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Magnetic Constraints on the Basement Structure of the Northern Kyushu, Southwestern Japan

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Aeromagnetic anomalies in the northern part of the Kyushu Island, southwestern Japan were reduced onto a smoothed surface of 1,500 m above terrain to compile a new aeromagnetic anomaly map (total magnetic intensity) on a scale of 1:200,000 (Okuma et al., in press). The reduction to the pole anomalies were calculated from total magnetic intensity anomalies as well and compared to the geology (Ozaki et al., in press) and rock magnetic properties (Petrophysical Database of Basement rocks in Japan for the 21st Century (PB-Rock 21), http://riodb02.ibase.aist.go.jp/pb-rock21/index.html) of the area.

In general, the aeromagnetic anomalies seem to be associated with the outcrops of basement rocks such as late Cretaceous granitic rocks and Paleozoic ultramafic rocks. As for magnetic susceptibilities of the late Cretaceous granitic rocks, there are obvious differences among them: older and younger members of late Cretaceous granitic rocks show magnetic susceptibilities equal and higher than 10^{-3} (SI) and lower than 10^{-3} (SI), respectively. Exceptions are older late Cretaceous granitic rocks east of the Tagawa-Kokura fault, which show magnetic susceptibilities lower than 10^{-3} (SI). Magnetic highs lie mainly over the older late Cretaceous granitic rocks and reflect their high magnetic susceptibilities.

The most obvious magnetic anomaly of 400 nT is distributed with a wavelength of about 50km in the E-W direction over the Seburi Mountains southwest of Fukuoka. To better understand the subsurface structure of the area, 3D imaging with source volume minimization (Nakatsuka and Okuma, 2009) was applied to the aeromagnetic anomalies. An E-W cross-section of the 3D magnetic model shows the magnetization high area of 1.0 A/m occupies the Seburi Mountains with a thickness of 20km. According to the seismic activity of the area from 1923 to 2008, major earthquakes with magnitudes larger than 3.0 seem to have occurred only at the boundary of the magnetization high area but not inside. This suggests the magnetization high area indicates the distribution of the granitic body of the Seburi Mountains.

Keywords: magnetic anomalies, aeromagnetic anomaly map, rock magnetic property, 3D imaging, Kyushu