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An overview of the geochemical evolution in the Mesoproterozoic (1.58–1.50 Ga) anorogenic complexes of central Sweden

Ein Überblick zur geochemischen Entwicklung der mesoproterozoischen (1,58–1,50 Ga) anorogenen Komplexe Zentralschwedens

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Abstract

Mesoproterozoic anorogenic rocks in central Sweden belong to the youngest group in the suite of Fennoscandian rapakivi intrusive complexes (1.53–1.47 Ga). They are typical bimodal with A-type granites enriched in Si, K, F, Rb, Zr, Hf, Ga, U, Th and REEs, and associated mafic rocks normally quartz-normative tholeiites with strong affinity for continental flood basalts. Assoiciated silicic dyke rocks of the small Rödö rapakivi intrusion show partly strongly evolved character with very high abundancies of e.g. Rb (2080), Cs (17), Nb (659), and Ga (79 ppm). Strong fractionation (60–95 %) of the major phases K-feldspar, plagioclase, quartz, amphibole and F-Ti oxides can explain this enrichment. Typical depletions in Zr, Hf, HREE, U, Th, and Y is explained by zircon, fractionation, while the characteristic LREE depletions are due to removal of bastnäsite group minerals. In addition to contamination by the rapakivi magmas, the dolerites show evidence for fractionation of mainly clinopyroxene, plagioclase, F-Ti oxides and apatite. Two groups of hybrid porphyry dykes formed by mixing of silicic and more or less evolved endmember magmas.

The coeval complexes further to the NW consists of three principal units: i) a basic unit, ii) a syenitic to peralkaline granitic, and iii) a met- to peraluminous silicic unit. The peralkaline granitic residual magmas can be formed by 50–70 % fractionation from syenitic parental magmas of the major phases anorthoclase, Fe-Ti oxides, clinopyroxene, fayalite, and apatite. This phenocryst assemblage (except fayalite) is observed in associated trachyte dykes. Combined evidence suggests that these units derive from three different source lithologies: the mantle, a K-rich mafic lower crust, and a calc-alkaline to alkali-calcic crust, respectively. The basic magmas underplated the crust and generated the two others, after which they cointruded to the emplacement levels. The presence of syenitic rocks only in the west may be related to the thorough reorganization of the lower crust in this region during the preceding Revsund intrusive event.