

Integrated Airborne Geophysical and Geological Data in Identifying the Tectonic Settings and Mineralization in Thailand

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Abstract

Airborne geophysical, regional gravity and new geological data of Thailand are synthesized for determining tectonic setting and associated mineralization. These data (with RTP, analytical signals, and first derivative enhancement techniques) are applied for tectonic/geological interpretation. The result reveals four geophysical domains, namely the western, central, eastern, and Khorat Plateau domains. These domains follow the N-S trending tectonic features, except for the Khorat Plateau domain. The results correspond with the tectonic units previously determined by geological syntheses and the new geophysical discontinuities can be delineated with more confidence. The western domain has low magnetic, high radiometric, and low gravity values and is subdivided into 2 subdomains. The subdomain to the west displays lower gravity and weakly residual magnetic anomalies and conforms with the Shan Thai terrane. The subdomain to the east has low gravity and residual magnetic values with small patches of high signatures and corresponds to the Inthanon basements. However, both subdomains occur in the terrain dominated by Sn-REE-related, S-type granites of Western and Central Granite Belts. The central domain has higher magnetic/radiometric responses and low gravity anomalies, and it conforms with the Sukhothai belt dominated by I-type igneous rocks with Fe-Sb-W-Au mineralization. Gravity discontinuity between the western and central domains can be delineated. The eastern domain shows strong magnetic responses and weak radiometric/gravity values and corresponds with the Loei belt dominated by I-type magmas with Cu-Fe-Au-Ag deposits. This domain displays obvious discontinuity to the east bordered by the western Khorat Plateau and to the west by the Nan suture. The central and eastern domains are equivalent to the Eastern Granite Belt. The Khorat Plateau domain illustrates peculiar airborne responses by low alternated with high signatures developed in the NW – SE trend. These responses are in contrast with the overlying undeformed strata of the Khorat Plateau Group. Most geophysical domains are cut across by the NW-SE and NE-SW trending faults. The low Bouguer gravity anomaly in the granite terrain indicates a thick, lower-density crust whereas or high Bouguer anomaly represents a thin crust, higher-density crust. However, in some regions, high gravity domains are located either in complex sedimentary and volcanic terrains or in alluvial plains. The interesting domain of negative Bouguer anomalies is along the western edge of the Khorat Plateau which corresponds to the volcanic belt with small plutonic stocks. The results will be useful for constructing the metallogenic map of Thailand in the near future.

Keywords: airborne magnetic, airborne radiometric, regional gravity, enhancement, tectonic setting