

Migmatite and granite magma formation during anatexis of granitic gneisses and metasedimentary rocks in Nordaustlandet, NE Svalbard



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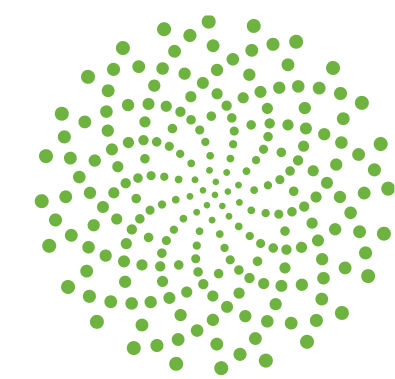


Fig. 1. The northern and central part of Nordaustlandet is comprised of Caledonian and pre-Caledonian crystalline basement, consisting of granitic gneisses, augen gneisses and migmatites.



Fig. 2. Granitic pegmatites and aplites net-vein the migmatite outcrops at Tjoholmen.



Fig. 3. Migmatite outcrops at Tjoholmen. The migmatites are net-veined by granitic pegmatites and aplites. Grain size varies a lot over short distances.



Fig. 4. Picture showing the main part of Tjoholmen



Fig. 5. Biotite rich restite present along the rims of the leucosome and the melanosome.



Fig. 6. Skarn-like diopside-calcite lenses have also been observed in the leucosomes. The lenses are interpreted to represent sedimentary xenoliths.



Fig. 7. Garnets in the core zone of the late granitic dykes in the area.



Fig. 8. Late mafic dyke at Tjoholmen



The local field inspector.

