Characterization of the magnetic properties of the Leka Ophiolite Complex

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Abstract: A detailed magnetic survey was conducted on the Lower Ordovician Leka Ophiolite Complex (U-Pb zircon age 497±2 Ma) on the island of Leka, Norway (65°05'11'' N, 11°37'45''). The Leka Ophiolite Complex is comprised of five rock units. First is the (1) hazburgite that is strongly deformed, overlain unconformably by an increasingly rich (2) dunite, (3) ultramafic cumulates, with a sequence of olivine, chromite, clinopyroxene and orthopyroxene. These cumulates are covered with (4) metagabbros, which are cut by an increasing amount of (5) metabasalt dykes (Furnes et al. 1988). Samples were taken in either blocks, or drill core for laboratory tests. Measurements included Natural remanent magnetization (NRM), magnetic hysteresis parameters and magnetic susceptibility (χ). The Leka Ophiolite Complex is also of special interest because there is excellent exposure of rocks, which represent both the petrologic and geophysical Moho. Thin sections were also made from representative samples from the different units. In thin section magnetite can be seen as rims around chromite grains and as discrete grains with varying size (.08-20µm). High temperature magnetic moment measurements confirm a dominant Curie temperature of approximately 580°C, indicating an end member magnetite as the typical oxide. NRM values range from 0.38 to 10.1 A/m and susceptibility values ranges from 0.03 to 0.12 χ (SI). Magnetic hysteresis measurements suggest the magnetite varies from single domain to multi-domain magnetite, with most being pseudo-single domain in size. A recently acquired high resolution aeromagnetic survey by the Geological Survey of Norway shows the Ophiolite has a positive magnetic anomaly with a maximum value over 150 nT. The ratio of NRM/χ*≈51,000 nT (present field) is the Q value, and it is greater than one for most of the samples collected indicating the anomaly can not be fully modeled only from induced components, and there is an important contribution from the NRM. Detailed ground magnetic field surveys using a cesium vapor magnetometer were made in strategic locations around the island. We compare the ground and aeromagnetic surveys to look at the details of the ophiolite. This ophiolite provides the unusual opportunity to map the geophysical and petrologic Moho in addition to the hazburgite, dunite and gabbro layers. Rock magnetism and paleomagnetic measurements are used to constrain the interpretation of ophiolite evolution and modeling.

Keywords: Leka Ophiolite Complex, Moho, Magnetic Properties,

References :

Furnes et al., 1988 : The Leka Opholite Complex, central Norwegian Caledonides: field. characteristics and geotectonic significance, *Journal of the Geological Society*, v.145; p401-412.