# Orogenic footprints in zircon: examples from the Baltic Shield

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Metamorphic rocks investigated across orogenic provinces in the southern Baltic Shield (ca. 150 samples) provide an extensive data set recording the orogenic footprints in zircon from the Paleoproterozoic to Neoproterozoic. Field relations, petrography and bulk rock geochemistry of the rocks, combined with *in situ* U-Th-Pb geochronology and detailed textures of zircon, form the basis for an evaluation of first order trends for the formation of zircon in response to high-grade metamorphism. Importantly, in the absence of partial melting, crystalline protolith zircon, or metamorphic zircon from a previous orogenic episode, is overall well-preserved showing no significant Pb-loss, recrystallization, or growth. This also applies for very high temperature (800-850°C) metamorphism. By contrast, zircon resorption and reworking is substantial in migmatitic rocks. Two principal types of secondary zircon are distinguished, both with low Th/U ratios (<0.1): (1) Cathodoluminiscent (CL)-dark transgressive domains enriched in U (commonly >>500 ppm) preserving remnants of the primary igneous zoning. The transgressive domains may pass over into unzoned rims. (2) CL-brighter (commonly < 100 ppm U), unzoned, sector or fir-tree zoned, distinct overgrowths with sharp discordant contacts to the protolith zircon and non-complex newly crystallised grains. Syn-anatectic granites typically have zircon indistinguishable from the metamorphic zircon in the migmatitic rocks that they intrude. Metamorphic zircon is common and in places voluminous in mafic rocks (eclogite, mafic granulite and garnet amphibolite) in the south-westernmost shield area. Type 2 zircon dominates in these rocks, but the crystals are chemically, isotopically and texturally complex showing several stages of growth. Trace element data indicate HREE-depletion in garnet-rich lithologies and lack of Eu-anomalies in eclogite zircon.