臺灣東部地區空中磁力探測(3/3)

The Advanced Research for Monitoring Volcanism in Northern Taiwan: The Airborne Magnetic Survey in Eastern Taiwan (3/3)

主管單位：經濟部中央地質調查所

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摘要

為了增進對臺灣東部深部地質構造及火山活動特性的瞭解，全程計畫針對花東縱谷南段瑞穗至鹿野間區域進行區域性空中磁力探測，範圍涵蓋臺灣東部四大主要地質區，由西向東依序為脊樑山脈地質區片岩帶、脊樑山脈地質區板岩帶、花東縱谷地質區及海岸山脈地質區，本年度探測範圍介於初來至鹿野之間。

本計畫產出了網格間距 100 m 的高解析度全磁力網格及各種磁力異常網格，並運用三維磁化向量逆推技術，獲得高解析的三維磁化向量模型。藉由分析磁力特徵並與既有地質圖比對，顯示分佈在脊樑山脈東側的淺部塊狀高磁異常體，其厚度約 3 km 上下，對應出露於脊樑山脈東側的超基性岩體，分佈在海岸山脈淺部的高磁岩體呈現明顯的條帶分布，其厚度約介於 2 km 上下，對應都鑾山層；海岸山脈東西兩側零星分布的小範圍高磁岩體，厚度大多約僅 1 km 上下；而海岸山脈條帶高磁岩體間的磁力低區，則對應弧間盆地。深部的高磁基盤呈現北北東方向條帶分布，探測範圍內由西向東共有 3 組高磁條帶，具有兩相鄰條帶間磁化方向近乎相反的海洋地殼特徵。特別是板岩帶與花東縱谷下方的海洋地殼，介於兩磁化方向相反的塊體間，有高角度南北向至東北-西南向的橫移斷層帶，可歸為位於板塊邊界的轉形斷層帶。

海岸山脈岩體由中新世火山岩體與上覆碰撞盆地構成，位於利吉斷層為東界的海洋地殼相關高磁條帶基盤上；與 107 年度所見相同的是，泰源盆地明顯受到利吉斷層截切並疊置成兩層，延伸往南逐漸尖滅。此外，106-107 年測區位於板岩西側，出露於玉里帶的海洋地殼塊體，延伸至本年度測區已位於測區外，但下伏於板岩層下方有巨厚海洋地殼塊體。宏觀而言，條帶狀且具磁極反轉特性的高磁基盤反映海洋地殼分布，自玉里帶往東南傾斜至海岸山脈下方，上界或東界與利吉斷層在深部相會；整體形貌呈現巨型複褶皺與覆瓦狀構造為主，並向東南傾斜延伸至外海下方。地表分布的鹿野斷層、池上斷層與卑南山斷層，往地下垂直延伸至海洋地殼塊體中，呈現縱切上部地殼的橫移構造，因斷層帶兩側分屬不同條帶磁力特性，具有轉形斷層特徵，並提供深層熱體上湧的通道，因此地熱分布與轉形斷層帶息息相關。

關鍵詞：空中磁力探測、火山地質、海岸山脈、花東縱谷、板塊構造

Abstract

The purpose of this three-year project (FY106-108) is to improve understanding of the deep geological structure and volcanic characteristics in eastern Taiwan by conducting an aeromagnetic survey in the southern section of the Longitudinal Valley. The survey area has been conducted covering Ruishui and Luyei areas from west to east across four major geological provinces in East Taiwan, such as the Backbone Range Schist Zone, the Backbone Range Slate Zone, the Longitudinal Valley, and the Coastal Range provinces. The surveying area in this year is between Chulai and Luyei.

The high-resolution total magnetic intensity grid and various magnetic anomaly grids with a gride size of 100 m have been compiled in this project; besides, a high-resolution magnetization vector model is generated by 3D inversion techniques. Comparing aeromagnetic characters and geological maps, it is evident to present the good relationship between magnetic anomalies and geological rock bodies in shallow depth. The block-like high-magnetic anomalies in the Backbone Range are closely related to the ultra-basic rock bodies and can extend to the depth of about 3 km. The high-magnetic belt anomalies in the Coastal Range is well related to the Tulanshan formation with a thickness of about 2 km. The thickness of the local high-magnetic anomalies distributed in the eastern and western side of the Coastal Range is about 1 km. The low-magnetic area between the high-magnetic belts is associated with the intermontane basin. The NNE-trending high magnetic belts can be separated into 3 sets, two adjacent belts with nearly opposite magnetization directions, as geomagnetic reversal of oceanic crust. In particular, the oceanic crust beneath the Slate Zone and the Longitudinal Valley between the blocks with opposite magnetization directions, with high-angle north-south to northeast-southwest-oriented transverse fault zones, can be classified as transform faults at the plate boundary.

The Coastal Range with oceanic basements, located east of the Lichi Fault, is composed of the Miocene volcanic bodies and overlain collisional basins. Similar to the result reported in the FY107 report, the Taiyuan basin cross-cut by the Lichi Fault underground and, therefore, had been stacking into two layers where gradually pinch out southward. On the otherhand, oceanic bodies crop out in the Yuli Belt mentioned in the FY106-107 reports extend off the survey area of the FY108; however, extending oceanic huge bodies underground underlain the slate formations. Within this broad perspective, the oceanic origin crust from the Yuli Belt dipping southeastward extent to underneath of the Coastal Range, upper bound connected to the Lichi fault as well as composed macrostructures of multi-folding and stacking structures,extending to deep offshore seabeds. The Luyei fault, Chishan fault and Peinanshan fault cropping out along surface can be identified in the 3D magnetic model that extent vertically into the oceanic basements. Furthermore, the direction of the magnetization vector of most high-magnetic rocks is slightly different from the present inclination of the geomagnetic field in between the strike-slip, subvertical faults with obvious characters of the transform faults in upper crust. These transform faults truncate shallow crust

to provide pathways for deep upwelling materials. It is likely to become the critical paths for deep geothermal sources to move upward.
Keywords：airborne magnetic survey, volcanic geology, Coastal Range, Longitudinal Valley, plate tectonics