Tracking fluid/melt flow in the lower crust using zircon isotopic (Pb, O) zoning, Kapuskasing Uplift

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Ion microprobe (SHRIMP and CAMECA 1280) analyses (U-Pb, O isotopes) document isotopically zoned zircon in lower crustal paragneiss from the Kapuskasing Uplift of the Archean Superior Province. Zircon cores range in age from 2.85±0.02 to 2.67±0.02 Ga and have $\delta^{18}O$ values of 5.1 to 7.1 ‰ (±0.3 to 0.5 ‰, 2 sd). Zircon rims with significantly higher $\delta^{18}O$ values (8.4 to 10.4 ‰) record nearly continuous metamorphic overgrowth events for ~80 Ma from 2.66±0.01 to 2.58±0.01 Ga during granulite facies (700° to 650°C; uncorrected Ti in Zrc) regional metamorphism. Multi-spot traverses record steep oxygen isotope discontinuities (4‰ over <10μm) at core-rim boundaries. These steep gradients demonstrate extremely slow rates of volume diffusion of O in non-metamict zircon during extended granulite-grade metamorphism (T>650°C for ~80 Ma). Therefore the $\delta^{18}O$ values and isotopic zoning within unrecrystallized zircon are primary and can be used to track impacts of thermotectonic processes, including fluid/melt infiltration, in the deep crust.

Metamorphic zircons (2.67±0.01 to 2.56±0.01 Ga in age) from granulite facies mafic gneisses in the area have variable $\delta^{18}O$ values from 7.6 to 11.3 ‰. Measured differences in $\delta^{18}O$ betweeen zircon and garnet range up to 1.1 ‰, well above the equilibrium fractionation of 0.1 (Valley 2003, RIMG 53). These higher $\delta^{18}O$ values for zircon (relative to detrital zircon cores in paragneiss) and anomalously large Δ(zircon-garnet) values demonstrate zircon crystallization before garnet and track fluid/melt infiltration events involved in the geochemical evolution of the deep crust. Zircons with the highest $\delta^{18}O$ values are from mafic gneiss within 1 m of high $\delta^{18}O$ paragneiss, possibly the result of fluid/melt infiltration from the paragneiss. We are evaluating ages and $\delta^{18}O$ values of zircons from a detailed traverse to monitor the extent and to date directly the timing of any fluid/melt flow across this contact.

Petrology of metamorphic rocks in Gorveh area, West of Iran

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There are metamorphic, sedimentary and igneous rocks at Gorveh area. Stratigraphy study showed that the formation existed from Triassic to upper cretaceous.Tectonical study distinguished that pressure systems have been effected in forming milinitization.

Petrographic study of metamorphic rock show that the regional metamorphism occurred in greenschist – amphibolite facies with contact and denamic metamorphism. Pelitic and basic rocks of regional metamorphism show that has been outcroped from slate to genisses in pelitic rocks and amphiboleschist –genisses in basic rocks. The realationship between diagensses and metamorphism crystallization indicated tow S1,S2 fabric that metamorphism crystallization have been formed during S1 and S2 and after them. The us metamorphism is of LP- HT type that P-T-t path is clock wise and metamorphism is a best correlation with magmatic-arc metamorphism.