Adjustment of the offset level for the simplified magnetometer using MI sensor

Kentarou Kitamura[1]; Rei Tanaka[2]; Masahito Nose[3]; Teiji Uozumi[4]; Akimasa Yoshikawa[5]
[1] NIT,Tokuyama.; [2] NIT, Tokuyama College; [3] DACGSM, Kyoto Univ.; [4] ICSWSE, Kyushu Univ.; [5] ICSWSE/Kyushu Univ.

Geomagnetic observation to understand plasma dynamics in the magnetosphere has been conducted by many investigators from the nineteenth century. In order to observe the magnetic perturbation with the accuracy of ˜0.1 nT, the fluxgate magnetometer has been usually installed in many artificial satellite as well as on the ground observations.

Kanno and Mori (1997) suggested that a permeability of an amorphous wire varies with the intensity the ambient magnetic field strength. This causes a linear proportional relationship between a skin-depth of the RF current in the wire and an ambient magnetic field. The magnetic sensor by using this basis was produced as the MI (Magneto-Impedance) sensor.

In this study we attempt to apply the MI sensor to an actual magnetometer for the geomagnetic observation. In order to use the MI sensor in the actual geomagnetic observation, it is required to modify the electronic circuit such as the removal of the AC coupling to measure the DC field. The dynamic range of output voltage is from 0 to 5 V which corresponds to +/- 4000 nT of the magnetic variations. However, the output voltage for the total magnetic field intensity could not be calibrated so that the output voltage often saturates with the large geomagnetic field. We develop a sensor case with the solenoidal coil to adjust the offset level, and installed the prototype magnetometer at Sasaguri test field in March, 2017. The measured data obtained in this test observation shows the strong temperature dependence of the MI sensor although the offset level of the magnetic field could be well adjusted. These results indicated that we need more reasonable contraption to compensate the temperature dependence of the MI sensor.