Nordkapp and Snefjord rare-metal till anomalies

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Nordkapp and Snefjord

7 permits cover an area of 70 km² at Nordkapp, Magerøya and 6 permits totalling 60 km² at Snefjord (fig. 1). The reason for the claiming is anomalously high concentrations of REE and a suite of elements (exemplified by Sn in fig. 2) in regional till samples (one sample per 30-40 km²) within a large area covering the Nordkinn and Sværholt peninsulas (claimed by other companies), and Nordkapp and Snefjord (Reimann et al. 2011). Follow-up till sampling (one sample per 2 km²) was carried out by NGU at Nordkinn in 2011 (Reimann et al. 2012).
The Nordkapp and Snefjord areas are generally higher in As, Sc, Sn (fig. 2), W, Nb, Be, Th and U and lower in Zr compared with Nordkinn and Sværholt.

Geology

The Nordkapp and Snefjord licenses are underlain by dominantly metasedimentary (psammites and pelites) successions belonging to two nappe units, the Magerøy Nappe and the Kalak Nappe Complex respectively.
The Kalak Nappe Complex overlies the Laksefjord Nappe Complex along a major thrust and covers large areas of northern and western Finnmark (fig. 3). It has been subdivided into 13-14 thrust sheets, or nappes, the highest of which includes the voluminous rift-related Seiland Igneous Province (Roberts 2007).

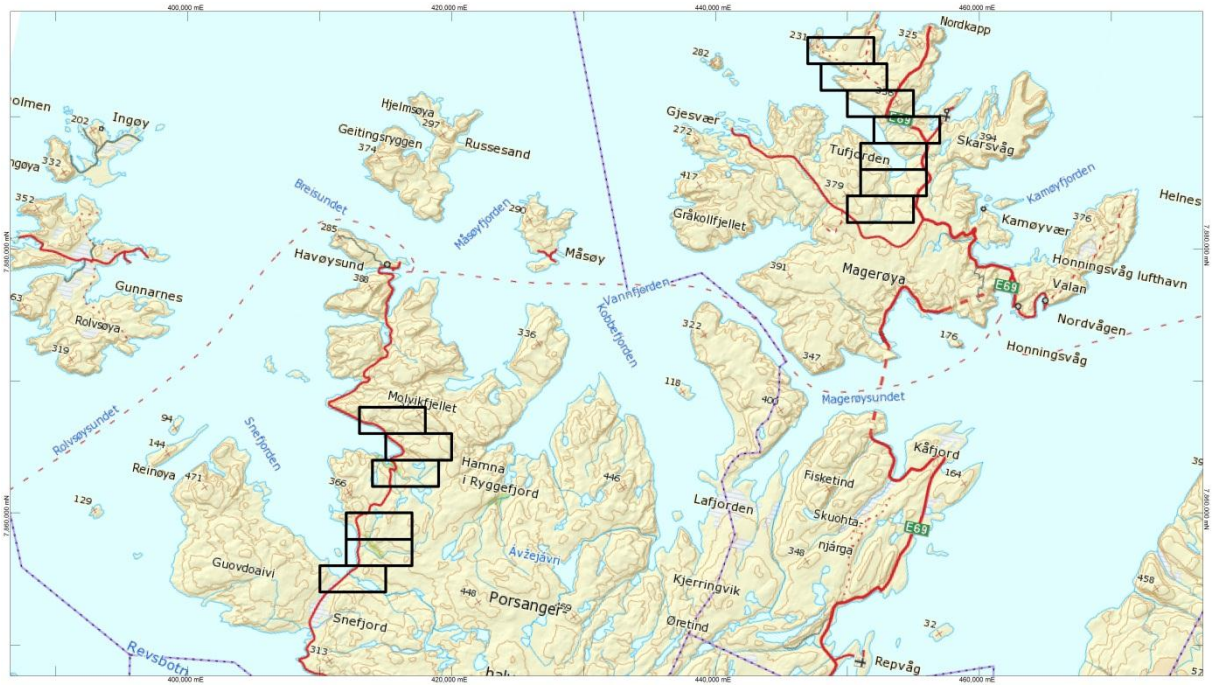

Fig. 1. Nordkapp and Snefjord permits.

