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FM-CW レーダーと MAGDAS によって観測された長周期の磁場・電場変動
Relationship between long-period electric and geomagnetic field oscillations observed by FM-CW Radar and MAGDAS

池田 昭大[1*], 湯元 清文[1], 柿並 義宏[2], 篠原 学[3], 野崎 憲朗[4], 長妻 努[4], 吉川 顕正[5], B. M. Shevtsov[6], V. V. Bychkov[6], Q. M. Sugon, Jr.[7], D. McNamara[7]
Akihiro Ikeda[1*], Kiyohumi Yumoto[1], Yoshihiro Kakinami[2], Manabu Shinohara[3], Kenro Nozaki[4], Tsutomu Nagatsuma[4], Akimasa Yoshikawa[5], B. M. Shevtsov[6], V. V. Bychkov[6], Q. M. Sugon, Jr.[7], D. McNamara[7]

[1] 九州大学宙空環境研究センター, [2]NCU,Taiwan and Hokkaido Univ., [3] 鹿児島工業高等専門学校, [4] 情報通信研究機構, [5] 九州大学理学府地球惑星科学科, [6]IKIR, Russia, [7]Manila Observatory, Philippines
[1]SERC, Kyushu Univ., [2]NCU, Taiwan and Hokkaido Univ., [3]Kagoshima National College of Technology, [4]NICT, [5]Dept. of Ear. and Pla. Sci., Kyushu Univ, [6]IKIR, Russia, [7]Manila Observatory, Philippines

Long-period oscillations are observed globally by the ground-based magnetometers. In particular, low-latitude and equatorial long-period oscillations (ex. Pc 5 pulsation) have been attributed to DP 2 type current system in the ionosphere. However, observations in the ionosphere are not so much reported. We believe that more extensive use of HF radars will lead to a better understanding of long-period oscillation.

The present study is based on the data from an FM-CW radar located at Sasaguri, Japan (SAS; M. Lat. = 23.2 degree, M. Lon. = 199.6 degree, LT = UT + 9.5 hrs). The FM-CW radar measure reflected radio waves from targets (e.g., ionized layer) as well as Doppler shift of those. East-west electric field in the ionosphere is estimated from the observed Doppler shift.

On 30 October 2003, long-period (1-8 mHz) magnetic oscillation was observed at equatorial station YAP (YAP: M. Lat. = 1.49 degree, M. Lon. = 209.1 degree) and low-latitude station Kuju (KUJ; M. Lat. = 23.6 degree, M. Lon. = 203.2 degree) in ground magnetic horizontal northward components (H). The FM-CW radar at SAS also detected the oscillation of the ionospheric east-west electric field Ey. These stations were located at a daytime sector during the event. The coherence between the Ey with the H at YAP showed higher coherence than that of between the Ey and the H at KUJ. Also the oscillation showed an equatorial enhancement. Thus our results suggested that the oscillation is caused by the DP2-type current system rather than by the global compression or field line resonance. The phase difference between the Ey and the H at YAP decreased with increasing frequency of oscillation. The phase relation is consistent with between currents and electric fields of the LR circuit in the equatorial high conducted ionosphere. In other words, the long-range oscillation in H at daytime was excited by the ionospheric electric fields.