

Zircon and monazite geochronology of long-lived (>150 Myr) metamorphism and magmatism during the terminal stages of Fennoscandian Shield evolution

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The Sveconorwegian orogeny in SW Baltica comprised a series of geographically and tectonically discrete, accretionary events between 1140 and 920 Ma. These events took place behind a long-lived, active continental margin characterised by episodic voluminous magmatism and high-grade metamorphism.

Voluminous I-type granitic magmatism is recorded between 1070 and 1010 Ma, with a peak around 1050–1030 Ma. Granitic magmatism picked up again around 1000–990 Ma, but with more ferroan compositions, suggesting a change in source and/or melting conditions. This ferroan magmatism was continuous until 920 Ma, and included emplacement of an AMCG complex (Rogaland Igneous Complex, RIC), typically interpreted to have intruded at ca. 930–920 Ma resulting in a wide (20 km) contact aureole.

HT metamorphic rocks more than ca. 20 km away from the RIC yield metamorphic ages of 1050–1030 Ma, corresponding to the first peak in magmatic activity, with little evidence of younger metamorphism. In contrast, UHT rocks closer to the RIC yield ages between 1100 and 920 Ma, with an apparent age peak at ca. 1000 Ma. Ti-in-zircon temperatures from these rocks increase from ca. 760°C to 820°C at ca. 970 Ma, well before the inferred emplacement age of the RIC. This observation suggests that UHT metamorphism was not directly linked to the emplacement of the RIC, but more likely to reflect heating from mantle-derived magmas. The present-day regional distribution of UHT/HT and low-grade rocks probably reflects late-stage orogenic doming rather than contact metamorphism.

The geochronological data provide insight into processes in the lower and middle crust of a long-lived, late Mesoproterozoic continental-margin arc, on tens of Myr time scales.