

Svecokarelian Thrusting with Thermal Inversion in the Karasjok-Levajok Area of the Northern Baltic Shield

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Recent mapping, isotopic dating, and metamorphic and structural observations from the Karasjok-Levajok area, lead to a tectonic interpretation that is similar in many ways to Phanerozoic plate tectonic models. Three major belts of Early Proterozoic rocks lie between two Archean gneiss complexes: the Jer'gul Gneiss Complex on the west and the Baišvarri Gneiss Complex on the east. The E-dipping Early Proterozoic belts are, from west to east: the Karasjok Greenstone Belt, the Tanaelv Migmatite Belt, and the Levajok Granulite Belt. Earlier geochemical studies suggested that the Tanaelv Migmatite Belt consists mainly of tholeiitic metavolcanites of an outer volcanic arc, and that the Levajok Granulite Belt represents geosynclinal metasediments intruded by calc-alkaline rocks of an inner magmatic arc. It is suggested here that basaltic rocks related to the Karasjok Greenstone Belt were subducted eastward, generating the arc magmatism, and contributing heat and CO₂ to produce the granulite-facies metamorphism. During later stages of the Svecokarelian event, thrusts developed parallel to the subduction zone. The granulites were thrust westward over the migmatites, which were in turn thrust over the greenstones. West-directed thrusts also developed within and beneath the Karasjok Greenstone Belt.

Thrusting of the granulite belt occurred at granulite-facies conditions and the heat from these rocks contributed to an inverted regional metamorphic gradient within the underlying Tanaelv Migmatite Belt and Karasjok Greenstone Belt. The metamorphic grade within the Karasjok Greenstone Belt increases from low grade in the western, deepest parts, to medium grade and migmatitic high grade upward, near the overlying Tanaelv Migmatites. Kyanite-bearing rocks in the deeper parts of the Karasjok Greenstone Belt contrast with sillimanite-bearing rocks in the shallower parts, and demonstrate that the metamorphism was *in-situ*, and not the result of thrusting of previously cooled high-grade rocks.

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Introduction

General tectonic models, now available for the Precambrian crystalline rocks of the Baltic Shield, help to evaluate the degree of regional thrusting and the possible role of plate tectonics in older Precambrian terranes. Within the southwestern Baltic Shield, regional thrusting may have occurred during the Sveconorwegian/Grenvillian orogenesis, about 1200 - 850 Ma ago (Berthelsen 1985). Although most of the rocks of the Baltic Shield were strongly deformed during the c. 2000 - 1700 Ma Svecokarelian/Svecofenian event, only in the far northern parts of the Baltic Shield is there definitive evidence for such old thrusting. The most recent models for these areas agree (Barbey et al. 1984, Berthelsen 1985) that a significant thrust fault, possibly a suture, marks the western border of the large Levajok Granulite Belt. The granulite belt (Fig. 1) extends from the Norwegian Caledonides over 300 km to the southeast, and the postulated thrust continues well beyond.

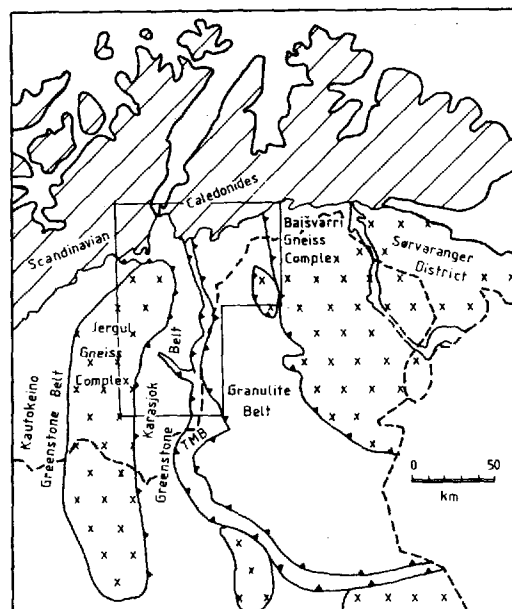


Fig. 1. Geologic sketch map of northern Norway and Finland showing the location of the Karasjok-Levajok area.