Geophysical Research Abstracts
Vol. 17, EGU2015-2600, 2015
EGU General Assembly 2015

P-T-t paths from polyphased garnets of the Yenisey Ridge: evidence for three tectonothermal events along the western margin of Siberian craton

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Studies of pelitic gneisses and schists within the Yenisey regional shear zone (Garevka complex) at the western margin of the Siberian craton provide important constraints on the tectonothermal events and geodynamic processes in the Yenisey Ridge. In situ U–Th–Pb geochronology of monazite and xenotime from different growth zones of the garnet porphyroblasts coupled with P–T path calculations derived from garnet zoning patterns records three superimposed metamorphic event [1]. The different field gradients reflect contrasting tectonic settings. The first stage occurred as a result of the Grenville-age orogeny during late Meso–early Neoproterozoic (1050–850 Ma) and was marked by low-pressure zoned metamorphism at c. 4.8–5.0 kbar and 565–580 °C with a metamorphic field gradient of dT/dZ = 20–30 °C/km. At the second stage, the rocks experienced middle Neoproterozoic (801–793 Ma) collision-related medium-pressure metamorphism at c. 7.7–7.9 kbar and 630 °C with dT/dZ < 10 °C/km. The final stage evolved as a synexhumation retrograde metamorphism (785–776 Ma) at c. 4.8–5.4 kbar and 500 °C with dT/dZ < 14 °C/km and recorded uplift of the rocks to upper crustal levels in shear zones. The duration of post-collisional thrust exhumation does not exceed 16 Myr, which gives an exhumation rate of the metamorphic rocks of about 500–700 m/Myr [2]. This is in good agreement with the rate of exhumation (400 m/Myr) calculated for coeval collision-related metamorphic events in the Teya complex of the Yenisey Ridge [3] resulted from crustal thickening due to overthrusting [4] and also agrees with the results of thermomechanical numerical modeling (350 m/Myr) [5]. The final stages of collisional orogeny were followed by the development of rift-related bimodal dyke swarms of the Baikal-Yenisey belt, resulting from Neoproterozoic (790-780 Ma) extensional processes along the western margin of the Siberian craton and the onset of Rodinia's breakup [6]. Post-Grenville metamorphic episodes of regional crust evolution are correlated with the synchronous succession and similar style of the later tectonometamorphic events within the Valhalla orogen along the Arctic margin of Rodinia [7,8] and supports the spatial proximity of Siberia and North Atlantic cratons (Laurentia, Baltica, Svalbard) at c. 800 Ma, as indicated by the Neoproterozoic paleocontinental reconstructions of the classic Rodinia configuration [9,10].

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