

Mid latitude GIC as the ground surface currents carried by the TM₀ mode waves in the Earth-ionosphere waveguide

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The geomagnetically induced current (GIC) has been attributed to the time change in the B_x component of the ground magnetic field. However, the GIC was found to be well correlated with B_y component [e.g., Watari et al., Space Weather 2009]. Recently, it was reported that the GIC has diurnal and seasonal variations, which suggests that the GIC could be a return current of the ionospheric currents since the ionospheric conductivity is affected by the solar radiation [Braendlein et al., JGR 2012]. To explain the close relationship between the GIC and ionospheric currents, the authors used the Earth-ionosphere waveguide model proposed by Kikuchi et al. [Nature 1978]. In this model, the TM₀ mode wave propagates at the speed of light with accompanying the ionospheric and ground surface currents connected by the displacement currents flowing on the wave front. In the present talk, we review the Earth-ionosphere waveguide model and explains the close relationship by applying the Earth-ionosphere waveguide model.

Keywords: Geomagnetically induced current, Earth-ionosphere waveguide, ionospheric current, polar-equatorial propagation