Extensive prekimberlitic lithosphere modification recorded in Jericho mantle xenoliths in kimberlites, Slave craton

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Wehrlite and pyroxenite xenoliths and megacrysts from the Jericho kimberlite were analyzed by µXRF and EBSD, and for major elements, trace elements, and isotopes (Pb-Sr-O) in major phases. Thermobarometry places these samples at 60 – 180 km and 600 – 1200 °C. While modes and textures vary, many samples have olivine-olivine grain boundaries with straight edges and 120° angle junctions, indicating granoblastic recrystallisation, while clinopyroxene and orthopyroxene are complexly intergrown. Clinopyroxene twins and subgrains recording orientations distinct from the encapsulating grain were detected using EBSD and are inferred to represent recent modification processes. Several distinct garnet compositions were measured, with multiple thin garnet rims in some samples suggesting possible successive stages of garnet crystallisation. Complex chromium zoning in garnet is detected by µXRF in several samples (fig.1). Pb-Pb ages for most samples are similar to the age of kimberlite entrainment (173 Ma), but the shallowest pyroxenite sample preserves the most radiogenic Pb composition, intercecting concordia at 0.7 – 1.1 Ga, and is the only sample with $\delta^{18}O$ above the mantle range (6.2±0.1 ‰). The deepest sample has the lowest $\delta^{18}O$ (5.5±0.1 ‰) and radiogenic $^{87}Sr/^{86}Sr$ similar to MARID rocks (0.709±1 ‰). These results suggest the Jericho lithosphere experienced several melt/fluid injection events that modified substantial portions of the sampled section soon before kimberlite entrainment.