

Experimental observations of geomagnetic field with magneto-impedance sensor

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In geomagnetism or space physics, magnetic field variations are usually measured with the fluxgate magnetometer. This instrument has a high resolution of the order of 0.1 nT or less, which is enough to detect various geomagnetic phenomena, such as geomagnetic pulsations, Sq variations, and geomagnetic storms. However, since one fluxgate magnetometer generally costs a few tens of thousand US dollars, it is difficult to deploy network observations with a limited amount of research grants.

Magneto-impedance (MI) effect was discovered about 25 years ago and a micro-size magnetic sensor that utilizes this effect becomes commercially available. It costs approximately 500 US dollars for a single-axis sensor. We made some modifications to the commercially available MI sensors as they can cover the range of the geomagnetic field ($\pm 50,000$ nT). For the period of March 30 to April 27, 2018, we conducted experimental observations of geomagnetic field variations with the MI sensors at Mineyama observation site, which is located about 100 km north-west of Kyoto. Data obtained with the MI sensors were compared with those from the fluxgate magnetometer that have been working at the site. Results showed that the MI sensor recorded geomagnetic variations with amplitudes of ~ 1 nT that were also detected with the 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. In presentation, we will display observation data from both the MI sensors and the fluxgate magnetometers at Mineyama. Future plans will be also discussed.