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CubeSat による超低高度域 (<400km) での Sq 電流観測計画
CubeSat Project for the observation of Sq current at extreme low altitude

北村 健太郎 [1*] ; 今井 一雅 [2] ; 高田 拓 [2] ; 篠原 学 [3] ; 池田 昭大 [3] ; 若林 誠 [4] ;
高専スペース連携 グループ [1]
KITAMURA, Kentarou[1*] ; IMAI, Kazumasa[2] ; TAKADA, Taku[2] ; SHINOHARA, Manabu[3] ; IKEDA, Akihiro[3] ;
WAKABAYASHI, Makoto[4] ; KOSEN SPACE COLLABORATION, Group[1]

[1] 徳山工業高等専門学校, [2] 高知工業高等専門学校, [3] 鹿児島工業高等専門学校, [4] 新居浜工業高等専門学校
[1]National Institute of technology, Tokuyama College, [2]National Institute of technology, Kochi College, [3]National Institute of technology, Kagoshima College, [4]National Institute of technology, Niihama College

It is well known that Sq (Solar quiet) current in the dayside ionosphere has been considered as a significant subsequence of Mesosphere-Ionosphere-Magnetosphere coupling. The intensity and the pattern of the Sq current often vary due to the magnetospheric disturbances such as magnetic storms and substorms while the fundamental pattern of the current is determined by the global distribution of the tidal wind flowing in the mesosphere. The study of the Sq current has been conducted by many investigators from various view points of the M-I-M coupling. In particular, the north-south asymmetry of the potential has been focused in terms of the energy balance between each hemisphere through the field line. In order to explain this potential asymmetry, an InterHemispheric Field Aligned Current (IHFAC) was theoretically predicted by *Maeda* [1974] and Fukushima [1979, 1991]. After that the ground magnetic observations supported such idea [*Takeda* 1990; *Stening* 1989; *Fukushima* 1994]. However the detailed morphology of the IHFAC is not well understood yet, despite that the direct detection of the IHFAC at Low Earth Orbit (LEO) was reported in the observation by the Ørsted satellite [*Yamashita* and *Iyemori*, 2002] and the CHAMP satellite [*Park et al*., 2011].

We think that the in-situ satellite observation in the lower altitude and the smaller inclination compared to the Ørsted (Altitude=760km, Inc.=97deg.) and the CHAMP (Altitude=454km, Inc.=87deg.) can be an efficient approach to reveal the morphology of the Sq current. In order to investigate the electromagnetic M-I-M coupling of the Sq current system including the IHFAC, the in-situ observation by a CubeSat (2U or 3U size satellite emitted from ISS) just above the coupling region closed to the foot print of IHFAC with the altitude of less than 400km (F region in the ionosphere) is planned in collaboration with 8 national colleges which belong to National Institute of Technology (KOSEN). The fluxgate magnetometer and the impedance probe are considered to be installed in the satellite to observe the small perturbation of the magnetic field and the electron density.After the ejection from the ISS, the CubeSat will gradually glide down to the upper atmosphere due to the strong atmospheric drag and finally burn up in it. The duration of the possible observation is estimated for more than 50 days. Such an extremely low cost satellite enables to conduct the observation in the lowest altitude where the conventional satellite cannot be operated because of a low cost-effectiveness.

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