

Is mafic magmatism a heat source for the high temperature metamorphism in southern Finland?

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The bedrock in southern Finland was affected by high temperature/low pressure metamorphism (c. 600-800 °C/4-6 bars) late in the orogeny causing wide-spread crustal melting. Heat source for this is controversial. Previously, mafic intraplate or underplating was suggested as heat sources. Lately, Kukkonen and Lauri (2009) suggested that crustal thickening and radioactive decay of the earlier formed rocks led to crustal melting during the lateorogenic stage. Väisänen et al. (2012) emphasised the role of mafic magmatism in transferring external heat from the mantle to the crust. Stephens and Andersson (2015) proposed that mafic underplating was responsible for the two-stage metamorphism in SE Sweden.

There are quite new evidences, published and unpublished, which show that the crust was intruded by mafic magmas before and during the high-grade metamorphism at 1.85-1.81 Ga. Although the number of the so far discovered mafic intrusions and their areal extent are quite low, they nevertheless inevitably show that mantle-crust interaction took place at the time. It is probable that more of these intrusions will be found in the future. A hypothesis is that mantle-derived mafic magmatism, combined with ubiquitous radioactive decay, incrementally increased the crustal temperatures high enough to cause wide-spread melting and formation of migmatites and granites during the lateorogenic stage. In summary, according to the present model, all the here cited models are in part responsible for the high metamorphic temperatures.

References:

- Kukkonen, I.T. and Lauri, L.S. 2009. *Precambrian Res.* 168, 233–246.
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