Low temperature thermochronology of Phanerozoic kimberlites and Archaean basement, Slave Province, Canada

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In an effort to investigate the burial history of the Slave craton, NW Territories, Canada we report the first results of a low temperature thermochronology study applying apatite fission track and (U-Th)/He methods, from the Ekati (45-61 Ma), and the Jericho and Muskox (172-175 Ma) kimberlite pipes (including their crater facies sediments, and sedimentary and basement xenoliths) and their host Archaean granitic basement (2.71-2.58 Ga).

Previous vitrinite reflectance data (%Ro 0.24-0.42) and porosity analysis from unaltered shale xenoliths in the Eocene pipes of the Lac de Gras diamond field (including the Ekati pipes), suggest a maximum burial temperature of 60°C for mid Cretaceous strata with 1.2 to 1.4 km sedimentary cover in the Lac de Gras kimberlite field region prior to major uplift and erosion, which began around 90 Ma [1]. The nearest Paleozoic sediments are preserved more than 400 km southwest of the kimberlite fields in the foothills of the Mackenzie Mountains where they are typically 1-2 km thick.

Our data are used to obtain improved constraints on the thermal history of the Slave craton and provide more precise estimates on its denudation history. This will lead to new insights for assessing the long-term stability of continental interiors in relation to subtle sedimentation and denudation patterns, which may be related to dynamic topography driven by mantle convection and far-field tectonism.

References

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Petrological Characteristics and LA-SF-ICP-MS U-Pb ages of S-type Granitoids from Central Turkey

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The S-type Sinandi microgranite (SMG) and the Namlikisla biotite-granite (NBG) (Aksaray-central Turkey) intrude metamorphic basement rocks and gabbroic rocks of an ophiolitic sequence and is itself cut by I-type granitoids. SMG and NBG consist of orthoclase, quartz, plagioclase, biotite, muscovite ± hornblend ± pyroxene and accessory zircon, titanite, epidote, apatite and opaque minerals. They have calc-alkaline peraluminous character, LILE and LREE enrichment, low Ce, Zr, Hf, Sm contents and pronounced Eu-anomalies (0.63 and 0.59, respectively). SMG and NBG display a crustal isotopic signature with high initial $^{87}Sr/^{86}Sr$ ratios (0.712827 and 0.715168, respectively) and low εNd values (-9.1 and -9.7, respectively).

Based on zircon typology method (Pupin, 1980) zircon populations from both granitoids are described by low to moderate A and T indexes, typical aspect for crustal originated granitoids. SMG has abundant $S_{7-12-13-18}$ zircon types and lesser amounts of $S_{2-9-10-17-19-23-24}$ types, whereas the zircon population of NBG is represented by preferential development of S_{2-7-12} types besides $S_{1-3-4-5-6-8-11-13-16}$ and $L_{1-2-3-4-5}$ types in lesser percentage. Zircon crystals from SMG and NBG commonly contain rounded to subrounded inherited cores overgrown by oscillatory zones displaying intermittent resorption surfaces and some secondary structures such as recrystallization and flow domains.

Rims and outer zones of zircons from SMG give a LA-SF-ICP-MS mean $^{206}Pb/^{238}U$ age of 81.5±0.84 Ma (2σ), while those of NBG yield 83.8±0.95 Ma (2σ). Ages of inherited cores range from 526 Ma to 1566 Ma for SMG, and from 144 Ma to 2304 Ma for NBG.

Consequently we suggest that Late Cretaceous S-type SMG and NBG were formed as a result of Alpine collisional magmatism during closure of the northern branch of the Neotethys Ocean. However, wide range of ages indicating cryptic igneous events were recorded. Moreover xenocrystic inherited zircon cores represent a variety of sources including the Proterozoic crust.

References

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