西オーストラリア・カルグリー地域における小型無人航空機 Ant-Pane4-1 と磁気抵抗型磁力計による空中磁場探査

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Aeromagnetic Survey by Small Unmanned Aerial Vehicle with MR-Magnetometer at the Kalgoorlie area, Western Australia

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We have developed the technology of small drones (unmanned aerial vehicles (UAV)) and an onboard magnetometer focussed on the aeromagnetic surveys under the Ant-Plane project. We succeeded long distant flight to 500km with magnetometer by Ant-Plene4 drone collaborated with Geoscience, Australia, in March 2006.

The survey was performed in the area 10kmx10km around Mt. Vetters Station, Kalgoorlie, West Australian. The magnetic data are obtained from 41 courses (250m in interval) of EW dierction. The altitude of the flight was 900m from sea level and 500m from the runway.

The Ant-Plane #4 consists of 2.6m span and 2.0m length with 2-cycles and 2-cylinder 85cc gasoline engine, GPS navigation system by microcomputer and radio telemeter system. The total weight is 25kg including 12.4 litter fuels and the coursing speed is 130. The magnetometer system consists of a 3-component magneto-resistant magnetometer (MR) sensor (Honeywell HMR2300), GPS and data logger.

Three components of magnetic field, latitude, longitude, altitude, the number of satellite and time are recorded in every second during 6 hours. The sensitivity of the magnetometer is 7 nT and we use a total magnetic field intensity for magnetic analysis due to unknown direction of heading of the plane.

MR-magnetometer sensor was installed at the tip of a FRP pipe of 1m length, and the pipe was fixed to the head of the plane in order to reduce the plane magnetization. After 4 hours 14 minutes from the takeoff, the 500km flight was accomplished and the magnetic data were stored in the data logger.

The straight flight course was almost consistent with the way point course, but the the course was drastically disturbed when the plane was turning. The noise level of magnetic magnetic field was increased to 30nT, when the plane was flight in the tail wind. However, it is much higher when the plane flied in the head wind. The anomaly pattern obtained Ant-Plane 4 was compared with the magnetic anomaly pattern published by Geoscience Australia. Both pattern were consistent, although the pattern obtained form the tail wind flight was not similar in some parts. Consequently we conclude that the magnetic survey by small drone and MR-magnetometer is possible in the calm wind. The magnetic noise might be increased by the heading change due to turbulent flow because of angular deviation of the x-, y- and z-components of MR magnetometer.