

南極半島ブランスフィールド海峡の磁気観測計画

船木 實¹、東野 伸一郎²、坂中 伸也³、中村 教博⁴、岩田 尚能⁵
¹極地研究所、²九州大学、³秋田大学、⁴東北大学、⁵山形大学

A project on magnetic survey in Bransfield Strait, Antarctic Peninsula

M. Funaki¹, S.Higashino², S.Sakanaka³, N.Nakamura⁴, N.Iwata⁵
¹NIPR, ²kyushu Univ., ³Akita Univ., ⁴Tohoku Univ., ⁵Yamagata Univ.

This study contributes to understanding the opening mechanism and the evolution of tectonics in Bransfield basin in the area of Antarctic peninsula from the viewpoints of magnetic anomaly, paleomagnetism, geology and geochronology.

Unmanned Aerial Vehicle (UAV), onboard 3-axes fluxgate magnetometer and 3-axes magneto-resistant magnetometer were developed for aeromagnetic survey in Antarctica. The UAV (Ant-Plane 6-2 and 6-3) is made of fiberglass, and the wings are made of balsa wood on a styrene base. The plane is a pusher type, equipped with an 86 cc horizontally opposed two-stroke gasoline engine. A 20 W dynamo is connected to the engine to supply electric power to the plane. The plane uses the autonomous navigation system and transmitter, and flight data are monitored at the ground station when the plane is located within a radius of 5 km (maximum 20 km). If problems occur during flight, an emergency parachute opens automatically. The plane can fly continuously for up to 4 hours at a cruising speed of 100 km/h with a payload of 2 kg. A 1-m-long pipe can be attached to the nose of Ant-Plane 6-2 and 6-3 to enable the installation of a magnetometer sensor. Ant-Plane (3-4 and 3-5), a scale model of the Grob G109, is a tractor-type model plane with a 20cc single-cylinder four-stroke gasoline engine. The plane controlled by the autonomous navigation system can fly continuously for up to 3 hours at a cruising speed of 100 km/h with a payload of 0.5 kg. A generator is connected to the engine to supply power for servomotors and a radio receiver. Magneto-resistant magnetometer is installed at the tip of wing.

Four UAVs (Ant-Plane 6-2 and 6-3, Ant-Plane 3-4 and 3-5) are used in Marsh Airfield for aeromagnetic survey. The flight areas are 50x100km in Bransfield Strait and the southern part of King George Island. The survey was not satisfied due to the strong wind, bad weather and the restriction at the control tower in Marsh Airfield. The first flight by Ant-Plane 6-3 was successful in calm and fine weather. The other 2 flights were not satisfactory due to some mechanical problems resulting from strong wind or other reasons. The outline of the first flight was as follows

UAV: Ant-Plane 6-3

Purpose: autonomous flight during 1 hour around Marsh Airfield to adjust the best flight parameters for autonomous flight system and to confirm data records of the magnetometer system

Weather: fine, wind: ca 3 m/s, wind direction: unidentified (300m above), temperature: 5 °C

Results: • Normal flight by autonomous system in the southern hemisphere

- Normal flight by autonomous flight under low temperature
- Confirmation of control gain of autonomous flight. However, more precise adjustment of the gain parameters is requested.
- Confirmation of the operation for 2-cycle gasoline engine situation and fuel consumption under low temperature environment. However, variation of engine rotation at the same throttle command occurred.

• GPS of magnetometer were disturbed by noise produced from UAV, while significant magnetic data were obtained after movement of the GPS antenna.

• Reasonable magnetic data (Fig. 1) was obtained by the 3-axes fluxgate magnetometer during the cruising

The magnetic survey on the ground elucidated the strong magnetic anomaly along Marian Cove around King Sejong Station. The results are presented in this symposium by Sakanaka et al.

The rock sampling for dyke rocks was carried out at the southern part of Fildes Peninsula, Weaver Peninsula and Barton Peninsula. Dyke rock samples collected with a small engine drill and a hammer are carried out around Esquedero Station and King Sejong Station. The rocks of Fildes Peninsula were altered, but those of the other sites were relatively fresh.

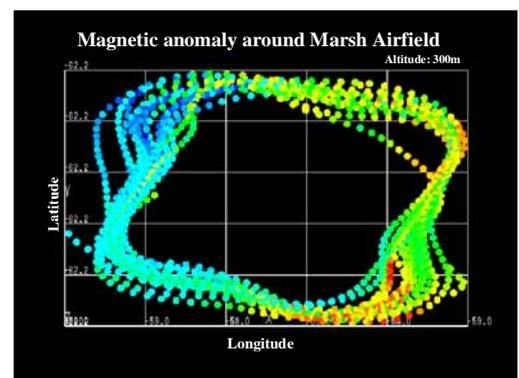


Fig. 1 Aeromagnetic field intensity around Marsh Airfield observed at the first flight, elevation of 300m