Geophysical Research Abstracts
Vol. 15, EGU2013-5750, 2013
EGU General Assembly 2013

Ar-Ar and Rb-Sr dating of very low-/low-grade metamorphism along the main Iapetus suture, Newfoundland

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The Late Ordovician closure of the main tract of Iapetus resulted in juxtaposition of the leading edge of the peri-Gondwanan microplate Ganderia and the composite Laurentian margin. The suture is the Red Indian Line, which separates the Iapetan realm into peri-Gondwanan and peri-Laurentian arc-backarc complexes. The discrete Red Indian Line forms part of a wider collision zone that has a protracted and complicated tectonic history starting with underplating of oceanic terranes beneath the composite margin of Laurentia at ca. 471 Ma during the early stages of the Taconic orogeny. Final collision along the Red Indian Line and closure of the Iapetus ocean occurred at 455 Ma with the underthrusting of the peri-Gondwanan Victoria arc and its Ganderian basement beneath the composite Laurentian margin. The accreted Iapetan realm terranes were progressively deformed during the closure of a remaining Iapetan marginal basin, resulting locally in significant overprint and reactivation during the Silurian (Salinic orogeny).

Metamorphic overprint in the deformed Laurentia margin (Notre Dame Zone) above the Red Indian Line is mainly of very low grade to low grade and very heterogeneous. PT-conditions cluster at 3-5 kbar, 300-400°C and 6-7 kbar, 270-330°C. Medium grade conditions are related to local contact metamorphism. Ages of the local peak metamorphism in the peri-Laurentian Iapetan realm were determined by dating white mica with the Ar-Ar system and white mica-bearing assemblages with the Rb-Sr mineral isochron method. Both methods yielded ages that postdate the closure of the main tract of Iapetus. These generally belong to two age ranges: 418-430 Ma (Salinic events) and 350-390 Ma Neoacadian events). Partly two overprints can be detected in one and the same sample. Metamorphism is related to (1) reactivation of deformation in shear zones which partly cause further crustal thickening or strike slip-related deformation, (2) to external fluid influx, (3) to advective heating by synkinematic intrusions or (4) to a combination of these effects. Salinic to Neoacadian postcollisional processes in the collision zone apparently are much more widespread than formerly recognized.