simulation results with observations in various aspects and discuss their differences.