# Syn-metamorphic fluids as sources of rare element pegmatites: B isotopes, fluid inclusions and U-Pb petrochronology of the late Pan-African Elat metamorphic complex, S Israel

B. ELISHA[1*], Y. KATZIR[1], Y. VAPNIK[1], L. WILLIAMS[2], A. KYLANDER-CLARK[3], O. DVIR[4]

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

[2]Arizona State University, Tempe, USA (lynda.williams@asu.edu)

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

[4]The Hebrew University of Jerusalem, Jerusalem, Israel (omrid13@gmail.com)

Most of the large rare-element gem-producing pegmatites formed during the latest stages of the Pan African orogenesis and the consolidation of Gondwana (650-550 Ma). The majority of these pegmatites have been shown to be genetically related to post-collisional S- or A-type granites. However, field observations, fluid inclusion micro-thermometry, B isotope ratios in tourmaline and zircon and monazite petrochronology indicate that the Elat pegmatites are genetically related to fluids extracted from syn-metamorphic partial melting of metasediments.

Fluid inclusions in spodumene and quartz indicate substantial crystallization pressures of ~4 kbar and temperatures of up to 620 °C. In pegmatites $\delta^{11}B_{Tur}$ ranges from -2 to -7‰, whereas zoned tourmaline crystals of adjacent metapelites show core to rim depletion in $\delta^{11}B$ from -2 to -22‰, and negative correlation with the metamorphic grade of their host rock. This indicates increasing $^{11}B$ loss during prograde metamorphic devolatilization. Overlap in maximum $\delta^{11}B_{Tur}$ values in pegmatite and schists suggest complete extraction of boron and other volatiles during partial melting of schists and accumulation into pegmatites after melt crystallization. Metamict zircons of the pegmatites are Hf and Th rich and are highly discordant, but their Pb-loss/common-Pb contamination array emanates from concordant (~800 Ma) detrital zircons of the host garnet schist, suggesting they derived from it. Monazite ages of the host schist indicate regional metamorphism at 630-600 Ma, probably representing the time of anatexis, fluid mobilization and syn-tectonic emplacement of the pegmatites.