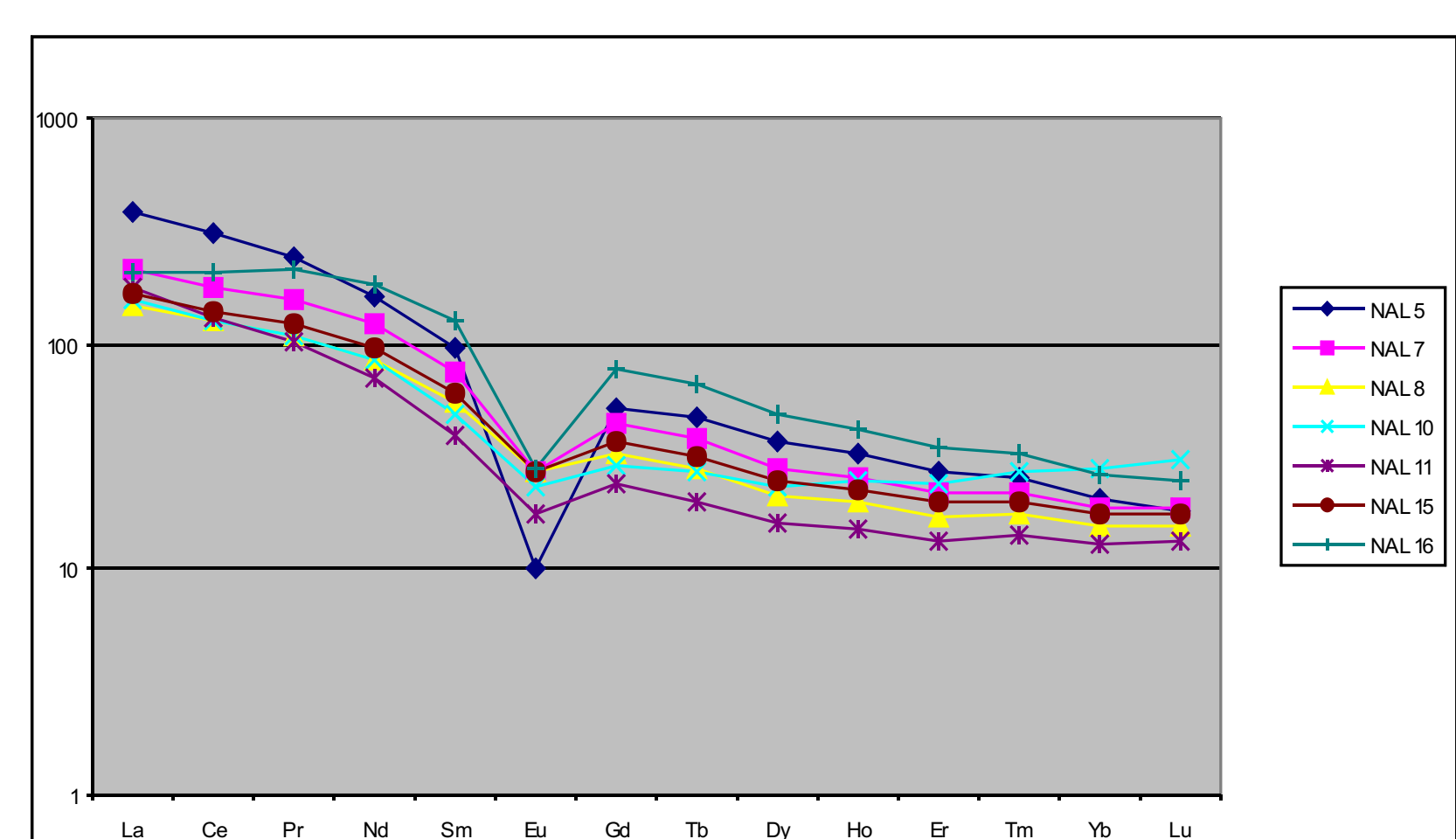


Fig. 9. Normalized REE pattern for granitic pegmatites and the aplite dykes show typical enriched LREE, and slightly depleted HREE pattern, with a clear negative Eu anomaly.

