R006-P09
ポスター１：11/4　PM1/PM2 （13:45-18:15）

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Field-aligned currents associated with pulsating auroral patches: Observation with Magneto-Impedance Magnetometer on board LAMP

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Magneto-impedance (MI) effect is described that the impedance of an amorphous wire sensitively changes as a function of an external magnetic field when a high-frequency current is applied through the wire as a carrier. A micro-size magnetic sensor that utilizes this effect becomes commercially available. We made some modifications to the commercially available MI sensors as they can cover the range of the geomagnetic field. Ground observations with the MI sensors revealed that they can record geomagnetic field variations with amplitudes of ~1 nT which were also observed with a fluxgate magnetometer. This suggests that MI sensors are useful for researches in geomagnetism or space physics, although they are much less expensive than fluxgate magnetometers.

For an experimental performance test of MI sensors on sounding rockets, we have been developing a triaxial magnetometer using the modified MI sensors (Magneto-Impedance Magnetometer, MIM) since autumn 2018. MIM is composed of the sensor component (MIM-S) and the data processing electronics component (MIM-E). MIM-S measures the geomagnetic field in the range of +-80,000 nT with a sampling frequency of 200 Hz and has the noise level of approximately 50 pT/sqrt(Hz). The dimensions, mass, and power consumption of MIM-S are as small as 70 mm by 70 mm by 50 mm, <0.5 kg, and ~3 W, respectively. MIM-E digitizes the output from MIM-S with a 24-bit A/D converter, resulting in a nominal resolution is ~10 pT, and processes the data with a Raspberry Pi3. Its dimensions, mass, and power consumption are 150 mm by 150 mm by 44 mm, ~1.3 kg, and ~6 W, respectively. We have conducted a thermal vacuum test, a vibration test, and an orthogonality and sensitivity calibration of MIM, and provided it with the Loss through Auroral Microburst Pulsations (LAMP) sounding rocket.

The LAMP sounding rocket was launched at 11:27:30 UT on March 5, 2022 from Poker Flat Research Range, Alaska at altitude of ~430 km. MIM successfully made an observation of the geomagnetic field in the ionosphere during pulsating aurora. This is the first mission that delivers MI sensors at the ionospheric altitude by a sounding rocket. From a detailed analysis of the MIM data, we found magnetic field variations at approximately 220 km altitude which are likely caused by small-scale field-aligned currents associated with pulsating auroral patches. In presentation, we will display data from LAMP/MIM and propose a possible model of the field-aligned currents to explain the observation. We will also discuss future possibility of MI sensors as magnetometers for sounding rockets or microsatellites.