



Over 400 m.y. metamorphic history of the Fennoscandian lithospheric segment in the Proterozoic (the East European Craton)

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Several Palaeoproterozoic terranes in the Fennoscandian lithospheric segment of the East European Craton (EEC) evolved differently prior to their final amalgamation at c. 1.8 Ga. South-westward younging of the major tectono-thermal events characterizes the Baltic –Belarus region between the Baltic and Ukrainian Shields of the EEC. While at c. 1.89-1.87 Ga and 1.85-1.84 Ga rocks of some northern and eastern terranes (Estonia, Belarus and eastern Lithuania) experienced syncollisional, moderate P metamorphism, subduction-related volcanic island arc magmatism still dominated southwestern terranes in Lithuania and Poland.

The available age determinations of metamorphic zircon (SIMS/NORDSIM and TIMS methods, Stockholm, SHRIMP method, RSES, ANU, Canberra) and metamorphic monazite (TIMS, Stockholm and EPMA method, Warsaw University) allow to distinguish several metamorphic events related to major orogenic processes:

- 1.90-1.87 Ga amphibolite-facies H/MP metamorphism occurred along with emplacements of juvenile TTG-type granitoids in the North Estonian and Lithuanian-Belarus terranes. They are coeval with the main accretionary growth of the crust in the Svecofennian Domain in the Baltic Shield (e.g. Lahtinen et al., 2005).

- 1.84-1.79 Ga high-grade metamorphism affected sedimentary and igneous rocks in almost all the terranes and is assumed to have been related to the major aggregation of the EEC (Bogdanova et al, 2006, 2008). In the metasedimentary granulites of western Lithuania, a prograde metamorphism commenced with monazite growth prior garnet at 1.84-1.83 Ga. The sediments and mafic igneous rocks in Lithuania, felsic igneous rocks in NE Poland underwent peak metamorphism and deformation at 1.81-1.79 Ga (zircon and monazite ages). The 1.83-1.79 Ga metamorphism has the same age as a metamorphic imprint and strong shearing of the crust in central Sweden (Andersson et al., 2004). The postcollisional granulite metamorphism of mafic intrusions at 1.80-1.79 Ga in Belarus indicates that the NW-SE collision can have triggered the crustal/mantle disturbance along the Fennoscandia-Sarmatia suture zone.

- c. 1.7-1.6 Ga moderate PT metamorphic overprint and deformation of 1.83-1.82 Ga magmatic charnockites and c. 1.8 Ga metamorphic granulites in western Lithuania was recorded by the growth of a new garnet, zircon and monazite. The dated charnockites and metasediments contain metamorphic monazite of both 1.60-1.59 Ga and 1.7-1.65 Ga ages. These metamorphic events can reflect a distal influence of the 1.7-1.6 Ga Gothian orogeny in SW Fennoscandia (e.g. Ahall and Connelly, 2008).

- 1.55-1.50 and 1.50-1.45 Ga events. In southern Lithuania, the 1.53-1.50 Ga AMCG magmatism was accompanied by high-grade metamorphism. Deformation and amphibolite facies metamorphism are marked by the 1.55-1.45 Ga $^{40}\text{Ar}/^{39}\text{Ar}$ ages of hornblende along EW-trending lineaments in central and southeastern Lithuania and Belarus. There are also indications of shearing and low grade, c. 1.50 Ga, metamorphism of metasedimentary rocks and charnockites in NW Lithuania and NE Poland. Altogether, the coeval AMCG magmatism, local high-grade and widespread low-grade metamorphism, and deformation can be manifestations of the Danopolonian orogeny, particularly prominent around the South Baltic Sea.

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References

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