Aeromagnetic map of Korea; Magnetic patterns and structural features

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Regional airborne magnetic survey is very cost-effective mapping tool. Magnetic anomaly maps have abundant information, which are an important tool for understanding the geological evolution and mineral exploration. The pattern of magnetic anomaly map is a powerful indicator of geologic structure and rock formation. Magnetic anomaly patterns primarily reflect the distribution and structural setting of magnetized material within the crust. These features including amplitude and orientation of individual anomalies or the texture of anomalous regions can provide useful constraints for geological interpretation.

KIGAM has conducted airborne magnetic mapping programme since 1982, and has coverage of almost whole the country. The latest version of airborne magnetic anomaly map was published by compiling data acquired from 1982 to 2012. The helicopter-borne surveys were flown by a line spacing 1∼2 km with control lines of 5∼8 km. The flight altitude was tried to keep 100∼150 m above ground surface with sampling distance of 30m. The data were continued to the reference level of 300 m above ground level, and regional field was reduced by 11th generation IGRF.

This paper introduced the latest version of magnetic anomaly map of Korea, and briefly examined the magnetic characteristics, with geologic characteristics and structural features of tectonic zones. Furthermore, magnetic patterns were quantitatively analyzed by using skeletonization technique.

Korea, southern part of the Korean peninsula, could be divided in 5 tectonic provinces, such as, Gyeonggi massif, Okcheon fold belt, Sobaeksan massif, Gyeongsang basin, and circum-Pacific alkali volcanic zone. Magnetic anomalies in Gyeonggi massif zone are broadly distributed with moderately high amplitude, and the dominant trend is NE, but not strong. Okcheon fold belt can be magnetically characterized as strong dominant NE trend (Sinian direction) and linear positive anomalies of high amplitude. Sobaeksan massif is magnetically characterized as diverse trend with strong amplitude in NE part and weak amplitude in SW part. In Gyeongsang basin, strong positive anomalies due to Cretaceous granites and volcanic rocks are distributed in the broad and weak field by Jurassic sedimentary rocks. Magnetic lineaments of NNE trend are disrupted by intense volcanic activities in Cretaceous period.

Magnetic lineaments were plotted by using skeletonization algorithm. Skeletonization is a syntactic pattern recognition method that is applied to gridded data to produce an automatic line drawing. The algorithms were tailored for seismic reflection profiles at first. Eaton and Vasudevan (2004) modified the technique to render it more suitable for other types of gridded data, with particular emphasis on aeromagnetic maps.

Magnetic first vertical derivative data calculated from pole-reduced aeromagnetic map were used as input of skeletonization algorithm. The event map was plotted by skeletonization process, and the orientation of the magnetic pattern was quantitatively analyzed by rose diagrams. They showed the distinguishing characteristics of magnetic pattern of tectonic provinces, which reflected their geological characteristics and structural features.