Tracking crustal melting with monazite and xenotime: migmatites of the northern Arabian-Nubian Shield

Y. KATZIR[1]*, B. ELISHA[1], A. KYLANDER-CLARK [2] AND Y. EYAL[1]

[1]Ben Gurion University of the Negev, Be'er Sheva, Israel (*correspondence: ykatzir@bgu.ac.il; brelisha@gmail.com; eyal@bgu.ac.il)

[2]University of California, Santa Barbara, USA (kylander@geol.ucsb.edu)

The tectonic significance of rare bands of high-amphibolite facies migmatites in the northernmost Arabian Nubian Shield (ANS), within mostly greenschist facies metamorphic rocks elswhere in the ANS is unclear. Here, in-situ LASS analysis of monazite and xenotime pecisely dates migmatization and tracks mineral growth and breakdown to constrain the mode and context of migmatite formation.

Several hundreds U-Th-Pb dates of monazite indicate that migmatizion in Abu Barqa (SW Jordan), Roded (S Israel) and Taba-Nuweiba (SE Sinai coast, Egypt) complexes occurred coevally at the Early Edaicaran (625-610 Ma). The distribution of monazite dates is bimodal with clusters at both ends of this time interval. REE patterns of monazite are well correlated with date, indicating garnet growth at the early pulse and garnet breakdown before and during the late monazite growth. Th/U ratio in monazite sharply increases up to ≥30 at ~620 Ma. The gap in monazite dates at 620-615 Ma is the timing of peak metamorphic conditions, when partial melting and monazite and garnet consumption occurred. New zircon growth was, however, impelled by partial melting and depleted the crystallizing melt in U. Xenotime dates (n=40) cluster at 600-580 Ma recording retrogredation to greenschist facies conditions.

Similar monazite ages (~620 Ma) of the lower-amphilolite facies Elat schist indicate that migmatites are the result of widespread regional, rather then local contact metamorphism, probably representing the climax of the East African orogenesis. A NE-SW trending 'migmatite belt' occurs north of the $\delta^{18}O$ (Zrn) = 6‰ line in northernmost ANS, provding means of crustal contribution to mantle-derived magmas.