Characteristic of longitudinal profile of dayside equatorial DP2 oscillation

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The magnetic dip equator is the final destination of magnetosphere-ionosphere coupling. Here, in the dayside region, signal of geomagnetic disturbances are enhanced by the Cowling effect [Hirono, 1950a, b]. It is well known that global DP2 current system connects the polar and equatorial ionosphere regions [Nishida, 1968, Kikuchi et al., 1996]. However, the detailed distribution of this current system, and the physical mechanism of how such a connection can be generated, are not well understood.

The purpose of this study is to observationally clarify the global distribution of global DP2 current system. To attain this goal, we analyzed longitudinal distribution of DP2-type geomagnetic disturbances along the dayside magnetic equator using MAGDAS data [K. Yumoto et al., 2006 and 2007]. We found that the peak amplitude of DP2 is located around 11LT. This distribution profile is different from Cowling conductivity's profile produced by conductivity model calculated using data of WDC for geomagnetism, Kyoto. To establish this conductivity model, IRI model [D. Bilitza, 1990] and NRLMSISE-00 model [M. Picone et al., 2001] are used to derive the parameter of ionized atmosphere and neutral atmosphere respectively. The difference between DP2 and Cowling conductivity indicates that the electric field has a strong peak at the morning side. If the conductivity distribution along dayside dip-equator is not proportional to the asymmetry of DP2 distribution, the asymmetry may not be explained by the Pedersen circuit model [Kikuchi et al., 1996]. On the other hand, the asymmetry can be explained by Cowling channel model [Yoshikawa et al., 2012], in which the induced charge along the terminator line of day and night and dayside dip equator generates a channel between polar and equator ionosphere regions. According to this theory, the asymmetric distribution of electric field and DP2 signal along the dayside dip equator is produced by the Hall current convergence from the polar region into the morning side dip equator. However, to validate this theory, we need further investigation of the DP2 profile in low and middle latitudinal regions.