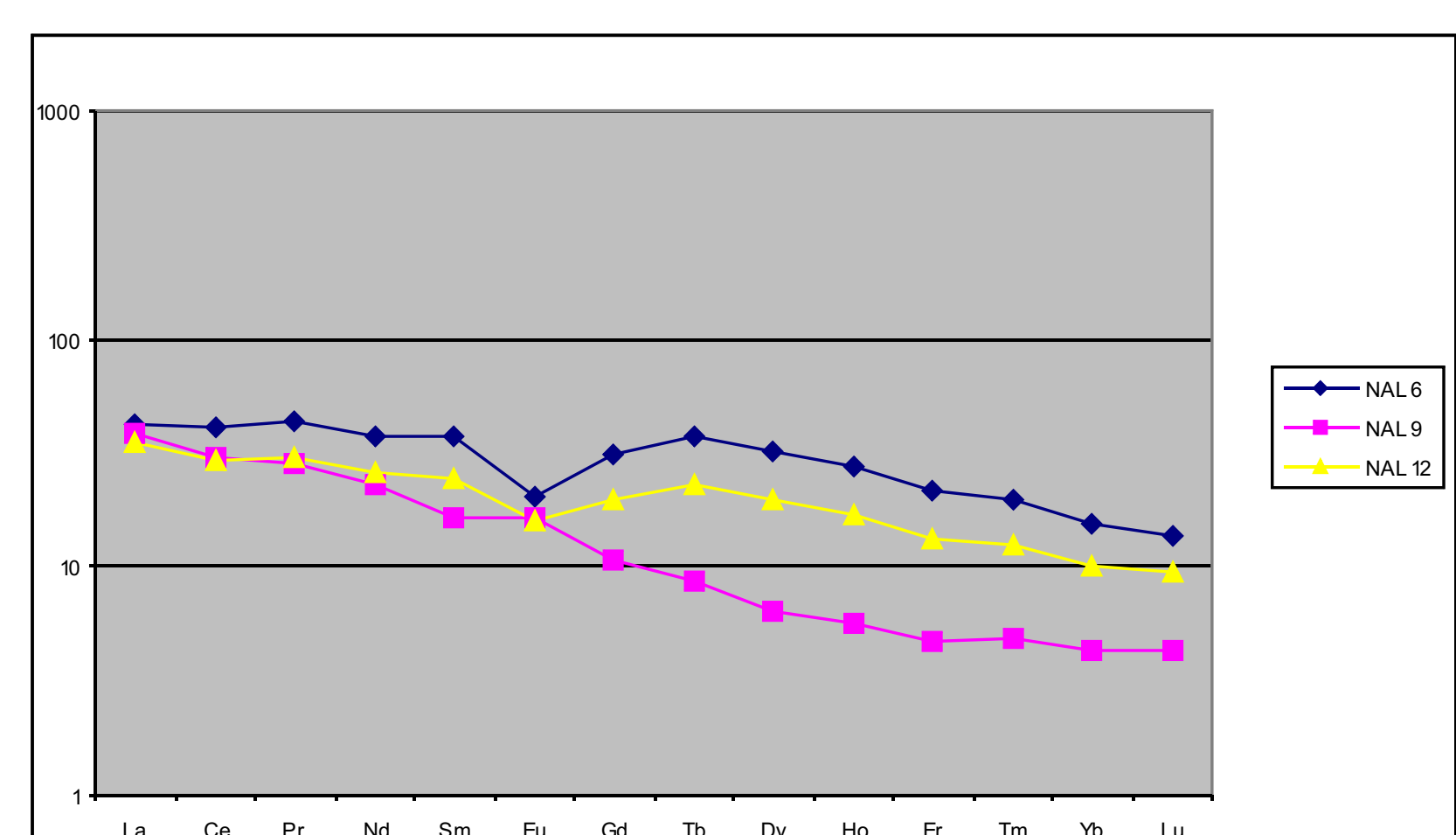


Fig. 10. Samples show flat LREE, slightly depleted HREE pattern, with only a slightly negative or positive Eu anomaly.

The northern and central part of Nordaustlandet is comprised of Caledonian and pre-Caledonian crystalline basement, consisting of granitic gneisses, augen gneisses and migmatites (fig. 1).

The granites, migmatites and gneisses, that are grouped together in the Duvefjorden complex, are spatially associated. Age dating of granitic rocks within the complex has yielded ca. 950 Ma for the augen gneisses, interpreted to represent deformed porphyritic granites, whereas the undeformed granites yield ages of 440-410 Ma (Johansson et al. 2002). The latter are peraluminous FQM crustal anatexitic two-mica granites, which intruded during a late phase of the Caledonian orogeny. Whereas isotopic and geochemical data has been published for the Caledonian granites and for the older Neoproterozoic augen gneisses, detailed petrology of the migmatites is still lacking.

The migmatites show a large variation in field appearance (fig. 3, 4, 5), texture and composition. This is for a large part due to difference in the nature of the protoliths. Different types of migmatites are also result from variable degree of melting, H₂O content, deformation and the melt fraction separated. The petrogenesis of the migmatites and associated granites is poorly understood, and the relationship between melting and deformation has not been described.

Outcrops on the island Tjoholmen in Duvefjorden expose metatexite and diatexite migmatites which are net-veined by granitic pegmatites and aplites. The migmatites appear to have formed by partial melting of augen gneisses in the presence of a H₂O-bearing fluid phase. Fluid-present melting occurred at or near the solidus and mainly involved quartz and feldspars. In the metatexite migmatites the leucosomes veins are rimmed by biotite-rich melanosomes which indicates that the partial melting did not involve breakdown of biotite or amphibole.

Normalized REE pattern for most of the granitic pegmatites and the aplite dykes show typical enriched LREE, and slightly depleted HREE pattern, with a clear negative or positive Eu anomaly (fig. 10).

Later the area has been cut by mafic dykes (fig. 8)

References

Johansson, Å., Larionov, A.N., Tebenkov, A.M., Ohta, Y. & Gee, D.G. 2002: Caledonian granites of western and central Nordaustlandet, northeast Svalbard. *Geologiska Föreningens i Stockholm Förhandlingar*, 124, 135-148.