

Metamorphic map of Finland

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Metamorphic map is a layer in the new 1:1 000 000 bedrock data base of Finland. It is compiled both from previous metamorphic studies and from the results of new mapping in the years 2011-2014 at the Geological Survey of Finland. Roughly half of the Proterozoic bedrock in Finland consists of metagreywackes and metapelites which record low-variance mineral assemblages which are more sensitive to PT-changes than high-variance assemblages in mafic and felsic lithologies. Consequently the Proterozoic part of the map is based on the metamorphic features of peraluminous metasedimentary rocks. In the Archean metasedimentary rocks are found only locally, the bedrock mostly consisting of tonalitic-trondhjemitic-granodioritic gneisses and amphibolite migmatites. Therefore the classification of the Archean metamorphism is based on observations in metaigneous and metavolcanic rocks apart from those areas where metasedimentary rocks are more abundant. Classification tools are mineral assemblages, preservation of primary structures, grain size and the onset and degree of partial melting. Pseudosections showing the stability fields of stable mineral assemblages for a given whole rock composition are used to constrain approximate PT conditions for the metamorphic zones. The PT field of a certain mineral assemblage is shown in the PT pseudosection with a colour which corresponds to the same colour in the map.

The metamorphic zones are classified to low pressure, medium pressure and high pressure facies series. The Svecofennian metamorphism is characterized by low pressure series with grade varying from low amphibolite to granulite facies, from andalusite schists to cordierite, garnet and sillimanite bearing migmatites. The Proterozoic cover sequence on the Archean and Proterozoic mobile zones in the Archean mostly represent medium pressure metamorphism with kyanite assemblages. The Archean metamorphism is mostly medium pressure type but both medium and low pressure granulites are found. An attempt was done to map the metamorphic age zones using the U-Pb age data on monazite, sphene and zircon from metamorphic rocks. For the Proterozoic metamorphism these data seem to indicate three events, low amphibolite facies Svecofennian schists and cover sequences mostly yielding 1.79-1.80 Ga monazite ages, migmatites in Southern Finland 1.81-1.83 Ga and migmatites in Central Finland 1.86-1.88 Ga. The strongest Archean metamorphic event was long-lasting, migmatites and granulites producing a spread of metamorphic ages from 2.70-2.60 Ga.