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Pi2 の極赤道電流系
Pi2 current system at polar to equatorial latitudes

菊池 崇 [1*], 橋本久美子 [2], 西村幸敏 [1], 新堀淳樹 [3], 長妻努 [4], 門倉昭 [5], 佐藤夏雄 [5]
Takashi Kikuchi[1*], Kumiko Hashimoto[2], Yukitoshi Nishimura[1], Atsuki Shinbori[3], Tsutomu Nagatsuma[4], Akira Kadokura[5], Natsuo Sato[5]

[1] 名古屋大学太陽地球環境研究所, [2] 九州保健福祉大学, [3] 京都大学生存圏研究所, [4] 情報通信研究機構, [5] 国立極地研究所
[1]Solar-Terrestrial Environment Laboratory, [2]Kyushu University of Health and Welfare, [3]Res Inst for Sustainable Humanosphere, [4]Nat Inst of Inform and Comm Tech, [5]National Institute of Polar Research

It has been reported that the Pi2 appears at the dayside geomagnetic equator with an enhancement in amplitude (Shinohara et al. GRL 1997; Tokunaga et al., GRL 2007). The Pi2 at the dayside equator is explained by means of electrojets driven by an electric field transmitted from the polar ionosphere (Shinohara et al. GRL 1997). Simultaneous ground and spacecraft observations show that the relationship between the Pi2 on the ground and above the ionosphere is in phase on the nightside and out of phase on the dayside (Han et al., JGR 2004). These observations indicate that the dayside Pi2 is caused by ionospheric currents extending from high latitude to the equator, while the nightside Pi2 is attributed to cavity resonance of MHD waves in the plasmasphere. On the other hand, the period of the Pi2 does not depend on the latitude at around the plasmapause, which may not match the cavity resonance model (Tokunaga et al., GRL 2007). In this paper, we show that the equatorial Pi2 is well correlated with the nightside Pi2 with no time shift greater than several seconds and that the amplitude of the nightside Pi2 is larger at higher latitude. This local time and latitudinal features are similar to those of the main impulse (MI) of sudden commencement (SC), which is explained by means of Region-1 type field-aligned currents generated during the compression of the magnetosphere (Araki et al., EPS 2006; Shinbori et al., JGR 2009). We also show that the Pi2 at nightside auroral latitude is out of phase with the equatorial Pi2. We suggest that the Pi2 is explained by means of Region-1 type field-aligned currents which flow into the auroral ionosphere and further to the dayside equatorial ionosphere. The relationship of the equatorial Pi2 and substorm current wedge should be clarified to identify the source of the Pi2 currents.

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