

Quasi-periodic DP2 fluctuations in the geomagnetically induced currents

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The geomagnetically induced current (GIC) has been attributed to the time change in the Bx component of the ground magnetic field. However, the GIC was found to be well correlated with By component at mid latitudes [e.g., Watari et al., Space Weather 2009]. Braendlein et al., JGR 2012] reported that the GIC has diurnal and seasonal variations, and suggested that the GIC could be a return current of the ionospheric currents via the wave front of the TM0 mode waves in the Earth-ionosphere waveguide [Kikuchi and Araki, JATP 1979]. We analyzed the quasi-periodic fluctuations in the GIC recorded in Hokkaido on December 14 2006, which accompany the DP2 fluctuations in the equatorial electrojet (EEJ) and D-component magnetic field at midlatitudes. We found that the GIC is well correlated with the EEJ as well as the midlatitude D-components. We suggest that the midlatitude GIC is a part of the magnetosphere-ionosphere-ground (MIG) circuit currents [Kikuchi, JGR 2014], and therefore, the GIC is the return current of the ionospheric currents via the wave front of the TM0 mode waves.

Keywords: midlatitude geomagnetically induced current, midlatitude D-component magnetic field, equatorial electrojet, TM0 Earth-ionosphere waveguide mode