



Modelling the thermal evolution of a collisional Precambrian orogen: High heat production migmatitic granites of southern Finland

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We present results of geochemical and thermal modelling on the Arc complex of southern Finland, a terrane that was affected by the Svecofennian orogeny at 1.89–1.87 Ga, and subsequently intruded by abundant high heat production late-orogenic migmatitic granites at 1.85–1.79 Ga. Our modelling suggests that the thermal evolution of the study area was a process of crustal thickening in a plate collision at ca. 1860 Ma ago, followed by conductive heating of the crust. In the modelling, we applied heat production values constrained by geochemical data in southern Finland, data on partition of U and Th in partial melting of the middle-lower crust, and a relatively low mantle heat flow. The modelled temperatures at 30–50 km depths in the imbricated crustal stack exceed the dehydration melting temperature of biotite (850 °C) at about 25 Ma after the collision, in agreement with the data on genesis of granite melts in southern Finland. The model simply explains the ~1.83 Ga high-T/low-p metamorphism in southern Finland as a natural consequence of crustal thickening (at least up to 60 km), which resulted in increased total heat production of the crust and lead to higher temperatures during the orogeny, as well as formation and transport of the high heat production granitic melts to the upper crust.