REMANENCES OF THE PAST

KARL FABIAN 1, Suzanne A. McEnroe 1, Peter Robinson 1

1. NGU, Geological Survey of Norway, N-7491 Trondheim, Norway

Crustal magnetic anomalies originate from mixtures of remanent and induced magnetizations. Runcorn's theorem implies that a homogenous crust would generate no anomalies from internal sources. All anomalies observed are therefore due to either contrast in susceptibility, anisotropy of susceptibility, variations in crustal depth, or to inhomogeneous remanent magnetizations. Previously, magnetism of the continental crust has been solely described in terms of bulk ferrimagnetism of crustal minerals, and much of it due to induced magnetization. While remanent magnetization of the crust proved crucial for dating the ocean floor, and for small scale mineral exploration, its contribution to large scale continental magnetic anomalies is commonly underrated. Recently, the study of strong negative anomalies led to the discovery of a new interface based remanence type: lamellar magnetism. Globally distributed studies now indicate that lamellar magnetism is not an exotic, but rather a ubiquitous source for remanent magnetic anomalies. The conditions for its formation and stability are currently investigated, but it certainly is not inhibited by elevated temperatures and pressures. Lamellar magnetism can form and stabilize during metamorphic burial and uplift. It is of considerable strength and probably persists deep in the crust. The other major contributor to remanent anomalies, fine grained magnetite, is coarsened and demagnetized under such conditions. It therefore seems possible that there exist remanent magnetic anomalies due to lamellar magnetism below magnetite's Curie depth. By understanding the mineral-magnetic properties of rocks from large remanent anomalies on Earth we also gain insight into possible mechanisms generating the magnetic signals on other planets, and moons of the Solar System. For example, lamellar magnetism could provide sufficient stability and intensity to explain the observed strong remanent magnetic anomalies on the southern hemisphere of Mars.

crustal magnetism, lamellar magnetism, magnetic anomalies

Karl Fabian, NGU, Leiv Eiriksons vei 39, N-7491 Trondheim, Norway
e-mail: karl.fabian@ngu.no