Geophysical Research Abstracts
Vol. 19, EGU2017-6390, 2017
EGU General Assembly 2017

Dayside and nightside magnetic field responses at 780 km altitude to dayside reconnection.

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During southward IMF, dayside reconnection will drive the Dungey cycle in the Earth's magnetosphere, which is manifested as a two cell convection pattern in the ionosphere. We address the response of the ionospheric convection to changes in the dayside reconnection rate. Previous studies have reported two apparently contradicting results. The first is that the ionospheric convection responds within one minute both near noon and near midnight. The second is that the response is 10-20 minutes delayed near midnight compared to near noon. To test these apparently contradicting scenarios, we have performed a statistical investigation of the response by examining the magnetic field perturbations at 780 km altitude due to dayside reconnection. The AMPERE data products derived from the Iridium constellation provide global maps of the disturbance magnetic field. The time development of the convection is modelled as the sum of an accelerating force and a decelerating force. Furthermore, the accelerating force is parametrised as a linear sum of past reconnection rates, while the decelerating force is proportional to the convection itself. This results in an asymptotic model which gradually reaches a steady-state value. By fitting the data to the model, we confirm previous reports of an almost immediate response both near noon and near midnight combined with a 10-20 minutes reconfiguration time of the two cell convection pattern. The e-folding time of the asymptotic model was found to be about 40 minutes. We present a new explanation of the response and reconfiguration times based on how MHD waves propagate in the magnetospheric lobes when newly reconnected open flux tubes are added to the lobes, and the magnetopause flaring angle increases.