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The Ultramafic Complex of Reinfjord: from the Magnetic Petrology to the Interpretation of the Magnetic Anomalies

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A 3D model of the geometry of the Reinfjord complex integrating geological and petrophysical data with high resolution aeromagnetic, ground magnetic and gravity data is developed.
The Reinfjord ultramafic complex in northern Norway is one of the major ultramafic complexes of the Neoproterozoic Seiland Igneous Province (SIP). This province, now embedded in the Caledonian orogen, was emplaced deep in the crust (30 km of depth) and is believed to represent a section of the deep plumbing system of a large igneous province. The Reinfjord complex consists of three magmatic series formed during multiple recharging events resulting in the formation of a cylindrically zoned complex with a slightly younger dunite core surrounded by wehrlite and lherzolite units. Gabbros and gneiss form the host rock.
The ultramafic complex has several distinct magnetic anomalies which do not match the mapped lithological boundaries, but are correlated with changes in magnetic susceptibilities. In particular, the deviating densities and magnetic susceptibilities at the northern side of the complex are interpreted to be due to serpentinization.
Detailed studies of magnetic anomalies and magnetic properties of samples can provide a powerful tool for mapping petrological changes. Samples can have wide range of magnetic properties depending on composition, amount of ferromagnetic minerals, grain sizes and microstructures. Later geological processes such as serpentinization can alter this signal. Therefore a micro-scale study of magnetic anomalies at the thin section scale was carried out to understand better the link between the magnetic petrology and the magnetic anomalies.
Serpentinization can significantly enhance the magnetic properties and therefore change the nature of the magnetic anomaly. The detailed gravity and magnetic model here presented shows the subsurface structure of the ultramafic complex refining the geological interpretation of the magnetic sources within it, and the local effects of serpentinization.