

Magnetic Field Measurement in the Ionosphere by using 2U-size CubeSat

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We started a development of CubeSat with the dimension of 20*10*10 cm under collaboration with 10 colleges to observe the small perturbation of the geomagnetic field at the LEO. Focus of the observation is to understand the global distribution of the Sq (Solar quiet) currents flowing in the dayside ionosphere, and to try an in-situ observation of the InterHemispheric Field Aligned Current (IHFAC). In particular, the IHFAC was theoretically predicted by Maeda [1974] and Fukushima [1979, 1991] to interpret the north-south asymmetry in the potential pattern. However, the fine structures and natures of IHFAC have not been well understood, although there are several observations of IHFAC from the ground magnetic observation and satellite observations (e.g. Yamashita and Iyemori, 2002, and Park et al., 2002).

In this study, the fluxgate magnetometer is installed in the CubeSat to observe the 3D fine structures of Sq current system. The thermal vacuum test was conducted for the fluxgate magnetometer to confirm the temperature drift of the sensor. As a result, the temperature drift of the magnetic sensor is less than 1nT/degree which is satisfy the requirement of the specification for observations of the Sq current. In addition, the fundamental feasibility studies depending on the electric power budget, orbital life time, the communication capacity, and specification of the magnetometer show that the observation of the Sq current by CubeSat is well feasible with a short duration of the development and quite low-cost.

Keywords: CubeSat, Sq current system, Fluxgate magnetometer