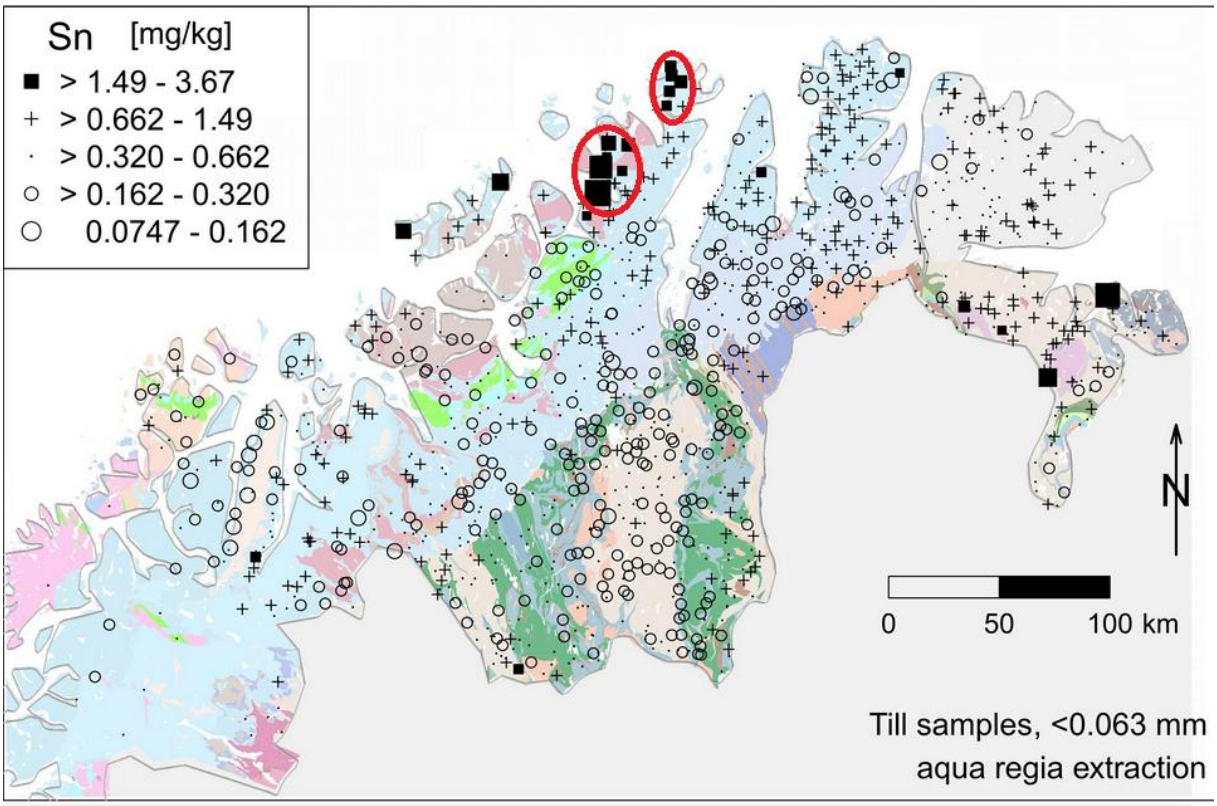

Fig. 2. Sn in till samples, NGU, Finnmark and Troms. From Reimann et al. (2011).

The Silurian Magerøy Nappe overlies the Kalak Nappe Complex and was thrust onto the Sørøy-Seiland Nappe during the early Silurian Scandian event (Andersen 1981). The Honningsvåg Intrusive Suite is intrusive into the rocks of the Magerøy Nappe, the youngest supracrustal rocks exposed in Finnmark. These include an approximately 5.5 km thick sequence of flysch-type metasediments and syn-orogenic granites in addition to the mafic/ultramafic Honningsvåg Intrusive Suite. The Magerøy Nappe lithologies underwent polyphase deformation and greenschist to amphibolite facies metamorphism during nappe emplacement in the Silurian – Early Devonian Scandian phase. The tectonothermal Scandian event also affected the Kalak lithologies that are separated from the Magerøy Nappe by a thick package of amphibolite facies mylonites.

A feature of a large number of the Neoproterozoic sandstone beds, mostly on the Nordkinn- but also recorded on the Sværholt peninsula, is the enrichment of laminae and foreset strata in a variety of heavy minerals, including Ti-magnetite, titanite, rutile and zircon (Roberts & Andersen 1985). Roberts & Andersen (1985) states that titanomagnetite is in certain layers in fact a major mineral, which could mean that it is a potential for also rare-metal heavy mineral concentrates in these rocks.

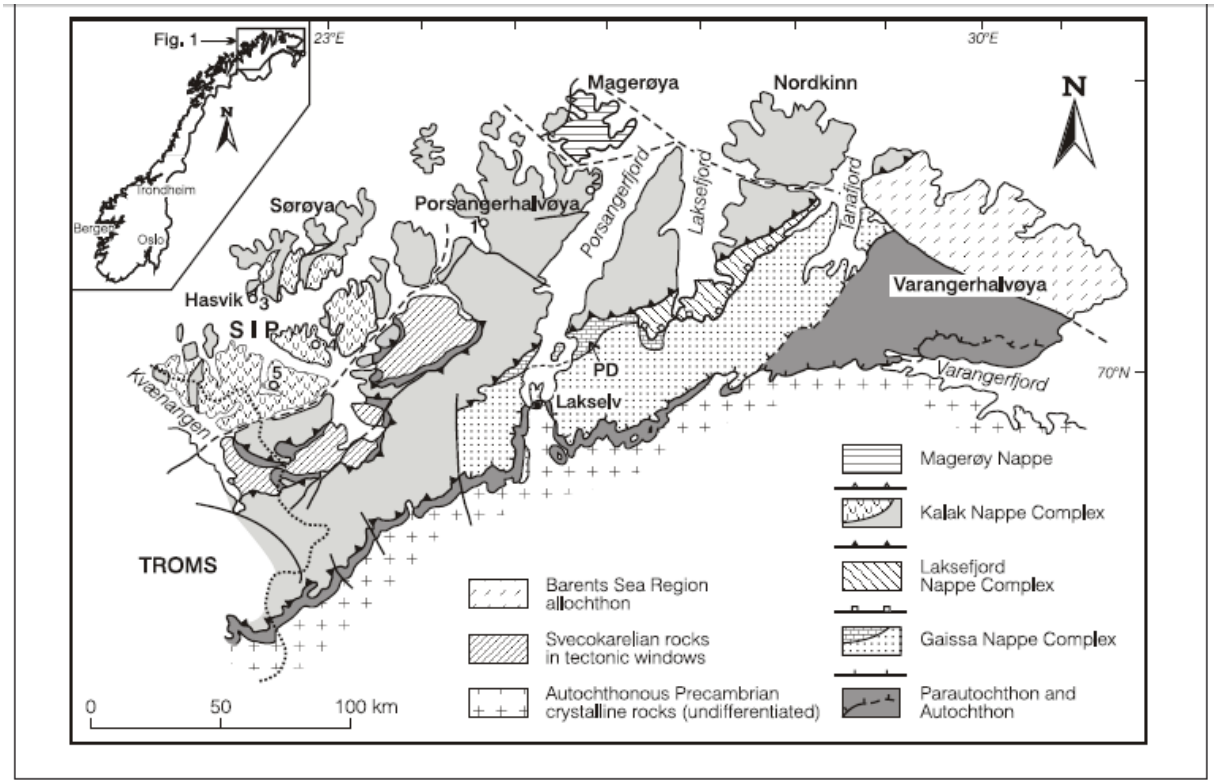

Fig. 1. Simplified tectonostratigraphy of the Caledonides of Finnmark (modified from Roberts 1985). The five small circles numbered 1-5 mark the locations of the samples dated by Daly et al. (1991), the first three of which formed the basis for their introduction of the term 'Porsanger orogeny'. 1. Litlefjord metagranite, U-Pb zircon 804 ± 19 Ma (now revised to 850 ± 15 Ma, Kirkland & Daly 2003). 2. Repvåg metagranite, Rb-Sr whole rock 851 ± 130 Ma. 3. Hasvik gabbro, Sm-Nd whole rock/minerals 700 ± 33 Ma (now revised, with a U-Pb zircon, Vendian age, R.J. Roberts, pers. comm. 2002). 4. Kvalfjord gabbro, Sm-Nd whole rock/minerals 612 ± 33 Ma. 5. Storvik gabbro, Sm-Nd whole rock/minerals 604 ± 44 Ma. PD – principal areas of outcrop of the Porsanger Dolomite (Formation). SIP – Seiland Igneous Province (V ornament).

Fig. 3. Simplified tectonostratigraphy of the Caledonides of Finnmark. From Roberts (2003).

Reconnaissance mapping

Reconnaissance mapping was carried out at Nordkapp and Snefjord early field season 2012 with still some snow cover. This revealed immature Caledonian Nappe sediments (greywacke and schists) and minor quartzite beds. No heavy mineral concentrate layers were observed. Scintillometer surveying was also conducted due to anomalous U and Th in till. Radiation was very low.
Due to the negative mapping no rock- or sediment sampling were conducted.

Weathering processes

Olesen et al. (2012) postulate that deep weathering processes may explain some of the anomalous high concentrations of heavy metals and REE in Fennoscandian till, and provide a possible explanation for the till anomalies at Nordkinn, caused by tropical weathering where the overburden may represent a glacially reworked saprolite. The observed anomalous high concentrations of REEs and heavy metals such as Cr, Ni, Mo, Zn and Pb (Reimann et al. 2011, 2012) can be partly caused by a weathering process where main elements such as K, Na and Ca have been partly removed by leaching. Similar geochemical patterns with reduced

concentrations of main elements and increased concentrations of heavy metals and REEs in till relative to the adjacent bedrock have also been reported in south-eastern Norway (Roaldset 1975, Reimann et al. 2007).

Honningsvåg Intrusive Suite

Rust staining within olivine gabbro of the Honningsvåg Intrusive Suite, along the road cut west of Storbukta attracted attention and one rock sample was collected (NO12001) from a 1 m wide massive-sulphide dyke or cumulate layer. Pyrrhotite is the major sulphide, with subordinate chalcopyrite and pentlandite. The sample assayed 0.73 % Cu, 0.32 % Ni and 844 ppm Co.

The Honningsvåg Intrusive Suite consists of several layered mafic/ultramafic intrusions and a transgressive body of igneous breccia that appears to represent a magma conduit (Robins 1998). Cross-cutting relationships show that the magma chambers – evolved by fractional crystallisation, assimilation of country rocks and periodic replenishment – were not active simultaneously but were emplaced sequentially, generally at successively higher structural levels. The sulphide showing at Storbukta occurs within Intrusion 5 of the Honningsvåg Intrusive Suite (Lundgaard et al. 2002).

Recommendation

It is recommended no follow-up on the till anomalies at Nordkapp and Snefjord. The Cu-Ni mineralisation in the Honningsvåg Intrusive Suite is worth a closer look next field season.

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